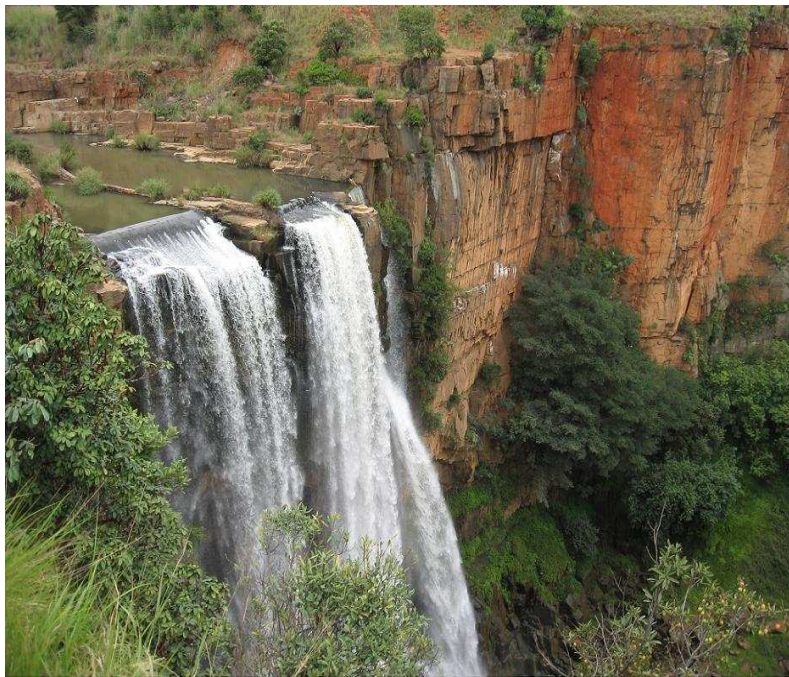


# South Africa's Water Reserve: Obstacles and Opportunities

*A case study of the Basic Human Needs Reserve and basic water services in southern Nsikazi and the Ecological Reserve in the Crocodile sub-catchment, South Africa*



M.Sc. Thesis by Danny Schoch

October 2007

Irrigation and Water Engineering Group  
Department of Water Affairs and Forestry  
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WAGENINGEN UNIVERSITY  
WAGENINGEN UR



# **South Africa's Water Reserve: Obstacles and Opportunities**

A case study of the Basic Human Needs Reserve and basic water services in southern Nsikazi and the Ecological Reserve in the Crocodile sub-catchment, South Africa

Master thesis Irrigation and Water Engineering submitted in partial fulfillment of the degree of Master of Science in International Land and Water Management at Wageningen University, the Netherlands

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## Abstract

Since Apartheid in 1994 was abolished the South African government aims to redress the racial inequities of the past. In water resource management and water services supply progressive policy and legislation have been enacted. The 1997 Water Services Act (WSA of 1997) and the 1998 National Water Act (NWA) provide the legal framework for the new policy. In the new legislation it is stipulated that access to water is a basic human right and that water is a resource that has an important capability for economic development and poverty eradication. Nature is identified as an important stakeholder and the ecological resource should be dealt with in a sustainable way and protected for future generations.

To reach these goals the South African government's Department of Water Affairs and Forestry (DWAF) wants to re-allocate the national water resources. In order to ensure equity and ecologically sustainable development, water for basic human needs and ecological needs are prioritised in the NWA. Water is allocated to the so-called Reserve; the Basic Human Needs Reserve (BHNR) and the Ecological Reserve (ER), before it is allocated to any other purpose. In the new legal framework the Reserve is the only right to water.

In practice the policy implementation and water allocation to the Reserve face difficulties. Currently, about a decade after the establishment of the new legislation, the BHNR and ER are not implemented. Many black communities do not have sufficient access to safe drinking water and natural live and biodiversity in and around rivers is declining.

The aim of this thesis research is to investigate what is happening on the ground in order to study the obstacles for the implementation of the Reserve. The obstacles for the ER, BHNR and the delivery of basic water services are studied in a case study in a specific area; the southern Nsikazi area in the former homeland of KaNgwane and the Crocodile sub-catchment, part of the Inkomati River catchment in Mpumalanga province in the north-east of South Africa.

The Reserve is not yet determined for the Crocodile sub-catchment and the determination process is complex, time consuming and capacity demanding. With the current lack in water control by DWAF the Reserve cannot be implemented. The Reserve is contested; a balance has to be found between ecology, economy and society. Stakeholder participation is needed to prevent resistance from water users and find agreement on the Reserve.

Basic water services delivery in southern Nsikazi is insufficient; standards for basic water services delivery are often not met and besides this it can be questioned whether the standards and the BHNR is sufficient for meeting basic human water needs. A lack of water control by local government is a main cause for the insufficient delivery of basic water services.

*Key words:* Water Reform, Ecological Reserve, Basic Human Needs Reserve, Basic Water Services, Water Control, Water Rights, southern Nsikazi, Crocodile sub-catchment, Inkomati Catchment, South Africa.



## Acknowledgements

This thesis research took place between January 2007 and October 2007 as partial fulfilment for the degree of Master of Science in International Land and Water Management, specialization Irrigation and Water Management at Wageningen University, the Netherlands. It was supervised by Ir. Flip Wester from the Irrigation and Water Engineering Group. The field research in South Africa took place between January 2007 and June 2007. The research in South Africa was facilitated by the regional office of the Department of Water Affairs and Forestry (DWAF) in Nelspruit and the African Water Issues Research Unit (AWIRU). Pr. Eng. Werner Comrie (DWAF) and Dr. Jaqui Goldin (AWIRU) supervised the research in South Africa.

As this research was my first thesis research an important personal objective was to do scientific research with integrity and to learn from this process; write a research proposal, collect and process the data and finally analyse the data, write the thesis report and present the research outcomes.

Next to this, I have a strong personal interest in South Africa and its complicated history. I wanted to experience how it is to live in this country where such major changes in society have taken place and still take place. What about Apartheid, is it really eliminated or is it still partly there? And, how do the changes or lack of changes affect water resource management? I wanted to see and experience whether the progressive new water policies have the impacts as envisioned by the government.

Most important of all, I am very interested in international development issues. For my internship I have lived in Bangladesh for 4 months where I worked in a project that deals with rural drinking water issues. This time I had the opportunity to live in South Africa for 5 months and I wanted to understand and find out how experiences in Bangladesh differ from experiences in South Africa and whether my own research has any relevance within the South African context. My time in South Africa gave me also the opportunity to experience whether I would like to have my professional career in the international water management and development sector and whether I would choose, or am able to work and live in a developing country.

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## Abbreviations

ANC	African National Congress
AWIRU	African Water Issues Research Unit
BHNR	Basic Human Needs Reserve
CMA	Catchment Management Agency
CMC	Catchment Management Committee
CMF	Catchment Management Forum
CMS	Catchment Management Strategy
CRMIB	Crocodile River Major Irrigation Board
DWAF	Department of Water Affairs and Forestry
DWAF Nelspruit	DWAF Mpumalanga regional office in Nelspruit
ER	Ecological Reserve
FBW	Free Basic Water
FIB	Friedenheim Irrigation Board
GDP	Gross Domestic Product
HDI	Historically Disadvantaged Individual
IB	Irrigation Board
ICMA	Inkomati Catchment Management Agency
IFR	Instream Flow Requirements
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
KNP	Kruger National Park
KOBWA	Komati Basin Water Authority
KRMIB	Kaap River Major Irrigation Board
MAR	Mean Annual Runoff
MIB	Malelane Irrigation Board
MLM	Mbombela Local Municipality
MUS	Multiple-use systems
NGO	Non Governmental Organization
NWA	National Water Act, 1998, Act 36
RDM	Resource Directed Measures
RDP	Reconstruction and Development Programme
RWH	Rain Water Harvesting
SAPPI	South Africa Pulp and Paper Industry
WAR	Water Allocation Reform
WHO	World Health Organisation
WMA	Water Management Area
WRCB	White River Conservation Board
WRM	Water Resource Management
WSA	Water Services Authority
WSA of 1997	Water Services Act, 1997, Act 108
WSDP	Water Services Development Plan
WSP	Water Service Provider
WUA	Water Users Association

# Chapter 1: Introduction

## 1.1 The Research

Since Apartheid in 1994 came to an end the South African government aims to redress the racial and gender inequities of the past. In water resource management and water services supply progressive policy and legislation have been enacted. The 1997 Water Services Act (WSA of 1997) and the 1998 National Water Act (NWA) provide the legal framework for the new policy. In the NWA it is stipulated that water is a basic human right that should be accessible to all South Africans (DWAF 2004b; Schreiner et al. 2002; Perret 2002; Backeberg 2005; Pollard et al. 2002). The NWA states that water is a resource that has an important capability for economic development and poverty eradication. Nature is identified as an important stakeholder and the ecological resource should be dealt with in a sustainable way and protected for future generations (Republic of South Africa 1998; DWAF 2004b; Schreiner et al. 2002; Perret 2002; Backeberg 2005).

In order to reach these goals the South African government's Department of Water Affairs and Forestry (DWAF) wants to re-allocate the national water resources. In order to ensure *equity* and ecologically *sustainable* development water for Basic Human Needs (water for drinking, food preparation and for personal hygiene) and Ecological Needs are prioritised in the NWA. Water is allocated to the so-called Reserve; the Basic Human Needs Reserve (BHNR) and the Ecological Reserve (ER) before it is allocated to any other purpose. In the new legal framework the Reserve is the only right to water (Republic of South Africa 1998; Schreiner et al. 2002; DWAF 2007).

Although the Reserve is the only right to water, in practice the allocation to the Reserve face difficulties and basic water services are not sufficiently delivered. Currently, about a decade after the establishment of the WSA of 1997 and a "new" NWA, many black communities do not have sufficient access to safe drinking water and the ER is not implemented at all (Schreiner et al. 2002).

The aim of this thesis research is to find out what the obstacles for the implementation of the Reserve are. How comes that the envisioned redress of the water related inequities of the past and sustainable water resource management do not take place? The obstacles for the ER, BHNR and the delivery of basic water services are studied in a case study in a specific area; the southern Nsikazi area in the former homeland of KaNgwane and the Crocodile sub-catchment, part of the Inkomati river catchment in Mpumalanga province in the north-east of South Africa<sup>1</sup>.

For this M.Sc. thesis in International Land and Water Management research was done for both the South African government's DWAF Mpumalanga regional office in Nelspruit (DWAF Nelspruit) as well as the South African research institute African Water Issues Research Unit (AWIRU) that is connected to the University of Pretoria. By getting input and supervision from DWAF's Mpumalanga regional office and AWIRU, academic feedback as well as inputs and feedback from the government institute responsible for South Africa's water management was received during the research process. Between January 2007 and June 2007 five months were spent in South Africa. As I had an office at DWAF Nelspruit I was able to study the current processes in Water Resource Management and Water Services from the inside.

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<sup>1</sup> The Nsikazi area is part of the Crocodile sub-catchment.

In order to answer the research questions literature was investigated, workshops were attended, observations in the field were conducted and interviews and discussion with water users, experts and other key stakeholders were carried out. In the end the preliminary research findings were presented to DWAF Nelspruit, water users and stakeholders for feedback.

The report is organised as follows. In the following parts of Chapter 1 the background of South Africa and its water reform policies and legislation are introduced. After this the Inkomati Catchment, the regional history and the problem description are presented. This is followed by the research objectives and research questions. Chapter 2 will discuss the conceptual framework which shows the conceptual perspective in this research. In the research methodology section the practical approach to the research is presented. Chapter 3 describes the research findings related to the ER in the Crocodile sub-catchment. In Chapter 4 the research area and research findings concerning the BHNR and basic water services component of the research are presented. Chapter 5 concludes the report and opportunities for the Reserve are presented.

## **1.2 The Context: Water, Apartheid and Water Reform**

### *1.2.1 Water scarcity*

Because of its low average annual precipitation of about 450 mm per year and comparatively high evaporation, South Africa is a water scarce country (world average of rainfall is about 860 mm/a). The climate is predominantly semi-arid and varies from desert and semi-desert in the west to sub-humid along the eastern coastal area (DWAF 2004b).

The annual per capita water availability of 1099 cubic meters is just over the level of 1000 m<sup>3</sup>/capita/year that is considered to indicate the state of water stress (Abernethy 1997). Surface water and groundwater are unevenly distributed in the country which is the result of climate and geography (21% of the country's surface area receives less than 200 mm) (Perret 2002; DWAF 2004b).

Next to this the rainfall is highly seasonal, as well as high within-season variability, over almost the entire country. Because of this surface runoff is also highly variable. As a result, most of the time stream flow in South African rivers is at relatively low levels. The irregular high flows that take place limit the proportion of stream flow that can be used (DWAF 2004b). Only 8.6% of the rainfall becomes available as useable runoff, this is the lowest fraction in the world according to Davies and Day (1998). These same authors state that there will be no spare water in South Africa after 2020 if the whole population is supplied with the water they need. Water-related disasters such as floods and droughts are not uncommon in South Africa (DWAF 2004b).

Groundwater is extensively utilised, particularly in the rural and more arid areas, but is limited because of the predominantly hard rock nature of the South African geology. Only one fifth of the country's groundwater is in large porous aquifers that could be abstracted and used on a large scale (DWAF 2004b).

In this water scarce country most urban and industrial development, as well as some densely populated rural settlements, have been established in locations remote from large waterways, because of the occurrence of minerals or influenced by the politics of the past. As a result, in several catchments the requirement for water already far exceeds its natural availability and often large-scale inter-catchment transfers of water have already been implemented (DWAF 2004b).

Four of South Africa's main rivers are international. These are the Limpopo, Inkomati, Pongola (Maputo) and Orange (Senqu) Rivers, which together drain some 60 per

cent of the country's land. About 70 per cent of South Africa's gross domestic product (GDP) and the same part of the population are supported by water supplied from these rivers, making the management of these international rivers very important to South Africa (DWAF 2004b).

### 1.2.2 Poverty, Apartheid and Water

Half the population of South Africa is living below the poverty line (2000 estimate). About half of the country's population lives in rural areas and in these areas poverty rates are higher (occurrence of 71.6%). Some 2.3 million households live in the former homelands<sup>2</sup> where the majority of South Africa's rural poor today live (see map of former homelands in Annex 2). Poverty is directly linked to race; about 60% of the black people (79,5% of the population is black, 9,2% is white, 8,9% is coloured and 2,5% is Indian/Asian (Mid-year estimates 2006)) are poor in contradiction to only 1% of whites<sup>3</sup> (Perret 2002; Malzbender et al. 2005; Statistics South Africa 2007; CIA 2007).

The demography of the country is closely linked to former Apartheid policy which excluded black people from owning or renting land outside the 13% of the country's surface area that was entitled as homelands. After the abolishment of Apartheid this land is still mostly state-owned and is available to users through traditional authorities and regulations. In these areas many people live under poor conditions (Goldin 2005; Perret 2002; Mandela 2004:177).

During the Apartheid era, large white farms benefited from a privileged access to natural (water) resources and rural infrastructure. These privileges did not benefit inhabitants of the homelands or independent Bantustans. Black areas still suffer from this history; in 2000, 83% of agricultural land was still owned by white farmers and about 96% of irrigation water was in the hands of private and cooperative schemes and Irrigation Boards (IBs) (Malzbender et al. 2005; Kirsten, Perret and Van Zyl 2000). According to Schreiner et al. (2002) in 2002 around 7 million South Africans were still dependent on water from open streams, boreholes or stagnant sources for drinking water. According to Swatuk (2005) around 10-12 million South Africans lack access to clean water. The South African Water Research Commission (WRC) states that currently between 12 million and 14 million South Africans are without access to safe water and more than 20 million are without adequate sanitation. Only 44,7% of South Africa's households have a tap inside their homes, 16,7% have a tap in the yard, 19,8% fetch water from a communal tap and more than 14% access water from dams, rivers, boreholes, rainwater, water carriers or tankers. Within the poorest 53% of the South African population, a third live in shacks or traditional dwellings, about 70% do not have access to piped water and more than 80% do not have access to modern sanitation (WRC 2007).

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<sup>2</sup> Since the formulation of the Natives Land Act of 1913 a number of homeland areas (also called Bantustans or Native areas) were established and became "reserves" for black people. This spatial discrimination was further implemented under the apartheid regime. The homelands got some form of autonomy from central government and some of them ultimately became independent states with own governments (so-called Bantustans). All homelands and Bantustans have been incorporated into the country again in 1994 (Mandela 2004; Perret 2002).

<sup>3</sup> In this thesis the term *black people* or *blacks* is used by the author for referring to African descendants while *whites* and *white people* is used to refer to European descendants. This is common practice in South Africa. When the term *African* is used this can be interpreted in several ways. It can mean either a black person or a person born in South Africa or Africa. In case of the latter it still remains unclear whether the person is black or white.

### 1.2.3 Post Apartheid: a new Constitution and Water Reform

After 342 years of white domination and rule in 1994 Apartheid was abolished with the first democratic election. The new government with Nelson Mandela as its president recognised the need for major reforms in the Constitution, legal system, policies and institutions. In the new Constitution the injustices of the past are recognised and racial discrimination since then is forbidden by law: “*No person may unfairly discriminate directly or indirectly against anyone (...)*” (Republic of South Africa 1996, chapter 2, section 9.4). The Homelands or Bantustans, in which since 1970 millions of black people were forced to live, were abolished.

Water reforms were conceived within the context of national reform designed to overcome the legacy of the Apartheid (Wester et al. 2003; Schreiner et al. 2001). In the new Constitution (implemented since 3 February 1997) the central government is the custodian of the national water resources and two main functions of DWAF are formulated; to manage the country’s water resources and to ensure that all people have sufficient water supply and sanitation service. The Constitution states that everyone has the right to have access to sufficient water and that the State must take reasonable legislative and other measures, within its available resources, to achieve the realization of these rights (Republic of South Africa 1996; Schreiner et al. 2001; Goldin 2005).

#### *The National Water Act and Water Services Act*

The new water management policies were formulated in two key laws - the Water Services Act (No.108 of 1997) and the National Water Act (No.36 of 1998).

The WSA of 1997 is the legal framework that deals with water services delivery and supply. The guiding principle of the WSA of 1997 is that “everyone has a right to basic water supply and sanitation”. The WSA of 1997 provides the framework for the provision of water and sanitation services to which people are entitled, however this entitlement to water is not specified in the Act. According to the WSA of 1997 local government (municipalities) is a Water Services Authority (WSA). Municipalities are responsible for the provision of water services and for implementing water improvement programmes at the local level and have to “ensure efficient, affordable, economical and sustainable access to water services” (Republic of South Africa 1997; Pollard et al. 2002; Goldin 2005). The WSA appoints a Water Services Provider (WSP) which is responsible for the daily operations and maintenance of the water systems. A WSA can be the WSP itself, but it can outsource as well (Pollard et al. 2002).

In time, it became clear that the 1956 NWA, which emphasised on development of water resources and the establishment of riparian rights, was not anymore able to meet the needs of the changing political, social, economic and ecological environments. Challenges of limited water resources, the need for economic development and provision of basic water supplies, required policy instruments which were more flexible, more integrative and more dynamic (MacKay 2000).

In the preamble of the NWA of 1998’s document the following is recognised: “*Recognizing that water is a scarce and unevenly distributed national resource(...)* (and) *water is a natural resource that belongs to all people, the discriminatory laws and practices of the past have prevented equal access to water, and use of water resources*” (Republic of South Africa 1998). The purpose of the NWA is to ensure that the nation’s water resources are protected, used, developed, conserved, managed and controlled taking into account the principles presented in Box 1.

### **Principles of the National Water Act**

- (a) meeting the basic human needs of present and future generations;
- (b) promoting equitable access to water;
- (c) redressing the results of past racial and gender discrimination;
- (d) promoting the efficient, sustainable and beneficial use of water in the public interest;
- (e) facilitating social and economic development;
- (f) providing for growing demand for water use;
- (g) protecting aquatic and associated ecosystems and their biological diversity;
- (h) reducing and preventing pollution and degradation of water resources;
- (i) meeting international obligations;
- (j) promoting dam safety;
- (k) managing flood and droughts.

(Source: Republic of South Africa 1998)

#### **Box 1: Principles of National Water Act**

The NWA prescribes Integrated Water Resource Management (IWRM) at the catchment or river catchment level. Under the NWA, water management is decentralised at the river catchment level moving away from the previous legislative framework that was governed by a strongly centralised system (Wester et al. 2003; Backeberg 2005). The DWAF established 19 Water Management Areas (WMA) in large river catchments or combining smaller river catchments together (see Annex 1 for the WMAs) which are going to be managed by so called Catchment Management Agencies (CMA). The governance structure of CMAs will balance the requirement to reflect the interests of diverse stakeholders with the need to ensure effective management of the catchment area (Pollard et al 2002). Currently the Inkomati CMA (ICMA) is the first and only established CMA in South Africa.

#### *Integrated Water Resource Management*

Since the 1990s Integrated Water Resource Management (IWRM) has been promoted in the water policy world (Anderson 2005). The South African government has embraced this concept and the need for all water users and stakeholders to participate is strongly agreed upon (Waalewijn et al. 2005; Swatuk 2005; Biswas 2004). Water Resources Management in South Africa is decentralised; the responsibility and authority for water resources management goes to CMAs and, at a local level, Water User Associations (WUA). These institutions of water users and other stakeholders are envisioned to facilitate effective participation in the management of water resources. WUAs were supposed to be established in 2002. DWAF will move from its present multiple roles as operator, developer and regulator to become the sector leader, policy maker, regulator and monitor. DWAF will coordinate the formation of the new institutions and give support and guidance in the execution of their tasks (DWAF 2004b).

The definition of IWRM that is most commonly used is formulated by the Global Water Partnership (2000); IWRM is defined as “*a process that promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems*” (Global Water Partnership, 2000) (For a short discussion about equity see Box 2).

Van der Zaag (2005) comes up with another definition of IWRM; “*reconciling basic human needs, ensuring access and equity, with economic development and the imperative of ecological integrity, while respecting transboundary commitments.*” In this definition the

emphasis is more on basic human needs on which the South African's government also has given priority on in the 1998's NWA. Jaspers (2003) in Anderson (2005) add that in IWRM includes a multi-disciplinary and participatory approach.

Within the IWRM perspective it is most commonly agreed upon that a basin or catchment is the most suitable unit for water management (Waalewijn et al. 2005). DWAF has adopted this perspective.

In South Africa's water reform equity is considered a very important goal. However, it is a complex concept that is interpreted in different ways (Prasad et al. 2006). According to Boelens (1998) several actors use the concept according to their own ideology and interest. Equity is often thought to be the same as equality (Klarenberg 2004). But in fact it is not. From the Merriam-Webster Online Dictionary website (2007) equity is defined as: "*justice according to natural law or right; specifically: freedom from bias of favouritism*". So, equity does not have to mean that everybody is equal. Equity is thus a biased concept and people's ideas about what is fair are subjective and concern the interest and ideologies of the parties involved.

**Box 2: Equity**

However, IWRM is not without problems. According to van der Zaag (2005) IWRM in general, and in South Africa in particular, poses an institutional challenge. Institutional capacity is necessary for integration, but this capacity commonly is in short supply. In South Africa, new water related institutions are built according to hydrological boundaries while existing administrative structures are not. From the field work this is confirmed and it was observed that WSA boundaries (municipal boundaries) do not follow hydrological boundaries and water transfers between different catchments take place. The blurring of boundaries can result in misunderstandings or in competition and a lack of cooperation between institutions.

IWRM is a useful approach in water management, although not necessarily a panacea; it is context specific and takes time before proper implementation can be achieved (van der Zaag 2005). IWRM provides a useful framework for water management, especially in South Africa where participation of previously disadvantaged individuals is important for an equitable access to water (interdisciplinary and socio-technical system to be continued in Chapter 2).

#### 1.2.4 The Reserve

The NWA includes the concept of the Reserve. The Reserve is identified as the specific water quantity and quality necessary to protect basic human needs and aquatic ecosystems (MacKay 2000). The Reserve consists of two parts: the Basic Human Needs Reserve (BHNR) and the Ecological Reserve (ER). It is defined as; "*the quantity and quality of water required to;*

(a) *satisfy basic human needs by securing a basic water supply, as prescribed by the Water Services Act, 1997 (...) and to*

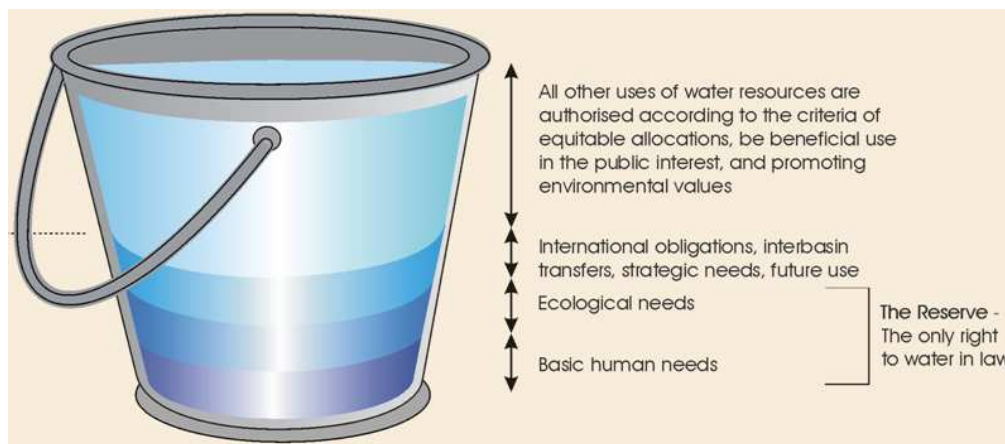
(b) *protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource*" (NWA 1998: 16).

In the NWA the quantity needed for basic human needs is not specified but it states that "*the BHNR provides for the essential needs of individuals served by the water resource in question and includes water for drinking, food preparation and for personal hygiene*" (NWA 1998: 16). The BHNR in fact is a catchment level stock of water necessary to meet the entitlements to basic human needs of catchment residents. The forerunner to the NWA, the 1997 white paper, does identify the minimum service level to which people are entitled; 25 litres per capita per day, as was used by the Reconstruction and Development Programme

(RDP), a development manifesto of the African National Congress (ANC) government (ANC 1994).

The portion of the natural stream flow that must remain in the river for the ER to ensure sustainable functioning of aquatic ecosystems is not fixed and is to be determined. The ER is not just the minimum water quantity and water quality necessary for protection. The ER will vary depending on the class of the resource (class A: pristine, unmodified until class F: critically modified, class E and F are not acceptable), however, the BHNR will not vary (DWA 2007; Pollard et al. 2002; MacKay 2000; WRC 2007).

According to the NWA all other water use rights are subject to the requirements of the Reserve. The provision of the Reserve prior to any other water use is a statutory requirement, and is the only allocation that has statutory protection in South African law (see figure 1) (DWA 2007). After allocating water to the Reserve, water is allocated for international obligations, inter-basin transfer and strategic needs for future use. The remaining quantity of water is allocated to other uses that are authorised according to the criteria of equity, efficiency and sustainability (WRC 2007).



**Figure 1:** Water Allocation priorities of the NWA (Source: Manyaka Greyling Meiring in DWA 2007)

Each CMA has to develop a Catchment Management Strategy (CMS) and according to the NWA “a catchment management strategy must take into account the class of water resources and resource quality objectives contemplated in (...) the requirements of the Reserve and where applicable, international obligations (NWA of 1998:16)”.

The Reserve does not include water required for additional household or productive needs, subsistence crops or small-scale productive use (e.g. garden vegetables or livestock production) (Pollard et al. 2002).

### 1.2.5 The link between BHNR and Basic Water Services

The BHNR and basic water services delivery are linked in this research. The BHNR represents a catchment level amount of water necessary to meet the entitlements to basic needs of inhabitants of the catchment. To do so it is necessary to have not only the amount of water (BHNR) but also the means to deliver it to the people (infrastructure and institutions). This amount of water (water resource) must be sufficient in the right quantity at the right time in the right place to ensure that the water can be delivered to the consumers (water services) (Pollard et al 2002). Without basic water services to be delivered and received by the people the aim of the BHNR is not achieved. Therefore, the BHNR and water services delivery including its obstacles are studied in the research area.

In next section the Inkomati Catchment will be described. The research was conducted in the Crocodile sub-catchment, part of the Inkomati Catchment. In Chapter 3 the Crocodile sub-catchment will be described but first general information of the wider research area is presented in next section.

### 1.2.6 The Inkomati Catchment

#### Topography

The Inkomati catchment is situated in the north-eastern part of South Africa and borders Mozambique and Swaziland. The Crocodile sub-catchment (see Annex 4) together with the Komati and Sabie-Sand sub-catchments form the Inkomati catchment (see Figure 2) which is located in Mpumalanga province in the northeast of South Africa. The Inkomati catchment is an international river catchment including parts of Swaziland and Mozambique. The catchment originates in the high plateau in the west. After flowing through the Transvaal Drakensberg range in the west, the Inkomati's rivers flow through the subtropical Lowveld, Swaziland and finally draining into the sea in the delta of Mozambique. The altitude ranges from over 2,000m in the west to 140m in the east (DWAF 2004A).

In 2000, the Inkomati catchment was identified as one of the 19 Water Management Areas (WMA) established in South Africa. The first CMA proposal was formulated for the Inkomati catchment (Waalewijn et al. 2005: 186; Nkomo et al. 2004; Anderson 2005).

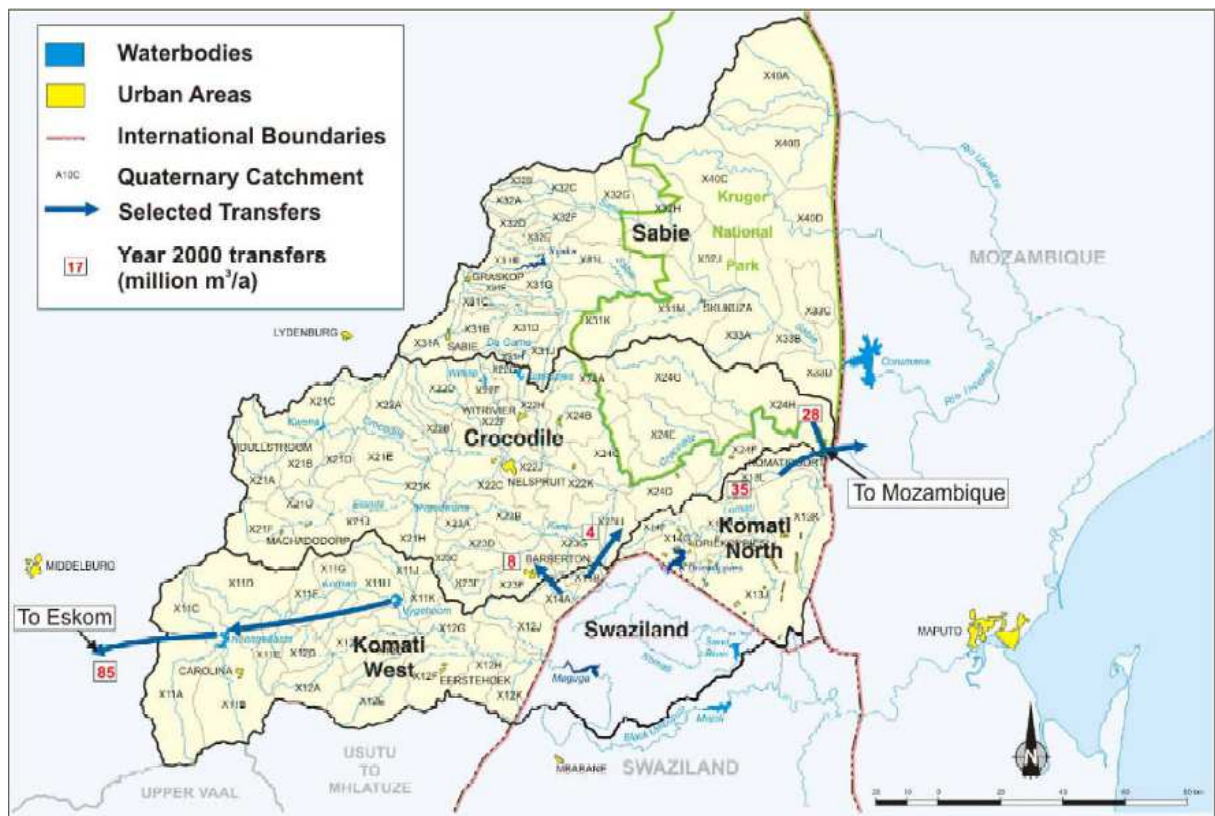


Figure 2: The Inkomati Catchment (Source: DWAF 2004A)

### Hydrology

Rainfall varies from over 1200 mm per annum in the Drakensberg mountains to as low as 400 mm per annum in the lower eastern part. Evaporation mainly determines the requirements for irrigation and varies from less than 1400mm in the west of the Inkomati WMA to over 1900mm in the north (see Figure 3) (DWAF 2004A). The total catchment area of the Inkomati Basin inside South Africa and part of Swaziland, covers 31,230 km<sup>2</sup> (DWAF date unknown). The mean annual runoff (MAR) from the Inkomati WMA is estimated to be 2945 million m<sup>3</sup>/annum. The MAR from Swaziland (475 million m<sup>3</sup>/annum) is not included in this number; although it is part of the catchment, it is not part of the Inkomati WMA (DWAF 2004A). In the Inkomati catchment as a whole little groundwater is available, only some 1% of the total available yield from water resources is obtained from groundwater (DWAF 2005).

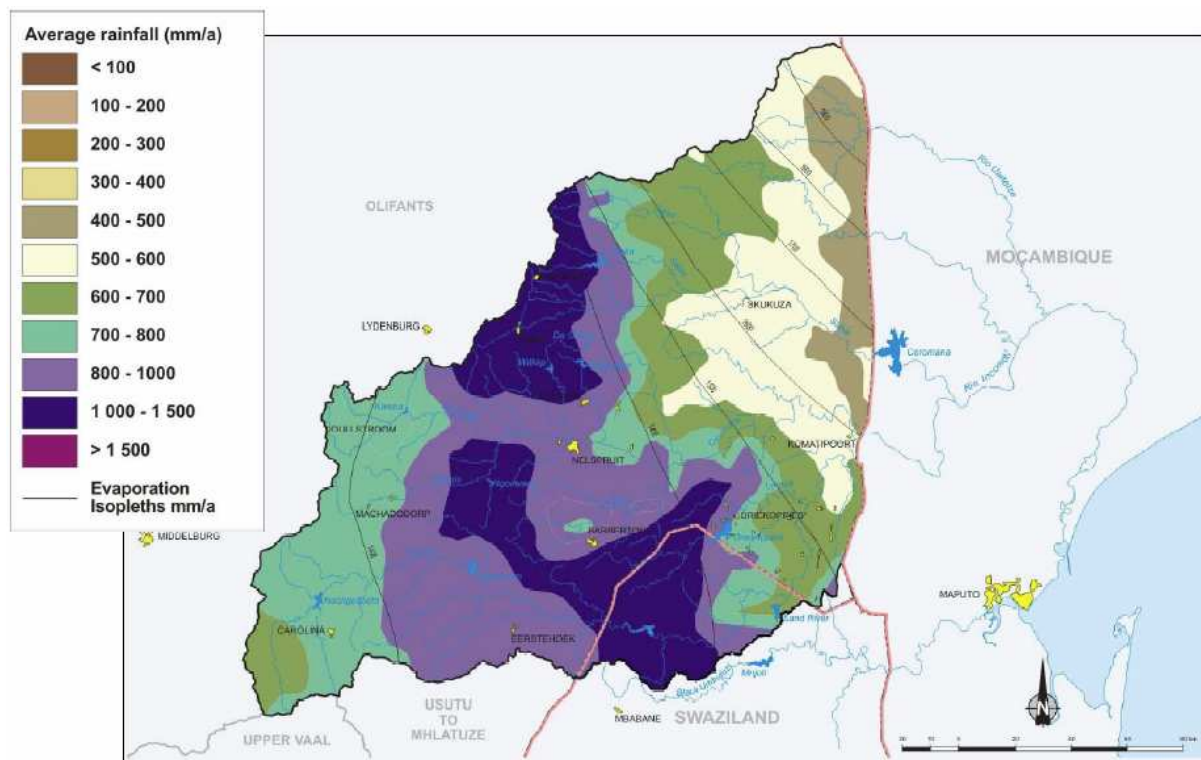


Figure 3: Rainfall and Evaporation in the Inkomati WMA (Source: DWAF 2004A)

### Economy

Agriculture is important in the Inkomati Catchment. According to DWAF the agricultural contribution to the national economy is less than 5% (in 1997) but in the Inkomati catchment it is 18,6%, making agriculture the second largest sector in contributing to the economy (DWAF 2005). The most important sectors in terms of contribution to the GGP in the Inkomati WMA are as follows: 1) Manufacturing 24,6 %, 2) Agriculture 18,6 %, 3) Government 16,4 %, 4) Trade 13,4 %, 5) Other 27,0% (DWAF 2004a).

Other sources give different numbers; agriculture would account for less than 2,5% of the GDP in South Africa, however, 30% of the labour force is working in agriculture or agriculture related activities (1999 estimate) (Statistics South Africa 2007; CIA 2007).

## *Demography*

The population in the Inkomati WMA was estimated to be 1,462,000 in 1995 (DWAF 2003b), of which 940,000 people are classified as urban and semi-urban population. The rest is classified as rural. In the meantime however, many of the settlements that were classified as rural for the purpose of the might now be classified as urban rather than rural (DWAF 2004a).

A large number of rural settlements exist in the Mhala, Mapulaneng, Nsikazi, Nkomazi and Mswati (former homeland) regions. Tribal areas within the Inkomati WMA are shown in Annex 3. Important urban centres in the Inkomati catchment are Nelspruit, White River, Komatipoort, Carolina, Badplaats, Barberton, Sabie, Bushbuckridge, Kanyamazane and Matsulu. To get a full understanding of current developments in water management in the research area it is useful to have knowledge about the regional history. The regional history of the Lowveld is presented in the next section.

### *1.2.7 Regional history*

#### *Early inhabitants*

Centuries before the first Black groups arrived the San (Bushmen) lived in the Lowveld area. Several black groups arrived about 2000 years ago and settled between the Limpopo and Sabie Rivers. The groups separated and a Karanga group from Zimbabwe moved south into the Inkomati area (Bornman 2006).

In the middle of the 18th century a group of people from the Embu district in Kenya occupied the present Swaziland; the Swazi people. The Dlamini group called themselves bakaNgwane (the people of Ngwane) and called the area they occupied KaNgwane (the present day Swaziland)<sup>4</sup>. At the same time, Sotho speaking tribes living in the area moved to the north of Swaziland into the Lowveld and Inkomati area since the area was occupied by the Ngwane. During the beginning of the 19th century amongst other groups the Shangane entered the area. The amaNdebele (Nguni) people from Central and West Africa settled in the Middelburg area in Mpumalanga during the middle of the 17<sup>th</sup> century and later also entered the Inkomati and Lowveld area (Bornman 2006).

#### *The arrival of the Europeans*

At first, Europeans avoided the Lowveld because of the warm and unhealthy climate. After 1652, the Dutch East India Company started expeditions into the interior in the search for gold. However, apart from a couple of expeditions the Europeans only arrived and settled in the area in the second half of the 19th century in their search for gold. The first European agricultural activities in the Lowveld started in the last decade of the 19<sup>th</sup> century. Until the 1950's there were only a few farms in the area. The major increase in agricultural development came after 1965 when Transvaal Sugar Limited (originally Transvaal Suiker Beperk (Tsb)) was founded and electricity was brought to the area (Bornman 2006; Waalewijn 2002).

#### *A contested history; colonisation or development?*

There are contradictory and contested discourses concerning the arrival of the Europeans and the influence on the black people living in the area. According to the black people they were chased from their lands when the Europeans arrived. When the Europeans arrived in the end of the 19<sup>th</sup> century/start 20<sup>th</sup> century they started marking land in the area

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<sup>4</sup> The name KaNgwane has remained and is how the Swazi people call themselves. The former homeland of KaNgwane was named the same (see section about southern Nsikazi).

with stones and other objects. The black people did not mark their land at that time. After that the black people were not allowed anymore to let their cattle graze on the white men's land. The number of cattle had to be decreased according to the whites and after that the black people had to work for 3 months per annum (unpaid) for the whites in order to be allowed to let the cattle graze on "their" land. This later changed to 6 months per annum. The black people that did not agree with this were imprisoned or chased away violently. The government (Union of South Africa) supported these activities<sup>5</sup>.

In the Lowveld, the chasing away of people down towards Plaston/Nsikazi started in 1924. The white people strategically removed black people from their lands. Black men were recruited for working in the mines and in agriculture for the whites. In 1963-1964 blacks living at Ngodwana (the location of the present day SAPPI paper mill) were re-allocated to Nsikazi. They were removed with trucks and transported to the Nsikazi area. In 1968 this occurred for the 2<sup>nd</sup> time and the people started living in the present day trust Zwelisha (southern Nsikazi). Since 1954 the (white) government started formalisation in Nsikazi. Standardised stands were created of ½ hectare, but when more people arrived the stands were cut smaller<sup>6</sup>.

The story of the white settlers is completely different. The white people (or European settlers), usually Afrikaners (Dutch descendants) or British descendants, have different stories as well. The stories have in common that according to them, the arrival of the Europeans is the reason for the development in the region. The black people did not practice agriculture or use the resources (land and water) that were available. Without the Europeans the area would never have developed. Besides this, the black people did not live in the areas where the white farmer community lives today. The black people lived in the hills (south and north of the Crocodile valley) instead of in the Lowveld because of the occurrence of lions, malaria, tsetse, and cattle diseases. According to these interviewed respondents it is therefore fully legitimate for the white people to live where they live now.

According to a British descendant farmer and IB board member his land was bought from the British government when his family arrived in the Lowveld. It is not that they forcefully removed black people from the land since the black people never lived in the lowveld itself. But even when they did, it is not his family that removed them from the land; they legally bought it from the British government<sup>7</sup>.

According to the Afrikaner farmer community it is important to understand the history of the Afrikaners<sup>8</sup>. According to an Afrikaner commercial farmer and IB board member the Afrikaners have always worked hard in difficult circumstances. After the Boer war –in which large numbers of Afrikaner women, men and children died in the British concentration camps- the Afrikaners did not have anything and were poor for a long time. It is acknowledged by the Afrikaner community that some things that have happened during Apartheid were wrong. However it is not true that the blacks were sent away by the whites. There was no agriculture before the arrival of the white settlers; the land and water was not used. *"We started with nothing and have taken a lot of risks. Now we made it and we are successful and the black people are complaining"* according to an IB member<sup>9</sup>.

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<sup>5</sup> From interviews emerging farmer, land claimant, former ANC councillor and chairman of emerging farmers association.

<sup>6</sup> Ibid.

<sup>7</sup> From interview with British descendant farmer and IB chairman.

<sup>8</sup> From interviews with Afrikaner farmers, IB chairmen and IB members.

<sup>9</sup> From interview with Afrikaner IB member.

### 1.3 Defining the Problem

Since the abolishment of Apartheid in 1994 the South African government and the DWAF formulated progressive policies aiming to deal with rural poverty and inequalities inherited from the former apartheid regime (Perret 2002). The DWAF has given priority to water for basic human needs and to ensure ecologically sustainable development. Before water is allocated to any other purpose it will be allocated for basic human needs and ecological needs (Schreiner et al. 2001).

However, within the implementation phase the BHNR and ER face difficulties. Although the new NWA was formulated in 1998 the Reserve is not yet implemented. Since 1994 around 6.5 million people have got access to new water supplies, however around 7 million people still have to collect their water from unsafe water sources (Schreiner et al. 2002). Today, between 12 million and 14 million South Africans are without access to safe water and more than 20 million are without adequate sanitation (Water Research Commission 2007). This is especially the case in the former homelands that are the poorest areas of the country. The per-capita consumption of domestic water in black rural areas is less than 5 percent of that consumed in typical white areas (Hamann and O’Riordan 2000 in Perret 2002; Schreiner et al. 2002). Even when the BHNR and basic water services delivery are in place it remains questionable whether the daily amount of 25 litres of water per capita is sufficient.

Despite strong government efforts to improve water services supply to the rural poor and to implement a comprehensive formal water management and supply system as specified in the NWA the state is not able to provide water for basic human needs for all South Africans (Schreiner et al. 2002; Hamann and O’Riordan 2000 in Perret 2002 ).

The ER also faces problems; the ER is not implemented and there are ongoing discussions and disagreements about the appropriate quantity of water to be allocated to the ER. The ER determinations are still not finalised. Until now, water allocations to nature are often not met. In the research area the Kruger National Park (KNP) faces problems; in dry winters there are days when no water is flowing in the Crocodile River deteriorating to the detriment of the biodiversity in the KNP (Gyedu-Ababio 2006).

There are also problems concerning the water resources. From recent calculations for the ER in water-stressed catchments it is shown to need unexpectedly large quantities of water to maintain the aquatic ecosystem<sup>10</sup>. To obtain this water current water users have to be cut back but DWAF is considering not cutting water used by historically disadvantaged groups (Schreiner et al. 2001). Within the Crocodile sub-catchment water requirements already exceed the estimated availability of water and this deficit is growing because of economic growth. The implementation of the Reserve will increase these existing deficits (DWAF 2005). However, as the ER is not finally signed off for any part of the Crocodile Catchment it is not yet known what the deficits will be. Besides this, the registration and verification and validation of existing water use is not finished and therefore it is not exactly known what water is available within the Crocodile catchment.

As water is scarce in South Africa and especially in the Crocodile catchment, the water needed for the Reserve has to come from other water using sectors. For the BHNR this is not a major problem since water quantities are not large (25 litres/capita/day) (Schreiner et al. 2002). However, water distribution infrastructure and management is required for the supply of water for basic human needs, this is generally not present in the former homeland areas including the southern Nsikazi area. Although not yet determined, the water quantity

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<sup>10</sup> From preliminary estimates of the ER in the Crocodile sub-catchment it is concluded that almost 26% of the natural mean annual runoff is needed for the ER (DWAF 2004b).

needed for the ER is most probably considerable and therefore conflicting with other water users; often the ones that are economically important for society and the state income (e.g. agriculture, forestry). It is not clear what the consequences of the re-allocation of the water to the Reserve are for other water users in the Crocodile sub-catchment.

Another difficulty with the ER is that water users often do not see a reason for keeping water in the river. For many water users there appears to be an apparent contradiction in the fact that they are not able to benefit from the use of the water for economic activities but that this water is used elsewhere, for instance across the border in Mozambique.

Then there is the dilemma between development and ecological sustainability. In the developing world people usually favour development over ecological sustainability; the environment will come later, when it is possible to afford (van der Zaag 2005). Since South Africa in general and, more specifically, the research area (southern Nsikazi) is an underdeveloped area this is very important to keep in mind. There are many uncertainties concerning the question of how to stimulate development while maintaining ecological sustainability.

It is obvious that the Reserve faces many difficulties. In this research it is investigated what the Reserve's obstacles are in the Crocodile sub-catchment and the southern Nsikazi area in the former homeland of KaNgwane. As many former homelands are not sufficiently supplied by basic water services the state of the basic water services delivery and its obstacles are studied in the southern Nsikazi area in the former homeland of KaNgwane. As the scarce water resource has to be re-allocated away from other water users, it is necessary to find out what the perceptions of the diverse water users on the Reserve are in the Crocodile sub-catchment. It is not clear what the consequences of water re-allocation to the Reserve are to other water users in the Crocodile sub-catchment and whether the attempt for sustainability in the end is viable or not. Because of a lack in capacity at DWAF and local government the obstacles for the Reserve are not properly studied and there is no clear understanding of the obstacles which is needed to come to a proper implementation of the Reserve. In this research this is investigated.

## 1.4 Objectives

Following from the problem definition the objectives of this research are:

- 1) To investigate to what extent the BHNR is operational and basic water services are delivered in southern Nsikazi in the former homeland of KaNgwane and to understand what the obstacles and opportunities are for the implementation of the BHNR and basic water services provision in this area.
- 2) To understand what the obstacles are for the implementation of the ER in the Crocodile sub-catchment.
- 3) To understand what the different water users perceptions are of the BHNR and basic water services and the ER in southern Nsikazi area in the former homeland of KaNgwane and the Crocodile sub-catchment.
- 4) To understand what the consequences are of the reallocation of water for the Reserve from other water users in the Crocodile sub-catchment.
- 5) To contribute to a body of knowledge on water resources and an understanding of the dynamics that are at play between the BHNR and ER realities in the southern Nsikazi area in the former homeland of KaNgwane and in the Crocodile sub-catchment.

The overall aim of the research is similar to the *societal objective*; to contribute to a body of knowledge that furthers the aim of development in the water sector and will lead to

improved access to safe water for inhabitants in the southern Nsikazi area in the former homeland of KaNgwane and improve the allocation and distribution of water to the environment in the Crocodile sub-catchment while taking socio-economical viability into account.

## 1.5 Research Questions

The *main research question* to be answered in this research is as follows:

**What are the obstacles for the Basic Human Needs Reserve and Basic Water Services in southern Nsikazi in the former homeland KaNgwane and what are obstacles for the Ecological Reserve in the Crocodile sub-catchment of the Inkomati Catchment, South Africa?**

In order to answer these research questions the following *sub-questions* are formulated:

### Basic Human Needs Reserve and basic water services

- 1) To what extent is the Basic Human Needs Reserve implemented and are basic water services delivered in southern Nsikazi in the former homeland of KaNgwane according to the government's standards?
- 2) Is 25 litres of water per capita per day at a maximum distance of 200 meters or the 6000 litres of Free Basic Water per household per month sufficient for Basic Human Needs in southern Nsikazi in the former homeland of KaNgwane?
- 3) What are the perceptions of the different water users (irrigated agriculture, emerging farmers, forestry, the environment, domestic and municipal water users and industrial use) on the Basic Human Needs Reserve in the Crocodile sub-catchment?
- 4) What is the influence of the physical, organisational and socio-economical dimensions of water control on water allocation for Basic Human Needs and the supply of basic water services in the Nsikazi area in the former homeland of KaNgwane?
- 5) In what ways have social adaptive capacity and traditional systems of water management addressed the question of water allocation for Basic Human Needs in southern Nsikazi in the former homeland of KaNgwane?

### Ecological Reserve

- 1) What is the status of the determination of the Ecological Reserve in the Crocodile sub-catchment and how does this effect the current (transitional) allocation of water to the multiple users of the water in the Crocodile sub-catchment?
- 2) What are the perceptions of the different water users (irrigated agriculture, emerging farmers, forestry, the environment, domestic and municipal water users and industrial use) on the DWAF's Ecological Reserve discourse in the Crocodile sub-catchment?
- 3) What is the influence of the physical, organisational and socio-economical dimensions of water control on the implementation of the Ecological Reserve in the Crocodile sub-catchment?
- 4) What is the influence of legal complexity on the process of water (re)-allocation to the Ecological Reserve in the Crocodile sub-catchment?
- 5) What are the consequences of (re)-allocation of water to the Ecological Reserve for the different water users in the Crocodile sub-catchment?

## 1.6 Relevance of the Research

In South Africa's new (1998's) NWA the priority in the allocation of water is water for Basic Human Needs and Ecological needs. These allocations are the only rights to water in the new act. Some 9 years after the 1998's act these only rights to water are not yet implemented within the envisioned Reserve. In the mean time the water rights of the past will be replaced by licenses, so called authorisations for water use. However, these licenses can only be issued once the Reserve is determined. Water allocation to the Reserve is acknowledged to be most important and is prioritised as a water allocation but the process is not running smooth. Next to this the Reserve is important to be determined and implemented to enable the broader water reform. This research investigates what processes are going on and what are the obstacles for the Reserve to be determined and implemented in order to gain knowledge and enable the Reserve to be properly implemented as envisioned in the DWAF's slogan "*Some [water]<sup>11</sup> for all, forever.*"

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<sup>11</sup> Water is inserted by the author.



## Chapter 2: Conceptual Framework and Methodology

The following section examines notions that are used in this research and shows the conceptual perspective in this research. The following concepts are included: 1) Catchment, watershed or basin, 2) Irrigation and water management are sociotechnical systems, 3) Water control and politically contested resource use; three dimensions of water control; water control is politically contested resource use; politics in discourse; contested water rights and legal complexity and 4) Social adaptive capacity.

### 2.1 Catchment, Watershed or Basin

Before becoming confused with the terms of catchment, watershed or basin it is necessary to explain what is meant by each of these terms. It will also become clear why the term river catchment is used in this research.

#### *Catchment*

DWAF (2004) gives a definition for a catchment; *“the area of land drained by a river. The term can be applied to a stream, a tributary of a larger river or a whole river system”*.

#### *Watershed*

A watershed can be defined as: *“A line of separation between waters flowing to different rivers, catchments or seas”* (DWAF 2004A). However, Lal<sup>12</sup> (2000) gives a different definition of a watershed; *“a delineated area with a well-defined topographical boundary and water outlet. Hydrological conditions within this geographical region are such that water becomes/is concentrated within a particular location by which the watershed is drained, and comprises a complex of soils, landforms, vegetation and land uses. It is a hydrologic unit where water from outside cannot enter and leaves it from a well-defined point”*. A characteristic of the word watershed that makes it problematic in its use is that its meaning is different in British English than in American English. In British English a watershed means the borderline between two catchment areas (as in the DWAF’s definition) while in American English it is the area as described in Lal’s definition.

#### *Basin*

The DWAF (2004) defines a basin as; *“the area of land that is drained by a large river, or river system”*.

In this research the term catchment is used because it is a term that is less ambiguous in meaning than the term watershed and therefore less confusing. Basin and Catchment are similar in meaning but as Catchment is commonly used in South Africa, this term is also used in this research. The term is relevant because basins or catchments are regarded as more appropriate and effective scales for water resource policy and management. The whole catchment reflects the relation between water, land, ecology and its ecosystems (Amakali, 2005; Lal, 2000).

Traditionally, water policy makers used administrative boundaries. However, recently hydrological rather than these administrative boundaries are seen as the most suitable

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<sup>12</sup> Thanks go to Annelieke Duker because by reading her thesis (Duker 2006) I was triggered to include this section in the conceptual framework and it guided me in the reading of Lal (2000).

management scale (see section on IWRM). Because natural boundaries do not follow administrative boundaries water policy on the catchment scale faces difficulties in the implementation phase. These problems are apparent in research that was undertaken in South Africa (van der Zaag 2005; Wester and Warner 2002).

## 2.2 Irrigation and water management are sociotechnical systems

Mollinga's concept of *irrigation is a sociotechnical phenomenon* is also included in the conceptual framework of this research. Mollinga combined the conceptual frameworks and methodologies from different disciplines to study irrigation and developed a new concept: *irrigation is a sociotechnical phenomenon* (Mollinga 1998). Mollinga used an *interdisciplinary approach* to the study of irrigation. According to Mollinga the social dimension of irrigation management cannot be ignored; within irrigation systems interaction between people takes place. Water users have to *cooperate* with each other, with the government or other agencies to make use of irrigation infrastructure. In the case of a single user there might be no cooperation between water users, but then there is the *interdependence* of different users within a catchment because they all abstract water and have influence on the availability of water to other users (Mollinga 1998).

Mollinga comes up with three concepts to illustrate that the social dimensions are part of irrigation; 1) *social requirements for use*, 2) *social construction*, and 3) *social effects*. By *social requirements for use* Mollinga means particular social conditions that are required in order to have the technologies work effectively, different technologies require different social requirements. For example non-adjustable (irrigation) structures require little management while gradually adjustable structures are complex and require highly skilled and intensive management.

The second concept Mollinga comes up with is *social construction*. This means that “1) *technology development and design are social processes in which different stakeholders interact (communicate, negotiate, take decisions, struggle, etcetera)*, and 2) *that the nature of that process and the different perceptions and interests of the stakeholders shape the technical characteristics of the technologies (together with the properties of the materials used and the nature of the (bio)physical mechanisms involved*” (Mollinga 1998).

The third concept is the concept of *social effects* because “*irrigation technologies have social effects*”. Irrigation technologies for example can have an effect on crop production and local economies. However technology also reflects the power relations in society. Technology in the field (e.g. irrigation canals and pumps) demonstrates the power relations in the research area and the use, control and allocation of water.

The three concepts together provide the basis of an understanding of irrigation systems as sociotechnical systems. To get a comprehensive understanding of irrigation it is necessary to address both dimensions, the social and technical part, at the same time (Mollinga 1998).

This research adopts Mollinga's concept for water management as a whole and not only for irrigation (as Liebrand 2007 did before). Water management as a whole can be studied following an interdisciplinary and sociotechnical approach. The social requirements for use, social construction and social effects concepts are all relevant for water management as well. Both irrigation and other water technology are socially constructed and are therefore part of the socio-political relations within society. This makes the concept very valuable for this research in South Africa. Irrigation and other water infrastructure was and is developed and designed by the ruling part of society (in the water sector still mainly whites) and it was this sector of society that shaped the technical characteristics of the technologies that are present today. Contemporary water use and control remains to a large degree still in the hands

of the white minority and this has unfavourable social effects for the black people of South Africa. Although Apartheid belongs to the past, it is reflected in the current water sector although there is a new NWA with new ideas about water allocation. Unequal relations of power continue to exist.

Another point Mollinga puts forward is that irrigation processes are not activities on their own, but are part of other processes and therefore are placed within a context. The context is sub-divided in; 1) the agro-ecological system and technical infrastructure (climate, soil, technology etc.), 2) the agrarian structure (markets for labour, land, technology etc.) and 3) the state and the institutions of civil society (the government, legal system, NGOs etc.) (Mollinga 1998). In this research it is acknowledged that context is important for studying irrigation processes but also applicable and useful for studying water management activities and processes.

## 2.3 Water Control and Politically Contested Resource Use

### 2.3.1 Three dimensions of water control

Mollinga (1998: 25) identifies *three dimensions* of water control: 1) technical control (engineering perspective; technical water control by infrastructure, 2) organizational control (disciplines; management science, organisation sociology etc.) and 3) socio-economic and political control (disciplines; economics, political science, anthropology etc.). In Mollinga's interdisciplinary approach he brings the different dimensions and disciplines together and he states that there are relationships between these dimensions. All three dimensions have influence on the actual water control situation and they have influence on each other as well; when there are changes within one dimension the other two dimensions will also change (Mollinga 1998).

According to Mollinga the concept of *power* connects the three dimensions of water control. In discussing several definitions of power Mollinga refers amongst others to the definition given by Giddens (1976:111): "*power in the narrower, relational sense is a property of interaction, and may be defined as the capability to secure outcomes where the realization of the outcomes depends on the agency of others. It is in this sense that men have power 'over' others: this is power as domination.*" In other words; "*management institutions and technical artefacts can be understood as the embodiment of particular social relations of power, and, the other way around, socio-economic and political power in irrigation takes concrete shape in particular forms of organization and technologies*" (Mollinga 1998: 29).

### 2.3.2 Water control is politically contested resource use

According to Mollinga water control is an example of *politically contested resource use* (Mollinga 1998). This is acknowledged by Turton (2002) only calling it differently; hydro-politics. Because water is scarce and essential for life, health and welfare, it has become a contested terrain and therefore a political issue. As more people compete for and rely on declining water resources the study of hydro-politics has come up recently (Turton 2002). Turton (2002) discusses several existing definitions of the concept of hydro-politics and concludes that these definitions are useful, but neither hits the nail on the proverbial head. In order to come closer to the nature of the term, he suggests a definition of hydro-politics which draws on Eastons (1965) definition of politics which defines politics as the authoritative allocation of values in society. Hydro-politics is then defined as; "*the authoritative allocation of values in society with respect to water*" (Turton 2002). According to Turton the value of

this definition is that it embraces the essential elements of political dynamics (Turton 2002). Unpacking this definition, Turton states that politics is to be seen as a dynamic process involving contestation of legitimacy and authority. This process refers to the politics regarding water allocation, distribution and control.

Mollinga (2001) identifies *three levels* of politics in water resources management: 1) the official state and inter-state politics regarding water, 2) the politics of water resources policy and 3) the everyday politics of water use. Hydropolitics can play at all of these levels.

In this research Mollinga's and Turton's perspectives are adopted and it is acknowledged that three dimensions of water control exist and that the concept of power connects these three dimensions. The research considers *water as a contested resource*. The reforms in water management as envisioned in the NWA are directly linked with politics and power relations within the South African society. These power relations are expressed in the three interlinked dimensions of water control which all will be considered within this research.

### 2.3.3 Politics in Discourse

According to Swatuk (2005) all (water resources) policy making is biased because it reflects the ideas of those who can best construct and deliver the most persuasive arguments. Swatuk states "*Water Management is never neutral, technical or an end in itself*". Although science can play a role when its messages are effectively constructed, policy is not made on the basis of rational science (Swatuk 2005). Political power can be exercised through discourse. Wester and Warner (2002) advocate the perspective that discourse is a powerful legitimising tool. While competing discourses may initially make themselves heard, it is the dominant discourse that comes into sight. In this way the dominant discourse excludes competing understandings. Scientific discourse is believed to describe the world objectively and therefore it has much more authority when the (scientific) experts make a claim (Wester and Warner 2002).

The IWRM discourse is a clear example of a dominant discourse having political power; IWRM reconstitute resource access, allocation and use decisions. This is a profoundly political act which challenges the existing structures of power in many societies (Swatuk 2005). Wester and Warner (2002) come up with the statement that river catchment management is a political process in itself. They are of the opinion that the management boundaries of river catchments are not as self-evident or "natural" as is believed, but instead, that they are the outcome of socio-political choices. According to them the approach of river catchment management or integrated catchment management "de-politicises" water resources management. By emphasizing "natural" boundaries, 'neutral' planning and participation, the practice of river catchment management is justified and legitimised, and presented like it is the only option. However, according to Wester and Warner (2002) "*(...) the delineation and maintenance of boundaries, the mobilization of interests and stakeholder representation, and the creation of catchment-level decision-making arrangements are quintessentially political processes that revolve around matters of choice*". The authors come up with examples of difficulties with drawing "natural" river catchment boundaries and show that there is nothing "logical", "natural" or "unavoidable" about taking river catchments as the units for water management (Wester and Warner 2002).

So, next to policy and policy making, also water resources management itself and its discourses are interpreted as political activities. In this research it is acknowledged that IWRM, River Catchment Management and South Africa's water reforms (including the ER and BHNR) are political activities.

### 2.3.4 Contested water rights and legal complexity

The concept of legal complexity in relation to water rights is also relevant in this research because of the major legal water reforms after the abolishment of Apartheid and the temporary existence of legal complexity.

#### *The legal complexity debate*

As water becomes scarcer and more polluted due to climate change, urbanisation, population growth, industrialisation and intensification of agriculture, competition on the resource increases as well as the value of water. Within the water management sector water is increasingly treated as an economic good resulting in water reforms (*see also the IWRM section*). Around the world many national legal frameworks are formulated and enforced according to this principle to make water reforms possible (Boelens et al. 2005; Wester et al. 2005). The same has happened in South Africa; an important goal of the NWA of 1998 is to fuel economic development and promote efficient use of water. Within the NWA water is acknowledged as an economic good and it can be traded according to market principles.

However, internationally there is much criticism on this approach. Globally defined water rights are said not to be capable to deal with context specific situations. It remains a question how these rights would function and are made operational in specific societal contexts, where other local legal frameworks already exist (see F. and K. von Benda-Beckmann 2003 in Boelens et al. 2005). Boelens et al. (2005) define the concept of legal pluralism or legal complexity as “*the existence and interaction of different (usually state and nonstate) normative orders in the same socio-political space.*” Water resources and irrigation systems are often used and managed under legally plural circumstances where rules and principles originating from different sources are legitimated by different legal and normative frameworks that coexist and interact (Boelens et al. 2005).

In South Africa no legal pluralism exists in water laws because there is no nonstate legal framework in relation to water next to state law. However, the 1998 NWA identifies existing lawful use under the old act temporary as lawful creating legal complexity. As Boelens and Zwarteveen state “*whoever controls property rights, controls the processes of resource extraction and environmental change*” it becomes clear that water rights (and allocation mechanisms) incorporate power (Boelens et al. 2003).

The existence of several legal frameworks can weaken water rights as these can be interpreted according to more than one legal framework. A result of this is that stakeholders can start legal framework shopping; legal frameworks can be used for opportunistic goals and become more a political process than a legal process. This is what happened in the land reform process in Zimbabwe where President Mugabe “continued the war for liberation” in order to get to a more equitable distribution of land and other resources. But in fact, the legal changes initiated by president Mugabe only benefited its political followers in getting power and resources instead of the people that were said to receive (women, children and farm workers) (more in Hellum et al. 2004). The redistribution of land in Zimbabwe did not start with the purpose of social justice but in favour of followers of the government. It clearly shows that the role of legal systems is important and what large influences it can have on policy and practice. In this sense a parallel can be found with the Andean case as described by Boelens and Zwarteveen (2003) where the political goal of changing government spending priorities was achieved by neo-liberal water legislation. Also in that case it is more about a political process than a legal process.

In South Africa legal complexity can lead to legal framework shopping. Although there is only one framework in relation to water in South Africa; water rights from the 1956 NWA are temporarily considered lawful under the 1998 NWA. This legal complex situation can be used by water users to resist that their water rights are taken away. This could have

negative consequences for the allocation of water to the ER and therefore this concept is useful for this research.

## 2.4 Social Adaptive Capacity

The concept of first order and second order scarcity is relevant for the research and is part of the conceptual framework. First order scarcity of water resources means that water resources are physically scarce. This is the case in South Africa. However, societies can adapt to this physical scarcity of natural resources. A lack of this so-called social adaptive capacity is called second order scarcity (Turton 1999). *Social adaptive capacity is the ability of a society to adapt its patterns of (water) resource use to increasingly scarce supplies and achieve a sustainable measure of social stability* (Turton & Ohlsson, 1999; Ashton and Haasbroek 2002).

According to Malzbender et al. (2005) by recognising and integrating traditional and customary systems in South Africa's formal statutory bodies the social adaptive capacity is increased. Water management then is adapted more easily to physical scarcity and the people are better in coping with water scarcity. For this reason traditional water governance should be taken into account. This is what is happening in the former homelands today. The ability of the state to effectively manage and control water resources by the state appears to be problematic in the former homeland areas. Despite strong government efforts the inability of the state to provide sufficient water and sanitation to all South African is clear. According to Malzbender et al. (2005) traditional or customary responses to insufficient water supply have proven to provide alternatives for water provision in these circumstances. For this reason the value of traditional responses should be acknowledged and customary law should be part of the water management framework (Malzbender et al. 2005).

## 2.5 Research Methodology

The research is presented in the form of a case study. The process of and obstacles for the BHNR, basic water services and Ecological Reserve are studied in a complex political environment. The case study method allows for a detailed and comprehensive understanding of how the process of water reforms and both water reserves are actually working within a particular area; the Crocodile sub-catchment and the Nsikazi area in the KaNgwane former homeland. Water management processes are complex and very much influenced by history, politics and power relations. The selected geographical site provides an area where these complex issues can be studied

The methodology used for answering the research questions relies mainly on qualitative research for the primary data collection process. Secondary data gathering relies on scientific literature research/review from DWAF policy documents, WSA (Mbombela Local Municipality (MLM)) documentation, AWIRU and other water management experts, water users and researchers.

The primary data collection process includes individual and group interviews (structured and semi structured) with key informants selected from DWAF, ICMA, KNP, IBs, WUAs, irrigating commercial farmers, emerging farmers, southern Nsikazi inhabitants, MLM (WSA), Water Service Providers (WSPs), tribal authorities, forestry companies, industry (SAPPI and others) and other stakeholders and experts. Besides this observations in the southern Nsikazi area and Crocodile sub-catchment were conducted for understanding and cross checking the obtained information from other sources. Within both the primary data gathering phase as the secondary data gathering phase snow ball sampling was used.

During the whole research process triangulation of the data and data sources was very important. As the water reform process is a highly political one there are different realities and information and discourses are often highly contradictory. In this thesis report no names of respondents are mentioned as it was promised to the respondents that their (often politically loaded) information is dealt with confidentially.

### 2.5.1 Research activities

For the BHNR and basic water services part of the research 5 short open interviews and 38 semi structured interviews have been conducted including group interviews (in total 59 respondents) with domestic water users (total 43 interviews) in southern Nsikazi. 19 open interviews with other stakeholders in southern Nsikazi and 13 open interviews and semi structured interviews with key stakeholders have been conducted (see Table 1). Ten days were spent in the southern Nsikazi area for conducting the interviews and observational studies. Some other occasions were used for observations in the area as well. The semi structured interviews on average took 45 minutes to conduct. The short open interviews took 10-15 minutes and were conducted in addition to field observations.

<b>Respondent (category)</b>	<b>Number of respondents</b>
Domestic water users	59 (43 interviews)
Tribal authorities	3 (+ group of 8 right hand men)
Ward councillor	1
Ecolink (NGO) staff	2
Water sellers	2
School teachers	3
Water services system operators	4
MLM officials local offices	4
DWAF Nelspruit	6
ICMA officials	1
MLM officials	3
WSP staff	2
Experts	1

**Table 1:** Respondents BHNR/ basic water services component

For the ER component of the research 27 semi structured and open interviews with key stakeholders and water users selected from DWAF, ICMA, KNP, WUAs, IBs, commercial and emerging farmers, MLM, tribal authorities, forestry companies, industry and other stakeholders and experts have been conducted. On average these semi structured interviews took 2 hours to conduct. Most respondents belonged to several groups or respondent categories. For example, most interviewed IB board members are also farmers. This can be seen in Table 2. The respondents of the BHNR and basic water services part of the research are included in the table since they were also shortly interviewed about their knowledge and attitude concerning the ER.

Additionally to the field and literature research two Crocodile Catchment Forum meetings were visited and the author participated in the Knowledge Generation for the Water Sector: Young Professionals Workshop of AWIRU. The author also joined a two day Kruger Rivers Monitoring Workshop in KNP and a Verification and Validation meeting for water users of DWAF. Participation in the Mental Models (for Management of Water Resources in the Crocodile Catchment) Workshop of the Association for Water and Rural Development (AWARD) and KNP was also part of the research process. During the final days in South Africa the preliminary research findings were presented to the regional office of DWAF in

Nelspruit and other stakeholders<sup>13</sup>. This occasion enabled discussion amongst different stakeholders and the researcher and was an opportunity to get feedback on the research.

<b>Respondent (category)</b>	<b>Number of respondents</b>
ICMA	2
DWAF Nelspruit	4
Emerging farmers	2 + group (6)
Experts	4
Farmers	6
IB board members	9
Industry	2
KNP/environment	1
Municipalities	2
<i>Nsikazi inhabitants</i>	59
WUA	2

**Table 2:** Respondents ER component

### *Respondent sampling*

Respondents in the southern Nsikazi area were randomly selected for an interview. First the settlement (township/trust) was explored and observational information was collected to get an overview of the site. Then semi structured interviews with people encountered in the area were conducted. Everyone encountered could be a respondent, the interviews were not limited to a certain group of people (e.g. women because they are the main water fetchers) because all of these “categories” have different contributions in supplying information. The head of a household might have different ideas and experiences with water services than the water fetcher of the household. Therefore both of them are useful for the research.

Besides random sampling snowball sampling was used as a sampling method. When a respondent comes up with persons that are interesting for the research these people were consulted. In the ER component of the research snow ball sampling was the only sampling method used.

Initially resource mapping (Participatory Rural Appraisal) with respondents was used to get an understanding of land ownership and access to water sources. Later on in the research process this method was not used anymore since it is very time consuming and better maps were obtained indicating the relevant information more precisely.

### *2.5.2 Data collection and storage*

All information useful for the research was written down in a field notebook. Also field notes from interviews and observation were made in a field notebook. Directly after an interview the notes were written out on paper and later on the notes were typed out and stored digitally. Because every interview is different (especially in the case of semi structured interviews) it is not always possible to store the findings in a standard format (which would be helpful for the analysis). This is a characteristic of qualitative research.

Besides the field notebook, a logbook was used for writing down the daily activities. Reflection on the progress, research methodology, framework and other aspects was also included in the logbook as well as in the field notebook (reflection on interviews etcetera).

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<sup>13</sup> The group of 10 attendants consisted of the chief engineer WRM DWAF Nelspruit and other DWAF officials, the Manager of Aquatic Biodiversity and Conservation KNP and chairman of the Crocodile Catchment Forum, IB members, irrigation farmers, industry (Tsb Sugar) and a consultant.

### *2.5.3 Limitations of the research*

During the field research phase it was often difficult to obtain information. Often informants did not know where to get certain information, although they are familiar with the topic themselves. There is a lack of integration of information between the DWAF head office in Pretoria and the regional office in Nelspruit. This lack in integration of information is also apparent between the ICMA, local government, DWAF Nelspruit and consultants executing work for these institutions. Besides this information of the Nsikazi area is often outdated.

It was regularly difficult to make appointments with government officials and other key stakeholders. It was especially difficult to appoint with officials of the Resource Directed Measures (RDM) directorate (responsible for the Reserve determinations) of DWAF head office in Pretoria. In the end no one from the directorate could be interviewed.

Information is often contradictory. It was regularly difficult to obtain factual information. This is especially difficult with qualitative research on politically loaded topics. Triangulation of data and sources was necessary but sometimes confusing since different perceptions upon reality exist.

Another difficulty during the research was the need for translation. For the field research in southern Nsikazi translation was needed. The translator did a good job however he did not show up for several appointments. Alternative translation was to be found or appointments had to be cancelled.

A final difficulty during the research process in South Africa has to do with safety. The field research concerning basic water services delivery in southern Nsikazi was not conducted in the townships in the south of southern Nsikazi. It was recommended not to do so because of safety reasons and also the translator was not willing to join these activities. Three incidences of crime have frustrated the research process to some extent.



## Chapter 3: The Ecological Reserve and Water Control in the Crocodile sub-catchment

Chapter 3 describes the ER determination and implementation process in the Crocodile sub-catchment and the obstacles for its determination and implementation. At first the research area, the Crocodile sub-catchment, is described and after this the complex ER determination process is discussed. Hardly any stakeholder participation took place in the determination process and there is no final ER determination for the Crocodile River or its tributaries. Then transitional water allocations are described. Water users and stakeholders' perceptions concerning the (size of the) ER are often contested and are discussed subsequently. The lack of water control and flow regulation by DWAF Nelspruit and other water management institutions and the influence on the implementation of the ER is described next. Then the role of water rights and legal complexity on water control and the process of water (re)-allocation to the ER is discussed. Finally conclusions are drawn.

### 3.1 The Crocodile sub-catchment

The Crocodile sub-catchment (see Annex 4 and Figure 4 for the Crocodile River and the main tributaries) is the most important sub-catchment of the Inkomati catchment from an economic point of view; most economic activities are located within this sub-catchment and it has the strongest potential for economic growth. The Crocodile sub-catchment comprises 1.2% of the total area of South Africa and supports one of South Africa's largest and most important irrigation areas. Problems related to water in the Inkomati Catchment are largest in the Crocodile sub-catchment (DWAF 2004a; DWAF 2005; Deksissa et al. date unknown).

The Crocodile River has a total length of about 320 km and drains a catchment area of about 10 440 km<sup>2</sup>, before it joins the Komati River and flows into Mozambique. The mean annual precipitation is 880 mm, with 80% of all rainfall received as convective thunderstorms during the warm summer months of November and April (Deksissa et al. date unknown).



**Figure 4:** The Crocodile River and main tributaries (Source: DWAF 2007)

The source of the Crocodile River is in the Verlorenvallei Nature Reserve and at Komatipoort the river enters Mozambique. At its source the altitude of the sub-catchment is 2000 meters above mean sea level and near Komatipoort the altitude is 100 meters. The annual precipitation decreases from west to east, from 1200 mm in the Drakensberg range to

400 mm in the Lowveld. About 80% of all rainfall is received as thunderstorms during the summer months between November and April. The Crocodile River Catchment consists of four tertiary catchments that can be divided in five sub-regions, the Elands, Upper Crocodile, Kaap, Middle and Lower Crocodile. The major tributary of the Crocodile River is the Elands River, which is the lifeline of the Crocodile River. The Crocodile River changes through its length from a wetland area through rapid mountain streams and finally to a wide slow flowing river in the lowveld (DWAF 2004A; Godfrey 2002; Deksissa et al. date unknown).

The sub-catchment has only one major dam, the Kwena Dam, in the upper part of the sub-catchment and is therefore not well developed from a water resources point of view. Next to the Kwena dam there are several smaller dams in the middle part of the sub-catchment (DWAF 2004A).

### *3.1.1 Economy*

The main part of the Crocodile sub-catchment lies in the Lowveld. This area has a sub-tropical climate suitable for the cultivation of frost-sensitive crops, sub-tropical and tropical fruit. Sugar cane is grown as an irrigated crop in the lower Crocodile. There are two large sugar mills (the Malelane and Komati sugar mills (in Komatipoort)) in the sub-catchment. In the higher mountainous areas forestry takes place. Pine and eucalyptus plantations supply the wood, pulp and paper industries. One of South Africa's largest paper mills is located in the Crocodile sub-catchment (SAPPI Ngodwana). In and around Nelspruit there are a lot of manufacturing activities and industrial development is increasing fast. Development opportunities have been identified, especially in steel, chemicals, food, wood products, paper and pulp. The Kruger Mpumalanga International Airport next to Nelspruit has recently been constructed resulting in better access to international markets and tourism (DWAF 2004a). The Kruger National Park (also in the Olifants and Levhuvhu/Letaba catchments) is an important feature of the Inkomati catchment as it draws traffic through the area from Gauteng. This forms the largest part of the tourism industry together with areas around Sabie, Graskop, Pilgrim's Rest and the Blyde River Canyon (DWAF 2003b; Bornman 2006).

### *3.1.2 Water users*

Irrigation and forestry are the major water users in the Crocodile sub-catchment. It is estimated that 42,300 hectares are under irrigation and around 1,777.50 km<sup>2</sup> (1,777,500 hectares) are covered with exotic forests (mainly eucalyptus and pine trees). The main crops in the area are sugarcane, citrus (orange, lemon, grapefruit, citrus is becoming less often cultivated because of the occurrence of disease), banana and macadamia nuts. Tobacco used to be a widespread cultivated crop in the area, however since world market prices have declined many farmers started cultivating other crops. Leaches and avocados are also cultivated in the Crocodile sub-catchment. The forestry is rainfed and is located in the Transvaal Drakensberg mountains where rainfall is high and sufficient for pine and Eucalyptus trees. These exotic afforested areas use a lot of the available precipitation. Besides this there is a large demand for water for emerging farmers in the region but as there is no allocable water available they often do not yet receive water. However, this most probably will change in the future (DWAF 2004A; Bornman 2006).

Almost all irrigation takes place at commercial farms, there are not many emerging farmers in the Crocodile sub-catchment. Amongst emerging farmers sugarcane is a popular crop because it is easy to cultivate and there is a strong demand from the market for the crop. Industrial water use is limited in the sub-catchment and consists mainly of the Sappi paper

mill at Ngodwana and the sugar mills at Malelane and Komatipoort. There are also several small mines in the area (mainly gold mining) but they use relatively little water. Before flowing into Mozambique the Crocodile river flows through the Kruger National Park which is an important stakeholder since it needs a certain minimum flow in its rivers for ecological and tourism purposes. As the Crocodile sub-catchment is positioned upstream of Mozambique it has to be managed according to international agreements and operating rules need to be developed for the implementation of the ER. Finally, domestic and municipal water users are important to mention. Water use by these sectors is relatively small but increasing. Many poor domestic water users use purified domestic water for small scale irrigation on the homestead since they do not have access to other sources of water. This will be discussed more elaborately in Chapter 4 (DWAF 2004A; DWAF 2005).

### 3.1.3 Water availability

The gross surface water resources in the Crocodile River sub-catchment are estimated to be 364 million m<sup>3</sup>/year. This water comes mostly from run-of-river flows but is increased by the Kweni Dam that adds to the run-of-river abstractions during periods of low flow. A few small dams contribute considerably to this yield. The ER will reduce the gross yield by an estimated 105 million m<sup>3</sup>/year (DWAF 2004a). The estimates for the ER are however debatable and actually up to now it is not known how much water will be needed for the ER. The gross yield is reduced by another 57 million m<sup>3</sup>/year by invasive alien plants. So, the surface water in the Crocodile system that is available is 252 million m<sup>3</sup>/year (at a 1:50 year assurance) (DWAF 2004a).

Because of the large water usage from the irrigation sector there are considerable return flows in the Crocodile sub-catchment. Other large return flows come from the industrial sector (Ngodwana paper mill and Malelane sugar mill) giving back an estimated 10 million m<sup>3</sup>/year to the system. The total return flow is estimated to be 42 million m<sup>3</sup>/year (at a 1:50 year assurance) (DWAF 2004a).

As in the whole Inkomati Catchment the groundwater use in the Crocodile sub-catchment is very limited and estimated to be about 2 million m<sup>3</sup>/year. The middle reaches of the catchment have a densely formed dolomitic geology and do not have large water storage capacities.

### 3.1.4 Water requirements and availability

Water requirements in the Crocodile sub-catchment already exceed the availability of water seriously; the sub-catchment is considered to be highly stressed. The water deficit is 149 million cubic meters annually (in 2003, see Table 3). Particularly water for irrigation is restricted because of the deficit. The water-stressed situation in the Crocodile sub-catchment is especially serious because this area has a large potential for economic growth resulting in increased water demands. The implementation of the ER will increase the already existing deficits. There is also a growing demand for water for emerging farmers, but there is no allocable water available. Efforts to remove invasive alien plants that border water bodies in the sub-catchment diminish the water shortage partly (DWAF's Working for Water Program) (DWAF 2004A).

Table 3 shows the water requirements and available water in the Crocodile sub-catchment (at 1:50 year assurance) for the year 2003. Next to irrigation, forestry is a large water user in the Crocodile sub-catchment, with an estimated area of 1 775 km<sup>2</sup> and a reduction in runoff (*read: water usage*) of 208 million m<sup>3</sup>/year, making the sub-catchment to be one of the most densely forested catchments in the country. The water needed for the

Ngodwana paper mill is supplied from the Ngodwana Dam, while the water requirements of the Malelane sugar mill are abstracted from the Crocodile River. Urban water requirements in the sub-catchment are also mostly directly abstracted from the Crocodile River (DWAF 2004a).

<b>Available Water</b>	Local yield	252
	Transfer in	12
	<b>Total</b>	<b>264</b>
<b>Water requirements</b>	Local requirements	364
	Transfers Out	0
	International requirements <sup>14</sup>	49
	<b>Total</b>	<b>413</b>
<b>Balance</b>		<b>-149</b>

**Table 3:** Water requirements and available water in Crocodile sub-catchment for the year 2003 (million m<sup>3</sup>/annum) (Source: DWAF 2004A).

### 3.1.5 International obligations and water transfers

The Republic of Mozambique and the Republic of South Africa and the Kingdom of Swaziland have signed an agreement for co-operation on the Protection and Sustainable Utilisation of the Water Resources of the Inkomati and Maputo water courses; the Interim IncoMaputo Water Use Agreement. This agreement sets limitations on water use in each of the basin states, target flows to be maintained to sustain the riverine ecology and sets water quality standards. The Crocodile River must contribute 45% of the requirements of Mozambique at the border at Komatipoort (Ressano Garcia in Mozambique) while the Komati River must contribute 55% (see Table 4) (DWAF 2004a).

<b>River</b>	<b>Contribution</b> (million m <sup>3</sup> /annum)		<b>Total</b>	
	<b>RSA</b>	<b>Swaziland</b>	million m <sup>3</sup> /annum	Percentage
<b>Crocodile</b>	49	-	49	45%
<b>Komati</b>	42	18	60	55%
<b>Total</b>	91	18	109	100%

**Table 4:** International obligations for Mozambique for Crocodile and Komati Rivers (Source: DWAF 2004 a)

The requirement for Mozambique in terms of the Interim IncoMaputo Water Use Agreement is the only transfer out of the Crocodile sub-catchment (49 million m<sup>3</sup>/year at a 1:50 year equivalent assurance). The minimum flow of the Crocodile River allowed to enter Mozambique is 1,2 cubic meters per second. During the wet season flows from the Crocodile River into Mozambique are usually larger. The minimum water quantity that must flow into Mozambique annually is 49 million m<sup>3</sup>/year (DWAF 2004a). There are two transfers into the Crocodile sub-catchment; the Kaap River (tributary of the Crocodile River, see Annex 4 for location Kaap tributary) receives water from the Lomati River (Komati sub-catchment) to supply the town of Barberton. The other water transfer is for irrigation in the middle reaches of the Kaap River. The increase of these transfers on the available water resources in the Crocodile sub-catchment is estimated to be 12 million m<sup>3</sup>/year (DWAF 2004a).

<sup>14</sup> The total requirement for the Inkomati WMA is 109 million m<sup>3</sup>/annum, 49 million m<sup>3</sup>/annum must be supplied from the Crocodile River catchment.

### 3.1.6 Water quality

According to DWAF's Internal Strategic Framework for the Inkomati WMA (DWAF 2004a) the water quality in the Crocodile sub-catchment is usually good although a decline in the water quality in the lower Kaap River (often high levels of arsenic) and lower Crocodile River is observed. This has to do with return flows from upstream users including irrigation, urban areas and old gold mining activities.

At the Crocodile Catchment Forums on the 9<sup>th</sup> of February 2007 and the 21<sup>st</sup> of May 2007 a number of water quality issues were reported. It was reported that there are high levels of Fe and Mn in the Crocodile River. Also organic pollution was reported around the Kanyamazane (township) area of the Crocodile River together with storm water infiltration in the sewerage system. A technical committee has been established by the Forum that checks the water quality in the Crocodile system. The committee found that there are too high concentrations of E. Coli in the Crocodile sub-catchments' rivers so sewage treatment is insufficient. Also concentrations of Ammonia, Nitrogen and Phosphate are higher than the standards.

Next to this, there are potential water quality problems caused by the SAPPI Ngodwana paper mill. Effluent from the paper mill has been disposed of through irrigation for a number of years but as the soil has become saturated with salts these leach out into the Crocodile River system. It is important to maintain an acceptable quality of water in the Crocodile sub-catchment as it is a requirement of the Interim IncoMaputo Water Use Agreement<sup>15</sup> (DWAF 2004a).

## 3.2 The ER Determination Process

The 1998 NWA is an ambitious new act. The act prescribes many changes (e.g. decentralisation of water management, water allocation reform etcetera) and not everything can be dealt with in the same time. Many processes are behind schedule. WUAs were supposed to be established in 2002 but at the moment only one WUA is operational in the Crocodile sub-catchment. The ICMA can still not fulfil water management tasks because it lacks the technical skills. In the mean time DWAF is busy with the Verification and Validation of current water use to determine the existing legal water use. The Reserve is one of the many components of the NWA. In the following sections the ER determination and implementation process and the obstacles for the implementation of the ER are presented.

Before the ER can be implemented the ER should be determined. The RDM Directorate of DWAF head office in Pretoria is responsible for the determination of the ER. The implementation of the ER is to be done by the Regional Offices of DWAF. There are different levels of confidence of ER determinations. There are Rapid Preliminary ER (low confidence; exploratory research) determinations conducted by desktop studies, more detailed Preliminary ER determinations and comprehensive ER determinations. Comprehensive ER determinations will provide the basis for a final ER determination.

The Reserve determination process is complex, time consuming and capacity demanding. The process consists of 3 steps; classification of a water body, quantification of scenarios and the study of the implications. In the classification phase the present ecological state of the river has to be classified on a scale of A-F (from natural to critically modified). For example, when a river is classified as a status C river, there are 3 options; the river stays a C classification river, or the ecological state is improved or decreased (B or D category). The decision made of the desired state of the river is called the management objective. The second

step is then to determine what flow rate is needed for this management objective and the other scenarios, the so-called quantification of the scenarios. At first this was thought to be fixed, however recently scenarios are included in the Reserve determinations. For example at present the necessary flows for the B, C and D classifications are determined. The scenarios are also included in a socio-economic accounting matrix. Finally, the implications of the desired state for ecology and the socio-economics are studied. After determining the Reserve for different scenarios and classifications decisions have to be made and stakeholders should participate in this process. Stakeholders in the end have to find agreement and decide on the desired ecological state of the rivers and the resulting ER determination<sup>16</sup>.

In South Africa, the maximum length of hydrological records is 70 years; usually 20 to 30 years of reasonable flow measurements are recorded. According to the chief engineer of WRM DWAF Nelspruit the flow figures are not yet well understood. Therefore the accuracy of the data used for ER determinations can be questioned. There are uncertainties about the assurance of supply and many assumptions have to be made in the ER determination process. After the ER determination the next step is to implement the ER. Almost all DWAF policies and procedures to date cover ER determination methods, there is little or no literature and guidelines on the implementation of the ER.

### *3.2.1 Stakeholders are not informed*

Most water users and stakeholders know about the Reserve to be implemented in the future. However, no one seems to know what is happening at the moment. Stakeholders are not involved in the ER determination process and there is no communication from the RDM office about current activities. Even the officials at the regional office of DWAF in Nelspruit do not know what is going on. The ICMA did not receive a copy of the Elands ER determination report<sup>17</sup> and also KOBWA were never informed that the Komati comprehensive ER has been determined<sup>18</sup>. The chief engineer of WRM at DWAF Nelspruit only found out that the Elands ER is signed off by asking for it several times. At the Crocodile Catchment Forum on the 9<sup>th</sup> of February 2007 the Deputy Director for the RDM Directorate of DWAF head office stated that the Elands River Reserve would be signed off the week after. According to her the comprehensive Reserve on the Crocodile River would start at the end of March 2007. She added that she will give the forum regular updates on the progress. At the Crocodile Catchment Forum on the 21<sup>st</sup> of May 2007 no one of the RDM office was present and no updates were given.

During the research it was very difficult to get hold of people at the RDM office. After many attempts an interview with the Deputy Director on the 20<sup>th</sup> of April in Pretoria was arranged, but at arrival the Deputy Director was not available without notice. Also after the appointment no response was received. After many other attempts the Deputy Director was contacted weeks after the appointment and she apologised and asked when the next Crocodile Catchment Forum would be. She was informed that she missed the forum meeting because it was held the week before. Every attempt to contact the Director and Deputy Director of the RDM office appears to be unsuccessful and promises are not kept. In short, it is very difficult to obtain information about current developments with the Reserve determination from the RDM office and no one seems to know what is going on. This has to do with a serious capacity problem within the department both at national as regional level.

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<sup>16</sup> From interview Komati ER determination project manager.

<sup>17</sup> According to the chairman of the technical committee of the ICMA. This could not be confirmed by the RDM office of DWAF since it was not possible to contact the responsible persons at the office.

<sup>18</sup> According to Komati ER determination programme manager.

But also political conflicts are an cause for the delays in the determination and implementation of the Reserve. According to the interviewed project leader of the comprehensive Reserve determination on the Elands River and several interviewed IB members, the RDM office is afraid of making decisions concerning ER determinations and communicating about the ER to farmers and other water users. Water re-allocations necessary for the implementation for the ER will possibly have negative effects on the water allocations to these water users. The RDM office is afraid of conflicts and even violence generated by affected water users and therefore the RDM office is reluctant to accelerate the ER determination and implementation process<sup>19</sup>.

### 3.2.2 Difficulties with participation

According to the NWA the broad public (all stakeholders) should be incorporated in the Reserve determination process. According to the programme manager of the Komati ER determination this is where problems start. The researchers and consultants with relevant educational background and experience often have difficulty to understand the Reserve since it is a complex scientific exercise. Therefore it is especially difficult for stakeholders to understand and to make decisions about something that is not always understood. In the Olifants River Reserve determination process stakeholder meetings were held. The problem was that it were not the same people coming to the different meetings. The first meeting was a general introduction; the second meeting was more in-depth etcetera, till the fifth meeting. As it were not the same people that participated in the meetings, the meetings stayed very general since at every meeting the basics had to be explained. At the fifth meeting it was still about the basics. In this case involving the public did not work.

It is unrealistic to assume that all stakeholders understand or are interested in participation. In fact only key stakeholders (DWAF and other government departments' staff, IBs and the irrigation sector) were involved in the meetings in the Olifants River Reserve meetings and no emerging farmers or other HDIs. Also in the Komati Reserve determination process only key stakeholders were involved in the process. The key stakeholders were only informed in this process but they were not consulted for making decisions. In the management objective decisions only officials from DWAF Nelspruit and KOBWA participated. In the Komati ER determination process it appeared that stakeholders were not always willing to participate<sup>20</sup>.

Means and information are needed for stakeholder participation. During two Crocodile Catchment Forum meetings on the 9<sup>th</sup> of February 2007 and the 21<sup>st</sup> of May 2007 only one emerging farmer visited the latter meeting. According to this chairman of an emerging farmer association he is usually not informed about the meetings and he does not have the means for transportation to these meetings. At this occasion the respondent was able to get transportation by the chief engineer WRM of DWAF Nelspruit and the author<sup>21</sup>.

According to several water users DWAF is not used to a participatory approach. Traditionally DWAF is a centralised institution and used to work with a top down approach. According to several senior officials of DWAF Nelspruit stakeholder participation is not the responsibility of DWAF; this is the responsibility of the (I)CMA.

In short it can be questioned whether the envisioned (*broad*) participation takes place. On the one hand it is not realistic to assume that all stakeholders are willing to participate or

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<sup>19</sup> From interviews project leader of the comprehensive Reserve determination on the Elands River, IB members.

<sup>20</sup> From interview project manager Komati ER determination.

<sup>21</sup> From interview chairman emerging farmer association; participation in Crocodile Catchment Forums.

have the knowledge for proper participation in this process. On the other hand stakeholders should be informed and consulted to enable stakeholder participation.

*ER not implemented or determined*

The (comprehensive) ER is only determined for the Elands tributary of the Crocodile River (in 2005) and is just signed off at the Resource Directed Measures (RDM) directorate of DWAF head office June 2007. The comprehensive Reserve determination process/study on the Crocodile River is said to have started at the end of March 2007<sup>22</sup>, however this could not be confirmed. The water users and other stakeholders in and outside the research area do not know what is going on with the ER. This is also the case for the officials of DWAF Nelspruit and the ICMA. The RDM Directorate of DWAF head office is not communicating its progress or delays in the determination of the ER.

The comprehensive Elands ER determination is signed off at DWAF head office. However, this is not a final Reserve determination. By scientific studies different Reserves are determined for different ecological categories. A process of stakeholder participation will take place and then decisions can be made in order to balance interests between society, economy and ecology.

The Reserve<sup>23</sup> determination was financed by South African Paper and Pulp Industry (SAPPI), the largest industry in the Crocodile sub-catchment, because the company wanted to secure their allocation of water by obtaining a water use license. DWAF was going to cut the water use permit of SAPPI. The company still did not receive a water use license but is using the water according to the old allocation.

*Transitional water allocations; existing lawful use is riparian rights*

As the Reserve is not finally determined or implemented at present existing lawful use of water under the 1956 Act is identified as lawful. Irrigated agriculture (almost entirely white commercial farmers) receives the same allocation as before the 1998 NWA. The KNP is entitled to receive river flow according to In-stream Flow Requirements (IFR). IFRs are regarded as the preliminary "Reserve" according to the requirements of the NWA until the ER has been determined by appropriate scientific methods. Although all the rivers flowing into the KNP have IFRs determined by DWAF the IFRs of the KNP Rivers are not met for greater part of each year (more in chapter 3 in section water control). KNP has considered going to court because of this, but eventually it was decided not to do so because of the chance of losing the case because the IFR determinations would be considered outdated (1997-1998)<sup>24</sup>.

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<sup>22</sup> According to Deputy Director RDM DWAF head office.

<sup>23</sup> Reserve and ER are used interchangeably in this report. The Reserve includes the BHNR. When the ER is determined the BHNR is added to this. The BHNR is assumed to be determined easily because it is multiplying 25 litres (per day) times the amount of people in a certain area. Also from a water resource management perspective the BHNR is perceived not to be complex since water quantities take a very small share of the total water use in the system. Therefore the determination of the ER is the core activity when determining the Reserve and therefore the terms are used interchangeably in here.

<sup>24</sup> From interview with Manager of Aquatic Biodiversity Conservation KNP and chairman Crocodile Catchment Forum; Gyedu-Ababio 2006.

### 3.3 Stakeholders' Perceptions

*ER generally accepted, but should be realistic*

In general the respondents (water users and stakeholders) are of the opinion that the ER is important and should be implemented. It is recognised that it is important to keep the rivers alive since aquatic and riparian life cannot be restored easily. It is commonly agreed upon that water should always be flowing in the Crocodile River, also during extreme drought. Water use should be restricted when this is going to happen.

However, besides this common acknowledgement the perceptions of the size of the ER are different amongst the different stakeholders. Many interviewed water users do not know a lot about the ER and do not know what is currently happening with the ER. Because of this many water users are suspicious towards DWAF.

*Environment*

Respondents representing nature conservation and ecologists are of the opinion that the Reserve is the only right to water (as is stated in the NWA) and they want more water according to natural flow regimes. The Reserve determination is delayed and it is not implemented. The consequences of this delay for ecology are too much according to the Manager of Aquatic Biodiversity Conservation KNP and chairman of the Crocodile Catchment Forum. While the Reserve and NWA date from 1998, in the mean time the rivers draining through the KNP have deteriorated over the past years and water quality and biodiversity are declining.

An environmental scientist is of the opinion that the ER is much too complicated. It is important that the rivers should never stop flowing; this has a very large impact on ecology and is currently not met. During many years of research about ER determinations, rivers regularly stop flowing during the dry season having strong degrading effects on natural life and biodiversity in the rivers. According to the respondent no rocket science, but simple and practical action is needed for ecology and society. *“The Reserve determination is a fat academic exercise which lost touch with reality”*. Flowing water is needed for many species and these species will die when there is one day without flow. The Reserve should be practical. It would make a large difference for biodiversity if a minimum flow was kept in the river always.

*Irrigated agriculture and industry*

Irrigated agriculture and industry generally are of the opinion that a minimum flow requirement is sufficient for the ER. According to the interviewed respondents from these sectors, the International Obligations with Mozambique should be the ER. According to the majority of the interviewed commercial farmers and IB members the 1,2 cubic meters per second that must remain in the Crocodile River is enough for a minimum flow for ecology; only at the far end of the river this is the flow in the river, upstream the flow is more since it is not yet abstracted by water users (mainly irrigated sugarcane farmers). When more water than 1,2 m<sup>3</sup>/s has to remain in the river for the ER, water will have to be taken away from agriculture or industry which is unacceptable according to the respondents. According to the respondents compensation is needed then<sup>25</sup>.

Amongst others, the Crocodile River Main Irrigation Board (CRMIB) is not well informed about ER determination activities and they have never received a study report about

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<sup>25</sup> From interviews farmers, IB members and respondents industrial sector.

ER determinations (e.g. Elands ER determination)<sup>26</sup>. Therefore they do not know what the conclusions and outcomes are and they are distrustful towards DWAF. When the ER is determined and the requirements are unacceptable according to the IB, the CRMIB will go to court and will get its own scientists who will determine the ER. The majority of the respondents from the agriculture and industry sector think it is not fair that the (minimum) flow needed for the Reserve will never be restricted at drought. During droughts the ER should also be adapted. According to an interviewed environmental manager in the forestry and paper industry and the chairman of the Elands River Catchment WUA (ERCWUA) the ER is a good principle and water use efficiencies should be increased in order to enable the Reserve to be implemented.

According to several interviewed respondents from the industrial and agricultural sector the Reserve should be realistic and should not have a negative influence on economy and society. For example, when water is cut for Tsb Sugar (sugar production industry) the first area that will suffer is jobs according to the director of Tsb Sugar RSA and chairman CRMIB. Tsb Sugar is responsible for 30-40% of employment in the Nkomazi municipality. If that changes, consequences are large for the economy. In the Nkomazi municipality (Crocodile and Komati sub-catchment) 40% of South Africa's bananas are produced and 25-30% of the country's grapefruits. Cutting back water has a direct impact on the economy. At droughts it is already seen that jobs are lost<sup>27</sup>.

#### *Southern Nsikazi inhabitants and emerging farmers*

In general the respondents representing the southern Nsikazi inhabitants have never heard of the ER and do not know anything about it. After explaining the principles of the ER almost everyone is of the opinion that the ER is a good thing and that nature should be helped in its survival since nature fulfils many functions for the people. One respondent believes that the ER is a bad thing. As water is scarce water should at first be allocated to drink water (as it is) and water for agriculture should not be cut because less food will be produced and the people will get less food.

The chairman of a southern Nsikazi emerging Farmers Association<sup>28</sup> is of the opinion that the government should first focus on land reform and then there automatically will be water reform. Only after these urgent topics the ER should be considered. The priorities set by the government are not right. The ER will be bad for the economy and also bad for black people working on (white) farms. The members of the emerging farmers association and another emerging farmer believe it is a good thing to keep water in the rivers for nature.

#### *Municipality*

According to a senior official of the Civil Engineering Department of MLM water for domestic purposes is of first priority. Also water for domestic use after the BHNR should be prioritised above the ER. Local government is the main stakeholder because local government provides water to the people<sup>29</sup>. MLM's Head of Civil Engineering mentions that MLM is already using more water than allocated and the growth is 5% per year. MLM needs more water but this will become more difficult when the ER is implemented. This increasing need is communicated to the WRM directorate of DWAF Nelspruit, however there was no response<sup>30</sup>.

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<sup>26</sup> According to the interviewed chairman of CRMIB.

<sup>27</sup> From interview director of Tsb Sugar RSA and chairman CRMIB.

<sup>28</sup> The respondent was involved in the ICMA establishment process.

<sup>29</sup> From interview senior official Civil Engineering Department MLM.

<sup>30</sup> From interview Head of Civil Engineering MLM.

### *Demand for dams*

According to many interviewed water users and stakeholders (even the aquatic biodiversity conservation manager of KNP) dams are needed in the Crocodile River system. Industry and agriculture are of the opinion that when more water is needed for the ER, more water storage capacity is to be created by dams before water is taken away from them. There is a lot of pressure by all water users for new dams on DWAF head office. Existing development should be sustained so water should not be removed from water users that contribute to the economy, but more water storage capacity should be developed<sup>31</sup>.

#### *1998's NWA is a good act, but not realistic*

The majority of the interviewed water users in the Crocodile sub-catchment think that the “new” NWA is an improvement compared to the old Act. However, the majority also thinks that the act is unrealistic. The ambitious act requires serious resources which are not available. Besides this there are some smaller components that have to be adjusted (e.g. the membership of a WUA should be obligatorily).

Some water users mentioned that the NWA is a first world act which is not applicable in a third world country. The ER would be too ambitious as well and cannot be properly implemented in the country because of scarce resources (capacity and expertise within DWAF/ICMA and other institutions) in general, and scarce water resources in particular.

#### **Box 3:** Stakeholders' perceptions of the NWA

### **3.3.1 The Reserve is contested**

In the previous section the opinions of the different water users and stakeholders were presented. According to the majority of the interviewed respondents it is important to find a balance between economy and ecology. Because water is scarce in the research area and its functions are essential for life, health and welfare, water allocations become a contested terrain and therefore a political issue. It remains questionable when economy and ecology are in balance; this cannot be defined scientifically. The economic implications should also be considered otherwise the Reserve cannot be viable. This is needed in a water scarce catchment. Because of different perceptions amongst the different stakeholders there will be dispute; KNP will always want more water for the Reserve than agriculture and industry. This will have to be solved with consultation of the stakeholders in a public participation process. In the end all stakeholders have to agree upon the ER<sup>32</sup>.

However, because of a lack in communication from DWAF the water users and stakeholders do not know what is happening behind their backs and the future consultation process will be difficult. Several stakeholders are distrustful and will therefore be non cooperative in the Reserve determination and implementation process. The majority of the interviewed respondents from the agricultural and industrial sector do not trust the ER determination process and environmentalists in general. According to some interviewed respondents environmentalists have a strong component of fanatics and environmentalists have developed a way of operating. They aim a lot higher because they are scared not to get anything (as if it is a bargaining game). “*They come up fighting before the fight has even started*”, according to an interviewed IB member. On the other hand interviewed respondents from the environmental sector have distrust in the agricultural and industrial sectors.

<sup>31</sup> From interviews water users and stakeholders.

<sup>32</sup> From interviews project manager Komati ER determination, IB members, farmers, industry and aquatic biodiversity manager KNP.

According to the NWA water users and stakeholders should participate in the ER determination process and a balance should be found between ecology and economy. When stakeholders believe that outcomes are unfair they can go to high court. This can also be done when they are not consulted<sup>33</sup>. It is somehow possible to balance economy and ecology because there are good figures of agricultural and economical activities. Consensus should be found between ecology and economy. The determination of the ER process should be very carefully managed to make sure that it is handled correctly and that agreement can be found in the end. DWAF must ensure that this process takes place. In the end the Reserve should be acceptable to everybody.

### 3.4 Water Control

At first the new water institutions will be described in this section about water control. This is followed by discussing water rights and legal complexity and the effect on water control. Then the (lack in) change in the water control situation in the Crocodile sub-catchment is discussed, which is followed by describing the water control of the actual water managers of the Crocodile River and its tributaries; the IBs. After this the lack of water control and flow regulation by DWAF Nelspruit is discussed, followed by a conclusion.

#### 3.4.1 *The new (water) institutions*

In the future the Inkomati CMA (ICMA) will be the most important institution in relation to water management in the Inkomati Catchment. The Inkomati CMA was officially launched by the Minister Ronnie Kasrils on 30 March 2004 in Nelspruit. The ICMA is the first operational CMA in South Africa. Although the ICMA is established currently, the ICMA is in a transitional phase since it cannot yet fulfil its water resource management tasks due to a lack in technical expertise within the institution.

The regional office of DWAF in Nelspruit is still responsible for many activities that the ICMA in the future will be responsible for. At the moment the ICMA is responsible for community participation in water resource management (WRM) and the cooperation with other government institutions. However, the actual WRM is still done by DWAF's regional office since the ICMA lacks technical capacity to fulfil these tasks. In the near future<sup>34</sup> the staff of the regional office of DWAF will (partly) be handed over to the ICMA and the CMA will become the implementer of WRM. Some senior officials will stay at DWAF's regional office in Nelspruit as DWAF will continue to be the regulator. When the ICMA will be fully operational is not clear and different dates are mentioned by the involved parties. In June 2007 a Water Allocation Manager was recruited for the ICMA, but a Water Resource planner and other technical staff are still to be found and employed<sup>35</sup>.

DWAF's Mpumalanga regional office in Nelspruit is under staffed and therefore it is difficult to fulfil its tasks. According to the chief engineer WRM of DWAF Nelspruit only 22% of the vacancies are filled at DWAF's Mpumalanga regional office in Nelspruit and it is difficult to attract skilled and experienced staff. At the moment, on average a DWAF employee stays less than 1 year within the Department before leaving for another –often

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<sup>33</sup> From interview NWA lawyer, IB member, notary and farmer.

<sup>34</sup> It is not known when this will really happen as the CMA establishment is delayed for several times. At first the CMA would be established at October/November 2006. However, labour unions delayed the process because they want to have full information about what the consequences are for the staff (from interview with senior official DWAF Nelspruit).

<sup>35</sup> From interview with chief executive officer ICMA and chief engineer WRM DWAF Nelspruit.

private sector- job because of better career opportunities. Because of this there is a huge brain drain and this is a serious problem for DWAF as well as the ICMA. As the ICMA will take over the WRM staff of DWAF's Mpumalanga regional office in Nelspruit there will be a lack in capacity in the ICMA as well.

While there are 9 DWAF regional offices, there will be 19 CMA's resulting in an increased shortage of (skilled) staff. Within the CMAs the wage will vary according to the CMA's size. The larger the CMA, the higher the wage will be. Because of this the smaller CMAs will have a disadvantage. Because the ICMA is the first operational CMA it will attract the WRM staff of the regional DWAF office before the Olifants CMA can. However, double capacity should be needed. And as the Olifants CMA will be categorised as a large CMA while the ICMA is medium sized, the wages will be higher at the Olifants CMA resulting in a future staff drain from the ICMA.

#### *The transition of IBs to WUAs*

In the Inkomati there are 26 IBs. In the NWA the shift from IBs to WUAs is prescribed in order to improve the participation of all water users and stakeholders in water resource management. WUAs will be regionalised and 9 will be developed in the Inkomati Catchment. According to the NWA IBs were to be transformed to become WUAs before 2002. This process is delayed. Currently almost all IBs are continuing their activities and only one WUA is functioning in the research area (Crocodile sub-catchment); the Elands River Catchment WUA (ERCWUA). In the Komati the Komati WUA is established but the WUA is not fully operational. The CMA is responsible to support the WUA, build capacity, check whether the WUA is accountable and the CMA should also support in the establishment of the WUA. According to the NWA the CMA has a monitoring role. In practice at the moment IBs still manage the water resources while DWAF and, in the future, the ICMA, are the regulators<sup>36</sup>.

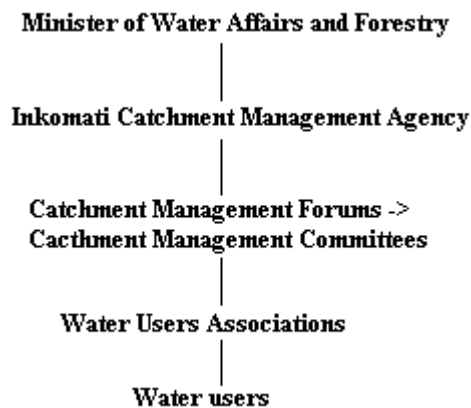
According to the former chairman and founder of ERCWUA other institutions are lacking far behind and therefore ERCWUA is facing difficulties in its functioning. Other IBs have not started the transformation to a WUA and the ICMA is not fully operational. According to the NWA the WUA has powers, but in practice ERCWUA does not have the financial means to use these powers. For example, legally the WUA is allowed to stop a water user from abstracting water. But financial means are needed to go to court and these are lacking. Support from the ICMA is needed since they receive water management charges. Another difficulty is the fact that WUA are voluntary organisations according to the NWA. According to the former chairman and founder of ERCWUA this is a big mistake. Now it is difficult because not all water users and stakeholders are willing to be part of the WUA and there is no real participation of all parties. According to the chief engineer WRM DWAF Nelspruit this will be changed in the NWA in the near future.

#### *Catchment Management Forum and Catchment Management Committees*

At the establishment of the ICMA Catchment Management Forums (CMF) were developed. CMFs are non statutory bodies but are a first step towards the establishment of Catchment Management Committees (CMC). CMCs look at the bigger picture; the entire sub-catchment. The WUAs are on a lower level (2-3 in a sub catchment), who have direct contact with the water users. The Crocodile CMF is the only successful CMF in the Inkomati Catchment; the Sabie CMF faces some difficulties (See Figure 5 for organogram). No CMCs are established yet.

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<sup>36</sup> From interviews with Chief Executive Officer of ICMA, former chairman and founder of ERCWUA, present chairman ERCWUA.



**Figure 5:** Organogram Water Management Institutions

### 3.4.2 *Water rights, temporary legal complexity and water control*

With the establishment of the 1998 NWA the formal water control by riparian title holders (mainly the white commercial farmers) was abandoned and since 1998 the new government is the custodian of the nation's water resources.

In the riparian rights doctrine the location of one's land determines the water rights (Haddad 2000). The user has the right to extract water from a river for the use on neighbouring land, as long as the water is returned to the river undiminished in quantity and quality (Simpson et al. 1997). A benefit of this principle is that water is only used and diverted close to the waterway, decreasing conveyance and evaporation losses and increasing the possibility that drained and infiltrated water will re-enter into the stream again. On the other hand, this can be seen as an unwanted characteristic in the drier areas of the world because development will be concentrated along waterways (Haddad 2000). Next to this, the principle of return flows being undiminished in quantity and quality is unrealistic. Unless water is used for cooling water for industrial purposes water quantities will always diminish after usage and water quality is usually decreasing as well. As this doctrine is only suitable in areas where there is abundance of water resources it does not fit in the South African context in general and more specifically in the water stressed Crocodile sub-catchment.

Even with the government as the custodian of the water resources, commercial (mostly white) farmers with water abstraction and conveyance infrastructure have access to water and people lacking these resources (in particular HDI's and emerging black farmers) do not. Water rights are still strongly related to land rights; people only have access to water for irrigation when they have land to irrigate. Irrigation water can only be obtained when a farmer has registered his land and specifies the crops cultivated<sup>37</sup>. So, in practice the riparian rights of the previous (1956) NWA are still in place (Meinzen-Dick et al. 2005; Liebrand 2007). The status quo is maintained because the NWA recognises all water use in the two years before the Act as lawful and thereby it accepts the inequities from the start (Schreiner et al. 2001). Although the NWA identifies the BHNR and ER to be the only rights to water, at the same time existing lawful use of water under the 1956 Act is identified as lawful. This results in a legally complex situation. The riparian water rights are still in place, the name is only changed to existing lawful use. This is also the case in the Crocodile sub-catchment. Therefore the white commercial farmers are still in control of the water.

<sup>37</sup> From interview chief engineer WRM DWAF Nelspruit.

In fact the water rights from existing lawful use will be abandoned after the process of compulsory licensing. Therefore the current legal complexity will be temporary. When the Reserve is finally determined water licenses will be issued taking the Reserve in consideration. The farmers that used more water than their allocation are the first water users that will receive less water. After cutting the unlawful water users the lawful users will be cut back till there is enough water in the system for implementing the Reserve. The current existing lawful use water rights will no longer exist. Rights to water will no longer exist but licenses to abstract water. The only right to water will be the Reserve and no water users will be compensated that are curtailed in their water usage activities. By compulsory licensing water is made available for the reallocation to the Reserve and HDIs.

However, from interviews with IB members and commercial farmers it can be concluded that the majority of the respondents is not aware of their water rights to be abandoned. The majority of the interviewed IB members and commercial farmers will not accept that their water rights will no longer exist. According to an interviewed NWA specialised lawyer, IB chairman and chairman of the technical committee of the ICMA “*you will get war if you touch a man’s existing legal right*”. The respondent refers to the Government’s Water Allocation Reform (WAR) Programme which is intended to reallocate water to HDIs. It involves the validation and verification of the extent of existing lawful water use and the compulsory licensing process. According to the respondent and the majority of the interviewed IB members, farmers and respondents from industry they will be resistant and they will go to court as they do not accept “their” water to be re-allocated. Some interviewed commercial farmers and IB members pointed out that the state’s actions in relation to water reallocations will influence the value of their property (since land and water rights are related) and therefore compensation is needed<sup>38</sup>.

So, while formally the riparian water rights will not be in place anymore in the near future, this is not known or accepted by the majority of the white commercial farmers. Even by having one formal legal system, legal complexity can exist in the minds of stakeholders as rights from the old NWA are temporarily identified as lawful. The temporary legal complex situation can frustrate the ER implementation process since the agricultural sector and industry are more likely to go to court.

According to the Komati ER determination programme manager DWAF is afraid of resistant water users that want to go to court. Because of this DWAF wants the ER to be determined in detail and scientifically; it should be strongly ecologically motivated. The respondent states that ER determinations remain questionable because during the determination process many assumptions have to be made. Court cases would slow down the ER implementation process dramatically<sup>39</sup>. The chief engineer of WRM of DWAF Nelspruit states that awareness creation concerning water rights and licenses for water users will be very important in order to prevent court cases and ensure a smooth legal process in the reallocation of water to the Reserve<sup>40</sup>.

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<sup>38</sup> From interviews NWA specialised lawyer, IB chairman and chairman of the technical committee of the ICMA; IB members and commercial farmers.

<sup>39</sup> From interview Komati ER determination programme manager.

<sup>40</sup> Remark from chief engineer WRM DWAF Nelspruit during presentation by the author of preliminary research results.

### *3.4.3 Water control before 1998: abstraction time and pump capacity*

Agricultural water abstractions from the Crocodile River and its tributaries by the use of pumps are controlled by abstraction time and pump capacity. In the Crocodile sub-catchment farmers are only allowed to abstract water during working days (120 hours; 5 days times 24 hours). Besides this the pump capacity is limited; a maximum capacity of 1 litres per second per hectare is allowed. It is still possible to over abstract water with this control. The pump capacity is the maximum capacity needed during peak irrigation requirements. A consultant has calculated the crop water requirements per crop type and location which is used by DWAF Nelspruit<sup>41</sup>. IBs can give restrictions in the time that pumping is allowed at times when water is scarce or needs to be stored for future requirements. There are difficulties with this kind of water control since there are farmers that only pump on 50% of the capacity (because of smaller pumps). Therefore they are theoretically allowed to irrigate for 240 hours (which does not fit in 1 week). In the 1970s this kind of control was established in the Crocodile and Lomati sub-catchments. Flood water is allowed to be stored in dams. The quantity of flood water that is allowed to be stored is twice the water allocation to the farm<sup>42</sup>. IBs can send a control officer to farms when they suspect a farmer to pump more than 120 hours. Besides pumping water directly from the rivers many farmers in the Crocodile sub-catchment get water from a canal irrigation system that is managed and operated by an IB. These IBs and even some large farms (e.g. Crocodile Valley) have their own diversion weirs and therefore they can control the water (more in section IBs are in control).

### *3.4.4 Water control after 1998: nothing really changed*

After 1998 there are no real changes in the water control situation in the Crocodile sub-catchment, only that there are no new water allocations. The pump capacity and time are still limited to a maximum of 1 litre per second per hectare for a maximum of 120 hours. Water can be indirectly controlled by DWAF Nelspruit and IBs by checking the farm area and the crop type. Farmers will not use (much) more water than their original allocation as calculated by DWAF when the area and crop type remains the same<sup>43</sup>. As DWAF allocates volumes and not hectares, farms can increase in size by changing to more efficient irrigation techniques (e.g. from sprinkler to drip irrigation). The farmer can show that not more water is used because of the increased irrigation efficiency. According to the chief engineer WRM DWAF Nelspruit DWAF would prefer to see farmers give the water back to the system, but logically this does not happen since then there is no economical incentive to increase efficiency<sup>44</sup>.

In the Lomati sub-catchment a card system is used for water abstractions and in the Komati sub-catchment there is centrally managed water control. In the Komati sub-catchment IBs started with electric flow meters and water abstraction restrictions are managed centrally; pumps are switched off centrally. IBs in the Lomati and Komati sub-catchments use water meters during drought so that every farmer gets its equal share. But in wet conditions the IBs do not use the meters. The IBs do not care whether the farmers are using more water at that time, as long as every farmer gets enough. In the Crocodile sub-catchment there are no water meters except for the Kaap tertiary catchment<sup>45</sup>.

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<sup>41</sup> According to senior official WRM DWAF Nelspruit.

<sup>42</sup> Ibid.

<sup>43</sup> From interview senior official WRM DWAF Nelspruit.

<sup>44</sup> From interview chief engineer WRM DWAF Nelspruit.

<sup>45</sup> From interviews senior official WRM DWAF Nelspruit; chairman KRMIB, chairman of the technical committee of the ICMA, NWA lawyer, notary and farmer.

### 3.4.5 IBs are in control

The Crocodile River Major Irrigation Board (CRMIB) manages the water in the Crocodile River till the abstraction points of the minor IBs in the Crocodile sub-catchment. The White River, Elands River and Kaap River are the tributaries that are managed by the minor IBs. The other tributaries are managed by DWAF. The CRMIB is the day to day water manager of the Crocodile River system. At the beginning of the water year in April the CRMIB discusses with DWAF Nelspruit and together they indicate a plan for the water use for the year and the principles and this is then to be approved by DWAF Nelspruit. The CRMIB and DWAF Nelspruit together discuss whether restrictions in water abstractions are necessary. According to an interviewed senior staff member of the CRMIB the IB is aware of the parameters that the water management activities and outcomes should remain within (International Obligations and IFRs) after working together with DWAF Nelspruit for years. The CRMIB is not mandated or responsible to manage the Kwena dam but the CRMIB is strongly involved. When the CRMIB wants to release water from the Kwena dam the DWAF bailiff of the dam together with the chief engineer of WRM of DWAF Nelspruit are consulted in order to confirm whether this is allowed or not. DWAF allows the CRMIB to continue their job in collaboration with DWAF. According to a senior staff member of the CRMIB the CRMIB is working with the river on a daily basis and has the expertise and understanding to manage the water. Although the CRMIB does not have a mandate to do so, the CRMIB assist DWAF Nelspruit in communicating the gazetted restrictions to the owners of agricultural land in the unmanaged tributaries. The CRMIB gives notice what time farmers are allowed to pump (e.g. from 7.00h-16.00h). DWAF Nelspruit monitors the allocations to irrigation every week<sup>46</sup>.

Irrigation infrastructure and water control is different within the (minor) IB schemes. The CRMIB has 2 bailiffs that visit farms and check whether farmers are pumping within the time they are allowed to pump. The bailiffs are not able to check every farmer every week. Usually about 98% of irrigators do not give problems, but 2% bends the rules. When farmers are over abstracting they will first get an official warning. When the over abstractions are continued the CRMIB takes the farmer to court. This has happened before, but according to the chairman of the CRMIB this is not an efficient process because it is time consuming and costly<sup>47</sup>.

In the Kaap River tributary all pumps are metered and water control is strong. All farmers in the tertiary catchment pump water directly from the Kaap River. The water meters' readings can be read on a central computer at the Kaap River Major Irrigation Board (KRMIB) because it is a telemetrical system. KRMIB does not consult with DWAF Nelspruit about restrictions.

According to the interviewed chairman of the KRMIB irrigation farmers are well organised and the cooperation between the irrigators is excellent (social control). In the 40 years that the respondent is the chairman of the KRMIB only 3 people were prosecuted for over-abstractions. In general the farmers cooperate and obey the law<sup>48</sup>. According to the chairman of the KRMIB there are no regulations about a minimum flow rate that has to flow into the Crocodile River from the Kaap River. When DWAF Nelspruit wants to have restrictions on water use, DWAF Nelspruit publishes this in the government's Gazette. Then DWAF Nelspruit consults with KRMIB how much water should be released for Mozambique for the international agreements<sup>49</sup>.

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<sup>46</sup> From interviews chairman CRMIB, senior staff member CRMIB.

<sup>47</sup> From interview chairman CRMIB.

<sup>48</sup> From interview chairman KRMIB, chairman of the technical committee of the ICMA, NWA lawyer, notary and farmer.

<sup>49</sup> Ibid.

The only WUA in the Crocodile sub-catchment -ERCWUA- is formally in control of the water in the Elands River Valley. Irrigation activities have declined since the 1980s and 1990s and the Elands River valley is relatively extensively used. According to the interviewed former chairman and founder of ERCWUA other water management institutions are lacking far behind (ICMA and other WUAs) and therefore ERCWUA is facing difficulties in its functioning and with controlling water abstractions. Legally the WUA is allowed to stop a water user from abstracting water. However, financial means are needed for legal support and to go to court but these are lacking. Support from the ICMA is needed since they receive water management charges<sup>50</sup>.

The White River Conservation Board (WRCB) as the main IB in the White River tributary controls the water in the White River. DWAF Nelspruit regulates by checking the dam levels in the tributary. The WRCB has physical water control by sluice gates and metered pumps (farmers that irrigate directly from the river). It is not possible to get more water (2750 m<sup>3</sup>/hectare/year; below Heik weir it is 3500 m<sup>3</sup>/hectare/year) because the system's design (canals, weirs etcetera) does not allow this. The farmers within the White River tertiary catchment are controlled by the minor IBs in the White River tertiary catchment and the bailiffs who operate and control the sluice gates of the canals (this can also be checked by board members). According to the chairman of WRCB water theft is very uncommon since it is difficult to abstract more water from the system. The respondent comes up with rare examples of illegal pipeline connections for water theft<sup>51</sup>.

The Friedenheim Irrigation Board (FIB) gets its water from the Nels River with a weir close to Nelspruit. The canal is built in the early 1960s. At droughts water can be pumped from the Crocodile River. The FIB is the owner of the irrigation canal scheme and distributes and controls the water and infrastructure. A bailiff is responsible for the maintenance and operation of the irrigation infrastructure and physical water control; opening, closing and locking the sluice gates. It is not possible for farmers to get more water from the canal system because the sluice gates are locked. The FIB has to submit their accounts to DWAF Nelspruit. DWAF Nelspruit can monitor the sluice gate at the intake of the canal from the Nels River. According to the chairman of the FIB, DWAF Nelspruit probably does not do so because of a lack in skills and capacity. Technically it is not possible to abstract more water than the maximum allowable amount in the total system. The canal cannot deliver more water than what it is designed for. It is only possible to abstract more water when there are restrictions since then less than 100% of the canal capacity is allowed to be abstracted<sup>52</sup>.

The farm Crocodile Valley near Nelspruit has its own control weir in an irrigation canal. According to the farm manager the control of DWAF Nelspruit on water abstractions is not strong enough. Illegal water abstractions on the farm are possible because there is hardly control of DWAF Nelspruit on the abstractions of the company. However, according to the respondent, the company has a strict policy not to illegally abstract water since this will negatively affect downstream farmers. A former manager of the company was a IB member and therefore the culture of non illegal water use is strong *within Crocodile Valley according to the current farm manager*<sup>53</sup>.

In the Malelane Irrigation Board (MIB) it is not possible to abstract more water than allocated. There are Parshall flumes (control structures) and sluice gates in the IB's canal system which enable ocular inspection and over abstractions are easily discovered. The MIB

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<sup>50</sup> From interview former chairman and founder of ERCWUA.

<sup>51</sup> From interview chairman of WRCB.

<sup>52</sup> From interview chairman FIB.

<sup>53</sup> From interview farm manager Crocodile Valley.

has a bailiff who checks for water theft. The sanctions for water theft are heavy and water distribution to an accused farmer is cut for a considerable time<sup>54</sup>.

In short it can be said that water control in the Crocodile sub-catchment is still the same as before 1998<sup>55</sup>. IBs are the actual day to day water managers in the Crocodile sub-catchment and DWAF Nelspruit is the regulator. DWAF has to approve the IB's activities but the actual water management is done by IBs. IBs have the power to restrict water abstractions (according to section 89 of 1956 NWA). Therefore IB are actually in control of the water in the Crocodile sub-catchment. In the new Act this is still in existence (section 95) during the transitional period before WUAs are established. IBs carry on with the water control. Most of the infrastructure (weirs, dams, canals etcetera) is owned by IBs and the actual physical water control is in the hands of IBs.

#### *3.4.6 Lack of water control by DWAF*

In the previous section water control was mostly discussed for farmers that fall under an IB. However, most farmers in the Crocodile sub-catchment are individual farmers that pump water directly from the river and are not depending on IB infrastructure. These farmers are not under control of IBs and in these areas DWAF Nelspruit is responsible. The tributaries of the Crocodile River that are not managed by IBs are hardly controlled or managed by DWAF Nelspruit because of a lack of capacity. DWAF Nelspruit does not have a bailiff for the Crocodile River because they have difficulties in attracting technical staff (see Box 4). In practice DWAF Nelspruit only notices over-abstractions when neighbouring farmers are complaining. DWAF is a national department and cannot check these issues on the ground<sup>56</sup>. According to the deputy chief engineer WRM DWAF Nelspruit it is known from hydrological modelling (Mike 11) that water in the Crocodile sub-catchment is over abstracted by farmers and/or IBs<sup>57</sup>. In at least one case it is obvious that a commercial farmer abstracts more water from the system than he is allowed to. DWAF Nelspruit did not manage to stop this farmer abstracting water illegally (see case below).

In general it can be said that water control in IB operated and controlled areas water control is stronger than in DWAF Nelspruit controlled areas since bailiffs are available or physical water control is available (because of control structures and canal system design). Besides this farmers are usually more cooperative in IB controlled areas (social control). In DWAF Nelspruit controlled areas there is a lack in water control by DWAF Nelspruit because farms are not metered and there is a lack in man power to control and police water abstractions.

#### *Case: illegal citrus farmer in Schoemanskloof*

In the Schoemanskloof a farmer with water rights for 67 hectares of citrus abstracts much more water than he is legally entitled to. In 2004, 211 hectares of citrus were identified by DWAF Nelspruit. The farmer is still expanding its cultivation area. DWAF Nelspruit has sent the farmer a directive and he is ordered to stop the over-abstraction of water by several pumps and illegal storage dams. The farmer ignores DWAF Nelspruit and does not respond and continues expanding his irrigation area. Next to farming the person is an influential man in business<sup>58</sup>.

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<sup>54</sup> From interview chairman Malelane IB and observer CRMIB.

<sup>55</sup> Except for the Kaap tributary where all pumps are metered.

<sup>56</sup> From interview with Chief Engineer WRM DWAF Nelspruit.

<sup>57</sup> From interview deputy chief engineer WRM DWAF Nelspruit.

<sup>58</sup> From interview senior official WRM DWAF Nelspruit.

DWAF Nelspruit does not have the means to deal with this issue. Therefore the legal advisor at DWAF head office was contacted and the so-called *Blue Scorpions* were asked for assistance in mid 2006<sup>59</sup>. The Blue Scorpions are DWAF's unit tasked with clamping down on illegal water use in South Africa. The unit is small and focuses on "over-extreme cases" only. Among the unit's difficulties are a lack of legal experts and not enough funds (International Water and Sanitation Centre 2006). Until now nothing happened and the citrus farmer continues expanding his irrigation area while only paying for the water he is entitled to.

*Lack of capacity and skills*

DWAF Nelspruit, the ICMA, MLM and other government institutions have difficulty with attracting engineers and other educated and technical staff members. At DWAF Nelspruit there is a vacancy of 70 to 80%. People do not stay long within the department and therefore expertise is not generated within the department. Once skills are developed the people leave because they can get a better position outside the department, usually in the private sector. In the whole country there is a brain drain of (usually white) educated people who have left the country. Because of history black people did not get the same possibilities in education and employment amongst other things. The Employment Equity Act promotes equal opportunities for previously disadvantaged groups. Because of the Employment Equity Act it is not always the best candidate that gets the job, but skin colour or gender determine the candidate. Many white people complain because of reverse discrimination and political appointments in government resulting in unskilled officials. This is a complaint in government's departments in general, also at local government and in the ICMA. The government often appoints consultants since capacity within government is lacking. However, there is also a shortage in skilled consultants that can do the jobs. Engineers and technicians are needed, but there hardly are black engineers (see Table 5). African, Coloured, Asian and Black people together only form 4% of South Africa's professional Civil Engineers. Only 1,9% of the white professional civil engineers is female. Many positions are not filled because black candidates cannot be found.

**Box 4: Lack of capacity and skills**

*Civil Engineering, professional engineer*

Member Type	Male	%	Female	%	White	%	African	Coloured	Asian	Black	%	Total
Professional Engineer	6299	98.05	125	1.9	6175	96	158	15	76	249	4	6424

**Table 5:** Black and white engineers (Source: ECSA Member Statistics March 2006)

**3.4.7 Future water control**

*ICMA and WUAs*

According to the chief engineer WRM DWAF Nelspruit and other DWAF Nelspruit officials it is the task of the ICMA to improve water control in the future. In practice a water controlling body is needed on the ground that is able to detect water over abstractions. WUAs can check water use on the ground and therefore these are suitable bodies for water control. The monitoring and water control needed for the ER will also become the responsibility of

<sup>59</sup> Ibid.

the ICMA<sup>60</sup>. An interviewed senior official WRM at DWAF Nelspruit mentioned that DWAF in the future will try to pass the bucket to the Department of Environmental Affairs to monitor and control water needed for the ER.

#### *Indirect water control by validation and verification*

Currently DWAF Nelspruit is busy with the validation and verification process of all water users<sup>61</sup>. In this process it is checked whether farmers do and have not used more than their allocations in the years of 1996-1998 in order to get a water licence. This is the so-called validation process. According to the prescribed water use allowance per crop and the cropping area it is calculated what the maximum amount of water use is for a farmer. Water users that use more water than their allocation will get less water on a descending scale in 5 years unless they can prove that DWAF is wrong in its calculations (in the so-called verification process). Unlawful water users will be cut back. When this process is finalised farmers can apply for a water license.

#### *Volumetric metering*

According to the interviewed DWAF Nelspruit WRM officials, IB members and ICMA officials metering is needed for strengthening water control. In canal systems weirs and other control structures should be equipped with loggers and all pumps need to be metered. According to the NWA every abstraction point needs to be measured when DWAF wants to. In the Kaap River all pumps already are metered. All farmers in the Kaap tertiary catchment pump water directly from the river.

On the initiative of the CRMIB a feasibility study is started to install water meters to all the pumps in the Crocodile River. ESKOM (electricity company) will pay for the (expensive) meters because they want to decrease the electricity demand during peak hours. Therefore they want farmers to stop irrigating from 18.00h-20.00h in order to prevent the need for the construction of a new electricity plant<sup>62</sup>. This project will be finalised in the end of 2007 or at the beginning of 2008. The CRMIB does not have the powers to force farmers to accept the water meters and to stop pumping from 18.00h-20.00h. This mandate is needed from DWAF but this is not given<sup>63</sup>. In the Kaap tributary all farmers agreed with the water meters so no resistance is to be expected. The KRMIB can see how much water is pumped by all farmers at all times by the use of a telemetrical system. Volumetric water metering is part of the licensing conditions; every water user that wants to obtain a water license needs to be metered. Also when someone wants to transfer its water rights a metered pump is a condition of the transfer.<sup>64</sup> When all pumps in the Crocodile sub-catchment are metered water control will be much stronger.

### **3.4.8 Lack in flow regulation**

Besides a lack in water control concerning water abstractions there are difficulties with regulating flows in the Crocodile River system. According to the chief engineer WRM DWAF Nelspruit the Crocodile River is about 90% non-regulated<sup>65</sup>. There is only one major dam (the Kwena dam) close to the source of the 320 kilometre Crocodile River. The Kwena

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<sup>60</sup> From interviews chief engineer WRM DWAF Nelspruit, deputy chief engineer WRM DWAF Nelspruit, senior officials WRM DWAF Nelspruit.

<sup>61</sup> The validation and verification process is necessary for the process of compulsory licensing.

<sup>62</sup> ESKOM also financed the installation of water meters in the Kaap tertiary catchment.

<sup>63</sup> From interview chairman CRMIB.

<sup>64</sup> From interview chairman KRMIB, chairman technical committee ICMA and NWA lawyer.

<sup>65</sup> From interviews chief engineer WRM DWAF Nelspruit.

dam is contributing to river flow, but in fact the tributaries are the most important sources of water (the Elands River is the largest tributary). The storage capacity of the Kwena dam is relatively small ( $167 \times 10^6 \text{ m}^3$ ) (Deksissal et al. 2003).

Currently it occurs regularly that under dry conditions the international obligations with Mozambique are not met<sup>66</sup>. It is not possible to properly manage the water in the Crocodile Catchment because water released from the Kwena dam takes 14-22 days (at low flow) to reach the Mozambican border<sup>67</sup>. The Kwena dam is about 250 km from the Mozambican border and certain portions of the Crocodile River are flat, wide and sandy. In spring the evaporation is very high because of (dry) *Selati* winds, vegetation growth and strong sunshine. According to the chairman of the CRMIB about 25-35% of the flow can be lost in the flat sandy portions of the river under those conditions. According to the chief engineer WRM of DWAF Nelspruit 1-1,5 m<sup>3</sup>/s of flow in the Crocodile River can be lost on a hot windy day due to evaporation.

With only one major dam, proper water regulation is not possible in the Crocodile River system. Instead the downstream (mainly sugarcane) farmers are restricted in their water abstractions to have a faster response in river flow. Usually water allocations are on a weekly basis but in these cases the CRMIB has to cut back the allocations within the week. Also when agricultural abstractions close to the border are decreased the response time to regulate the flow is often too long and international requirements are not met. In addition to this Instream Flow Requirements (IFR) for KNP are often not met with the same cause. Remaining a higher flow rate in the river (e.g. 2-2,5 m<sup>3</sup>/s) in order to meet the international obligations is not possible because of the stressed catchment<sup>68</sup>.

#### *An extra weir*

On the initiative of the CRMIB (after consultation with DWAF Nelspruit) an extra weir in the Crocodile River was constructed in the 1980s to make it easier to regulate the flow in the Crocodile River. However, KNP did not want to have control structures in the Crocodile River bordering the park and therefore forced the CRMIB and DWAF Nelspruit to stop with the construction of the weir. Negotiations led by the DWAF Minister did not help<sup>69</sup>. Another weir is needed in the downstream section of the Crocodile River (somewhere closer to Mozambique) in order to meet the international obligations always (and for the IFRs for KNP). But KNP does not agree because this will mean that a weir is constructed bordering the KNP. Within DWAF Nelspruit WRM department there are ideas of constructing a weir just upstream of KNP in the Crocodile gorge in order to prevent resistance from KNP. KNP would also benefit because of better flow regulation since IFRs would more often be met.

#### *Water control and regulation needed for ER is complex*

Besides a lack in water control and flow regulation in the Crocodile River and its tributaries the water control and flow regulation needed for the ER will be complex. It will be difficult because the flow required for the ER is not constant or proportional but variable depending on the seasons and weather conditions. Rainfall data should be collected and available in real time and immediate action is needed for regulating the flows<sup>70</sup>. A monitoring

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<sup>66</sup> The international obligations will be updated soon; this is up to international policy makers. The flow of 1,2 m<sup>3</sup>/s from the Crocodile River is an interim agreement and will most probably increase (from interview with Chief Engineer and Deputy Chief Engineer: WRM DWAF Nelspruit).

<sup>67</sup> From interviews chief engineer WRM DWAF Nelspruit, senior staff member CRMIB.

<sup>68</sup> From interviews chairman CRMIB and senior official WRM DWAF Nelspruit; DWAF 2004a.

<sup>69</sup> From interviews deputy chief engineer WRM DWAF Nelspruit.

<sup>70</sup> Currently rainfall data is available months later according to the Komati ER determination programme manager.

system in a reference river (a small undeveloped tributary of the Crocodile River) is needed to know what flow must remain in the Crocodile River and its tributaries. The final determination of the ER will be a flow duration curve<sup>71</sup>.

### *Conclusion*

Current water control does not allow the ER to be implemented. Water control is in the hands of IBs and commercial farmers. IBs own most dams, irrigation infrastructure and water control structures and are therefore technically in control of the water. Besides this existing lawful use under the old act is recognised as temporary water rights and therefore the irrigation sector is in control of the water. In the near future these water rights will be abandoned, however, the irrigation sector will resist when water will be re-allocated away from agriculture.

Besides this stronger water control and flow regulation is needed by DWAF Nelspruit and/or the ICMA for the implementation of the ER. The international obligations to Mozambique are not complex (a minimum of 1,2 m<sup>3</sup>/s from the Crocodile River), but regularly not met. The Reserve, which will be complex (variable in time and depending on weather conditions and probably a larger quantity than the international obligations), cannot be met with the current water control situation. All abstractions should be metered and controlled and an extra weir is needed for better flow regulation.

## **3.5 Consequences Water Users and Stakeholders**

The consequences of the implementation of the Reserve for other water users and stakeholders are not known yet. At first the Validation and Verification phase should be finalised. Only then it is exactly known how much water is used and how much water is in the system. Then also it is known how much illegal water is abstracted and will be back in the system.

Besides this the ER is not determined yet. At first a final ER determination has to be signed off at the RDM directorate at DWAF head office. A public participation process will have to take place where decisions will be made about the category of the rivers and accordingly the ER will be set for 5 years. Only when this process is finalised it is known how much water will be needed for the Reserve and what the consequences will be for the water users and other stakeholders.

Probably there will be curtailments for agricultural, industrial and domestic water users. The total annual volume needed for the ER based on preliminary estimates is approximately 328 million cubic meters of water being about 26% of the annual natural MAR (DWAF 2004b). This portion is considerable and would undoubtedly have effects on the allocation of water to the water users in the Crocodile sub-catchment. However, according to the deputy chief engineer WRM DWAF Nelspruit the preliminary ER determinations outcomes and annual volumes are generally too high<sup>72</sup>.

According to the interviewed Komati ER determination programme manager the low flow Reserve does not need much more water than the international obligations and so there possibly will not be negative consequences for other water users. According to the respondent the ER minimum flow requirements are most probably met for the Komati and possibly also for the Crocodile River when the international agreements with Mozambique are met. Flow must remain in the Crocodile River anyway for irrigated agriculture in the downstream part of the Crocodile River (mainly sugarcane farmers). Only at the real end all the allocated

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<sup>71</sup>From interview Komati ER determination project leader and deputy chief engineer WRM DWAF Nelspruit.

<sup>72</sup>From interview deputy chief engineer WRM DWAF Nelspruit.

water is used by irrigation. However, the requirements for Mozambique are still (or are supposed to be) in the river, so this is the minimum flow in the river at all times (in theory). The determined low flow of the ER in the Komati River in September (the lowest flow in the river) for 50% of the time is 1,3 m<sup>3</sup>/s; this is just more than 1,1 m<sup>3</sup>/s<sup>73</sup>. This will only be at the real downstream stretch of the Komati River because of the irrigation demands till the end. The regulated flood flows are not met then, but maintaining a minimum flow in the Crocodile River is most important for ecology and this is often not met at the moment. High flows are also needed for other mechanisms in the ecosystem. Then more water is needed which might be conflicting with other water users<sup>74</sup>. The international requirements of Mozambique are most probably becoming larger so then the low flow for the ER is more easily met (see footnote 66).

Besides the fact that it is not exactly known how much water is in the Crocodile River system, how much water is used and what flow is necessary for the Reserve (all of this is studied at the moment), it is not yet known how the water that is available after the Reserve is allocated. The so-called *Operating Rules* are still to be defined; the policy for prioritising water allocations to uses after the Reserve is still to be written. A Water Allocation Manager is recently recruited for the ICMA who will be responsible for defining the Operating Rules<sup>75</sup>.

### 3.6 Conclusions

Chapter 3 showed that the ER faces many obstacles in the Crocodile sub-catchment. The ER is not yet determined for the Crocodile River and its tributaries. The determination is highly complex, time consuming and capacity demanding. Stakeholder participation did not yet take place yet. The perceptions of water users and stakeholders concerning the ER differ and are conflicting. A balance is to be found between ecology and economy and society but this is not found since stakeholders are not consulted.

Currently mainly the commercial agricultural sector is in control of the water. The water control of DWAF Nelspruit and flow regulation is insufficient and regularly the international obligations with Mozambique and IFRs are not met. In the stressed Crocodile sub-catchment farmers and/or IBs over-abstract water. Technical, social and political water control by DWAF Nelspruit is lacking and over abstractions of water can continue. The water control of DWAF Nelspruit and flow regulation have to be strengthened in order to make the ER implementation possible (metering, extra weir). Enforcement by DWAF Nelspruit is also necessary when over-abstractions are detected.

There are water rights originating from the old water Act that still apply. This results in legal complexity. The temporary legal complexity can have a negative effect on the implementation process of the ER since the resistance against the ER is most probably larger because of a lack of understanding by the agricultural (and other) water users and they are more likely to go to court.

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<sup>73</sup> The flow of 1,1 m<sup>3</sup>/s is the international obligation with Mozambique for the Komati River.

<sup>74</sup> From interview professional environmental scientist and Komati ER determination programme manager.

<sup>75</sup> From interview Chief engineer: WRM DWAF Nelspruit

## Chapter 4: The Basic Human Needs Reserve and Basic Water Services in Southern Nsikazi

Chapter 4 presents and discusses the obstacles for the BHNR and basic water services delivery in the southern Nsikazi area, part of the former homeland KaNgwane. To start with KaNgwane, southern Nsikazi, Mbombela Local Municipality and tribal authorities are described. Then the obstacles for the BHNR and basic water services delivery in the southern Nsikazi area are presented and discussed. Firstly the standards for the BHNR and basic water services are discussed. Secondly, it is described to what extent the BHNR is implemented and basic water services are delivered in southern Nsikazi. There is a large backlog in basic water services delivery in the MLM area, but especially in southern Nsikazi. After this the standards for water services delivery are questioned followed by describing the perceptions of different water users about the BHNR and basic water services. While many do not receive basic water services according to the standards, the people of southern Nsikazi are not satisfied with the standards. More water is needed and accessibility in terms of distance from the household should be increased. Then the influence of the three dimensions of water control on basic water services and the BHNR are discussed. Local government and WSPs lack water control in the water services supply scheme of southern Nsikazi. Water for basic human needs is distributed inequitably. The influence of traditional systems of water management and legal pluralism on basic water services and the BHNR in the research area will be described afterwards. Especially in informal areas water services delivery is problematic<sup>76</sup>. Amongst others because tribal authorities allocate land to people that is not suitable for water services delivery<sup>77</sup>. In the response to insufficient water services delivery the people of southern Nsikazi search for other sources of water. This is described in the section of society's adapted behaviour. In the end, the conclusions are made and it is reflected whether the research questions for the BHNR and basic water services component of the research are answered.

### 4.1 KaNgwane, Southern Nsikazi and Mbombela Local Municipality

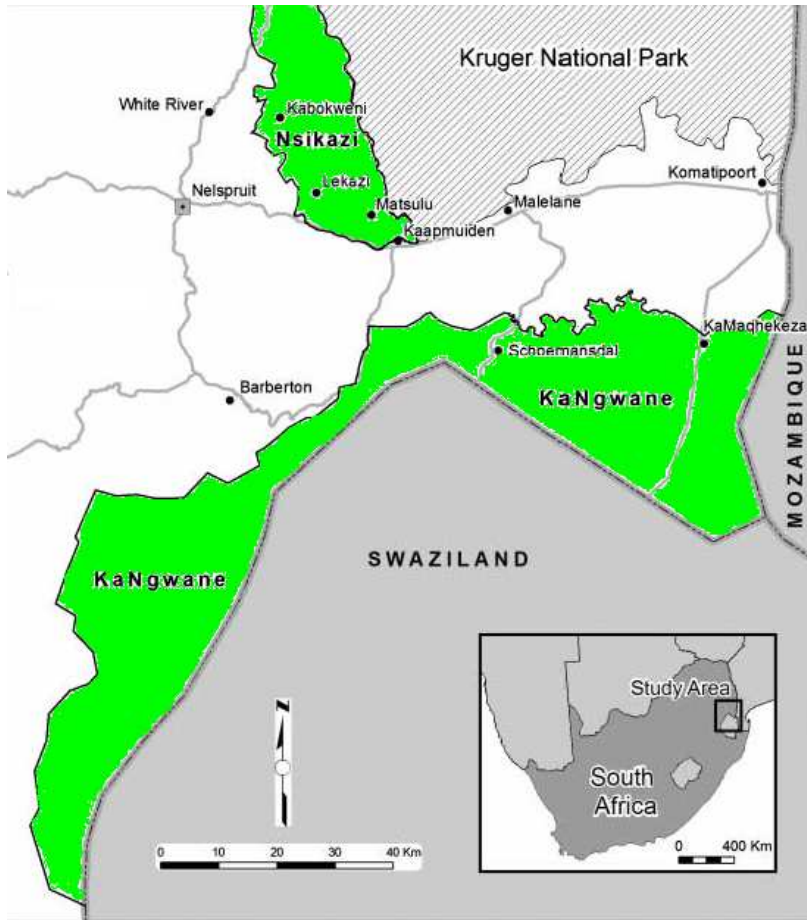
#### 4.1.1 KaNgwane

KaNgwane was created as a homeland for the Swazi people not residing in Swaziland. KaNgwane together with the independent nation of Swaziland was the traditional homeland of the Swazi, who were organised into a kingdom in the early 1800s. In 1895 the territory of KaNgwane was taken over by the Boer South African Republic. Under the apartheid system, it became the Bantustan for Swazi people in 1977. KaNgwane was granted internal self government on 31 August 1984. KaNgwane was one of the smallest of the Bantustans and occupies mostly hilly land.

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<sup>76</sup> In this thesis the terms *informal* and *formal* are used. By informal an area is meant that is governed by tribal authorities as well as local government. Formal areas are not governed by tribal authorities and only by local government.

<sup>77</sup> From interviews senior officials Civil Engineering MLM.



**Figure 6:** KaNgwane and Nsikazi (adapted from King 2007)

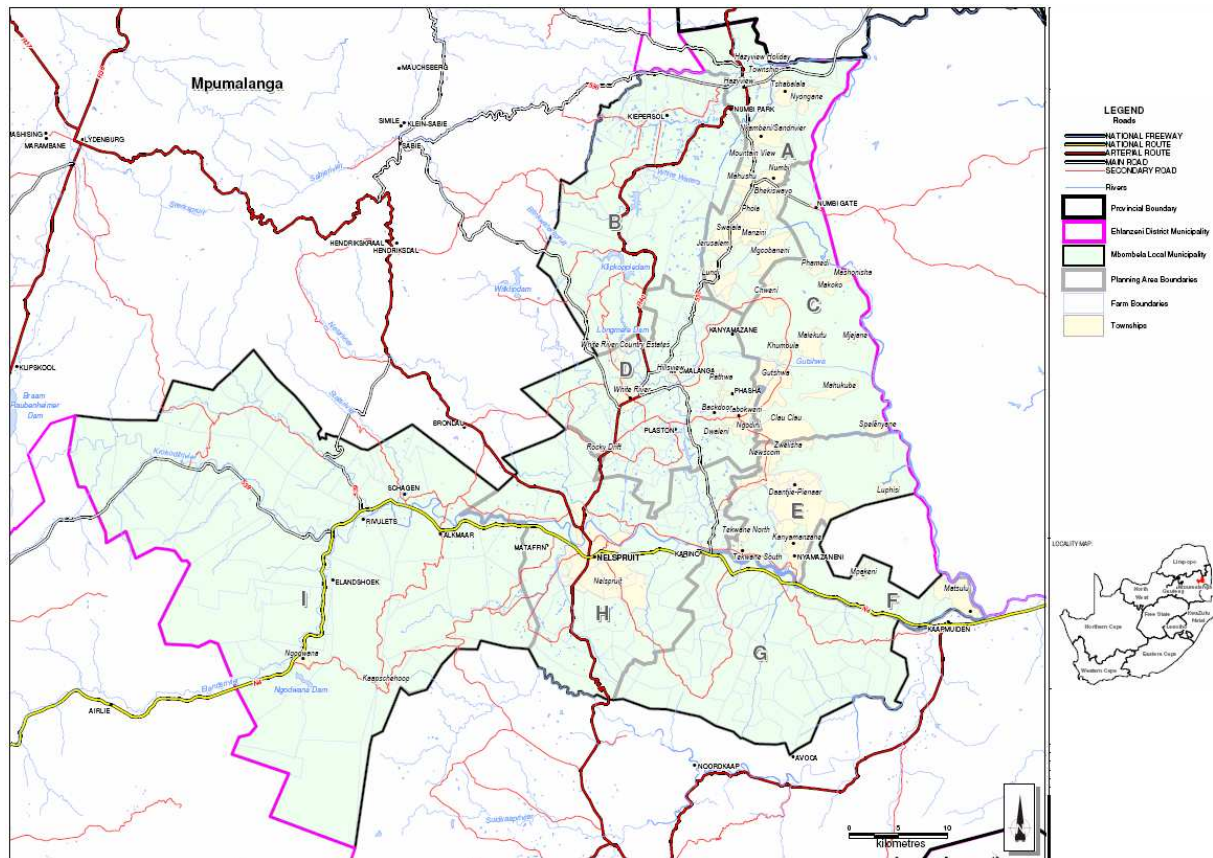
The KaNgwane territory consisted of four regions; Nsikazi, Mwetzi, Mlondozi and Nkomazi. The main portion formed a narrow strip along the western and northern border of Swaziland. The smaller Nsikazi area is a 65 km by 30 km strip of land between the Crocodile River in the south and the Sabie River in the north and bordering KNP in the east (see Figure 6). After the abolishment of the Apartheid system, the homeland was re-incorporated into South Africa in 1994 and is now part of Mpumalanga province. The Nsikazi area is part of the Crocodile sub-catchment. The area is highly populated, poor and remained underdeveloped as compared to the ‘white’ South Africa (King 2007; Waalewijn et al. 2005).

#### 4.1.2 Mbombela Local Municipality

The Nsikazi area is under jurisdiction of Mbombela Local Municipality (MLM) and MLM is the WSA. MLM covers an area of approximately 334,000 square kilometres. Urban areas that are part of the MLM are the City of Nelspruit and the towns of White River and Hazyview, as well as the Nsikazi area which include peri-urban and rural settlements in the north. In southern Nsikazi there are formal areas of Kabokweni, KaNyamazane, Msogwaba, Daantjie, Zwelisha, Tekwane and Matsulu (see Figure 7).

Mbombela is the Siswati word for "a lot of people together in a small space". According to the South African 2001 Census the Mbombela Local Municipality has a population of 474 807. However, according to the population statistics for the MLM (2006) the estimated total population of MLM is 734,482<sup>78</sup>. In Nsikazi the estimated population size for 2006 is 608,364. This number is derived from aerial photography of 2002 to determine the number of households in the area. The 116,244 identified households have an estimated household size of 5.23 (Mbombela Local Municipality 2006c; Mbombela Local Municipality 2006a).

<sup>78</sup> DWAF comes up with another number; 517 661 inhabitants while MLM’s Water Services Development Plan of 2006 comes up with again another number; 662 842 inhabitants (Mbombela Local Municipality 2007). All population numbers are estimates.



**Figure 7:** Mbombela Local Municipality (Source: Mbombela Local Municipality 2006b)

#### 4.1.3 Southern Nsikazi

Southern Nsikazi is supplied by the Crocodile River for its water services. Northern Nsikazi is supplied by the Sabie River. The Gutschwa River is the border between northern and southern Nsikazi (see Figure 8). Because of the homeland policy of the former Apartheid government the majority of South Africa's inhabitants (black people) were forced to live on 13% of the country's surface area, usually poor areas from a natural resources point of view. This is also the case in Nsikazi. In southern Nsikazi there are many hills and soils are often shallow. With approximately 400,000 inhabitants (444,812 inhabitants according to DWAF (2003c), but numbers are different) the area is densely populated. The people live in rural, peri-urban areas in informal trusts or urban townships<sup>79</sup>. Often there are no clear borders between the different trusts and townships. In 2001, 55.42% of the households in MLM earned less than the mean level of living of R 800 (€ 80) per month<sup>80</sup>. Unemployment is very high in MLM and was as high as 62.27% in 2001 (Statistics South African Census 2001) (Mbombela Local Municipality 2006b). The figures will be worse for Nsikazi alone since it is less developed than other areas within MLM.

<sup>79</sup> Townships are urban settlements that are formal and under local government. Trusts are ruled by chiefs and under local government and are usually informal rural or peri-urban settlements. Land is allocated by the chief and there is hardly any planning.

<sup>80</sup> On the 21<sup>st</sup> of August 2007 one South African Rand (ZAR) is worth €0,10.



**Figure 8:** Southern Nsikazi (Source: DWAF Nelspruit)

The estimated population growth rate in Nsikazi is 5% per year<sup>81</sup>. This growth rate is considerable larger than that in South Africa in general<sup>82</sup>. This has to do with high birth-rates and illegal immigrants from Mozambique, Zimbabwe, Swaziland and other countries settling in the area. Although Apartheid is abolished, the consequences of the policies are still easily to be seen. When leaving the spacious white dominated agricultural area of the Lowveld and entering the crowded and messy Nsikazi area the differences are clearly visible.

#### *The field research in southern Nsikazi*

The field research for the BHNr and basic water services component of the research was executed in several formal and informal areas. The informal areas include; Gutschwa, Gutschwakop, Dwaleni, Newscom, Zwelisha, Clau Clau, Tekatoko village and Mjejane<sup>83</sup>. The field research in formal areas is done in Kabokweni and KaNyamazane townships. The limited time spent in formal (township) areas during the field research has to do with safety issues as crime rates are high in these areas. Next to this water services delivery is much

<sup>81</sup> According to a senior official Civil Engineering of MLM.

<sup>82</sup> The population growth rate in South Africa as a whole is -0.46% (2007 estimate) (CIA 2007).

<sup>83</sup> Mjejane is just north of the Gutschwa River and therefore in Northern Nsikazi. The field work was conducted here before having obtained the right information and maps of the area.

better in formal areas than in informal areas and therefore informal areas were more interesting to do field research.

#### **4.1.4 Tribal authorities**

In southern Nsikazi there are several tribal authorities. The tribal authorities consist of a Chief and his right hand men, so called *Indunas*, and assisting community members. The tribal authorities have powers in their tribal (informal) area. Tribal authorities allocate household stands and farmers can get a right to occupy a piece of land. The farmer does not become owner of the land. Besides this, the tribal authorities solve conflicts within the communities by the tribal court. Another role of the tribal authorities in southern Nsikazi is that the people can complain to the Chief's Indunas about problems concerning services (including water services, electricity and infrastructure). The Indunas will confirm in the field what is going on and report to the local government's councillors. The tribal authorities represent the community, but the people themselves can also complain to the councillors directly<sup>84</sup>. More about tribal authorities is discussed in section 4.6.

In the following sections the BHNR and basic water services in southern Nsikazi will be discussed. The influence of tribal authorities on water services delivery in the research area will also be described together with society's response to insufficient water services delivery.

## **4.2 Basic Human Needs Standards**

### **4.2.1 Basic Human Needs Reserve not clearly defined**

Before discussing the obstacles and opportunities for the BHNR and basic water services delivery in southern Nsikazi it is helpful to know how much water is reserved for basic human needs. The BHNR is defined as "the quantity and quality of water required to satisfy basic human needs by securing a basic water supply" (Republic of South Africa 1997). However, the WSA of 1997 or NWA do not specify a quantity or an assurance level for the BHNR. It only states that "the BHNR provides for the essential needs of individuals served by the water resource in question and includes water for drinking, food preparation and for personal hygiene". The South African National Water Policy explicitly states that there is no definition of what is sufficient water and mentions the RDP provision as a short-term target (Republic of South Africa 1997; Republic of South Africa 1998; National Water Act; ANC 1994; Pollard et al 2002).

The 1997 White Paper, forerunner to the act, identifies the minimum service level to which people are entitled to be 25 litres per person per day (within 200 m of the people's homes) as being the starting point for BHNR determination (ANC 1994). According to Pollard et al. (2002) this is the generally accepted standard which is confirmed by the former Deputy Director General Policy and Regulation of DWAF, Barbara Schreiner (in 2002) (Pollard et al. 2002; Schreiner et al. 2002).

In the mean time there is however still no comprehensive methodology for the determination and management of the BHNR. The BHNR has not been defined quantitatively or qualitatively. However, as indicated earlier, the common perception is that for water-balance assessment and scenario studies an allocation of 25 litres per person per day (RDP

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<sup>84</sup> From interviews with Chief, Induna and domestic water users; Waalewijn 2002; King 2007.

norms) would meet the BHNR<sup>85</sup>. In 2000, the Free Basic Water (FBW) policy was formulated which makes the provision of six thousand litres of water for free per household per month an entitlement (DWAF 2001a; Schreiner et al. 2002). It is assumed that this means 25 litres per person per day, but then the household size has to be 8 people. From statistics of MLM, field work and other sources it can be concluded that in the research area the average HH size is slightly more than 5 people so the people are likely to receive more water per day than 25 litres.

In the end there is still considerable lack of clarity as to what quantity of water is allocated to the BHNR and what are the standards for basic water services since it is not specified by law. There is room for interpretation in basic water services levels since FBW is a policy and not legislation. Legally the provision of sustainable water services is a local government responsibility and FBW cannot be enforced by National Government (Brown 2005). Local government will still have some discretion over the amount of water that falls under FBW. In some areas local government may choose to provide more, while in other areas a smaller amount may be possible (DWAF 2001b).

For the delivery of basic water services both RDP and FBW policy standards are used. It is questionable whether this water quantity is sufficient for basic human needs in general (more in section 4.4).

#### 4.2.2 Water Services Authority's standards

In the research area (southern Nsikazi) MLM is the WSA. MLM defines a *Basic Water Supply Facility* as: "The infrastructure necessary to supply 25 litres of potable water per person per day supplied within 200 metres of a household and with a minimum flow of 10 litres per minute (in the case of communal water points) or 6 000 litres of potable water supplied per formal connection per month (in the case of yard or house connections)". A *Basic Water Supply Service* is defined as: "The provision of a basic water supply facility, the sustainable operation of the facility (available for at least 350 days per year and not interrupted for more than 48 consecutive hours per incident) and the communication of good water-use, hygiene and related practices" (Mbombela Local Municipality 2006b). MLM uses the RDP and FBW standards.

The generally accepted standard for the BHNR is 25 litres per person per day. However, 60 litres per person per day is used in the Design Water Usage criteria in Mpumalanga Province (DWAF 1998). The 60 litres is increased by multiplying with 1,1 for a water treatment works loss factor and again multiplied by 1,1 for total conveyance losses. In the end the amount of water is multiplied with 1,5 at summer (summer peak factor). So, according to the Chief Engineer Planning and Development of DWAF Nelspruit in summer 108,9 litres/p/d is distributed for the residents of southern Nsikazi (DWAF 1998).

According to MLM's Head of Civil Engineering and contact person of the WSA the government's RDP standard of 25 litres per person per day at a maximum distance of 200 meters is outdated. According to the respondent MLM uses 50 litres per person per day at a maximum distance of 200 meters as a standard for communal taps<sup>86</sup>. Next to this MLM uses the FBW policy standard of 6000 litres per household per month for free. This is the standard for all connections, not only for household or homestead connections, also for communal taps. In practice more water is supplied than the standards, namely 125 litres per person per day. Every day about 50-60 mega litres (\*10<sup>6</sup>) of water is purified at the KaNyamazane

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<sup>85</sup>From interviews with several senior officials WRM DWAF Nelspruit; Pollard et al. 2002.

<sup>86</sup> So, there is a contradiction in what the Head of Civil Engineering of MLM mentions and what is stated in the Water Services Development Plan (Mbombela Local Municipality, 2006b).

purification plant, which means an average of 125 litres per person per day (in the case of 50 mega litres per day). This is significantly more than the standards, but this does not mean that the 125 litres is available per person per day because of normal distribution losses (friction etcetera), spilling of water, leaks, illegal connections and extra leakage because of this (non proper connections with losses as a consequence) and “head enders” use more water. From studies it is concluded that around 70% of the water supplied is lost (see section water control)<sup>87</sup>. In the end it is about the amount of water that is received by the people.

#### *4.2.3 BHNR not implemented*

The BHNR is not implemented yet. The Reserve (ER and BHNR) will be implemented in the future when water licenses are issued, until now no water is set aside for the Reserve. The Reserve is included in the license. The RDP and FBW policy is implemented everywhere in South Africa and in fact is the same concept in terms of water services delivery<sup>88</sup>. So, the BHNR is not yet in place, but 6000 litres of water per household per month for free and the 25 litres per person per day are entitlements. This water use is prioritised and other water uses are restricted, FBW is never restricted<sup>89</sup>. In the next section it is discussed to what extent basic water services where the people are entitled to are delivered in southern Nsikazi.

### **4.3 BHNR and Basic Water Services Delivery in Southern Nsikazi**

#### *4.3.1 Water services infrastructure*

In Figure 9: the water services supply scheme for southern Nsikazi is shown. In Annex 5 a schematic overview of the water services supply scheme of southern Nsikazi can be found. Water for water services is abstracted from the Crocodile River. At first the water is pumped to the KaNyamazane Water Treatment Works and purified. After this the water is pumped over a distance of 7 km via bulk pipe lines to the Msogwaba reservoirs. From these reservoirs the water is distributed via other supply pipelines and secondary reservoirs. Several reticulation networks distribute the water from the secondary reservoirs to the domestic water users (Mbombela Local Municipality 2007). The water is delivered to the domestic users via communal taps (stand pipes), homestead taps and household taps. Communal taps are usually standpipes from where people can collect their water. Standpipes are supposed to be located with a maximum radius of 200 meters. In formal areas all households are supposed to have a tap connection in the house or in the yard. In the informal areas and non township areas the people usually collect water from communal taps.

#### *Other water sources*

There are numerous locations where there is no water services pipeline infrastructure. Next to the homestead taps, household taps and communal taps MLM delivers basic water services via trucks and tanks that are supplied by trucks<sup>90</sup>. 5000 litre storage tanks for communal taps are filled by the trucks. Water is also distributed directly from the trucks. There are incidents that the MLM truck drivers sell water illegally to domestic water users<sup>91</sup>.

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<sup>87</sup> According to the Head of Civil Engineering of MLM and contact person of the WSA.

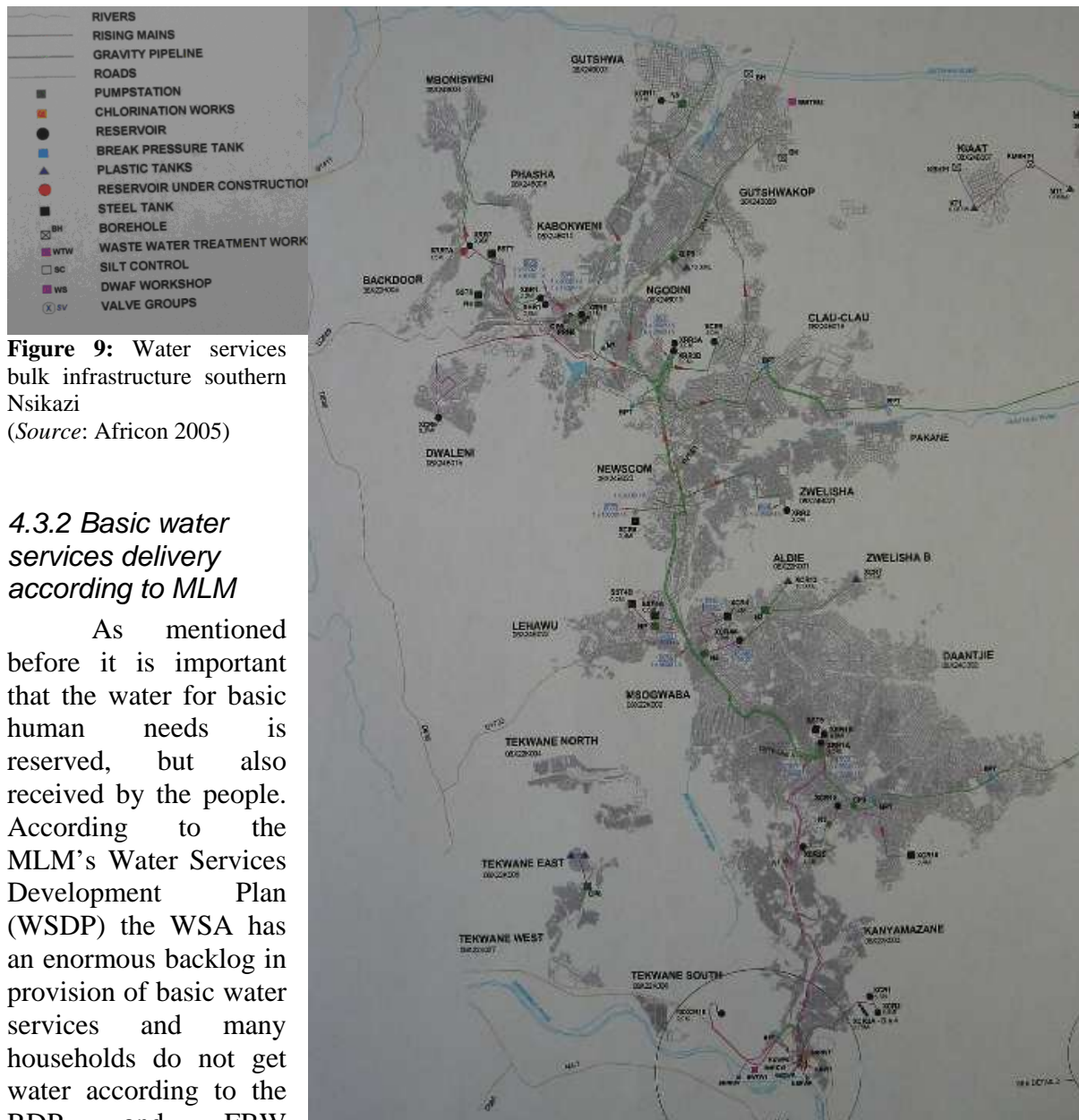
<sup>88</sup> When a household has 8 members 25 litres per person per day is available (6000litres / 8 = 25 litres per person per day).

<sup>89</sup> From interview senior official WRM DWAF Nelspruit.

<sup>90</sup> MLM does not supply water by trucks in all areas that do not receive basic water services.

<sup>91</sup> According to domestic water users in southern Nsikazi

Other non formal water sources were identified in the research area, these are discussed in section 4.7.



**Figure 9:** Water services bulk infrastructure southern Nsikazi  
(Source: Africon 2005)

#### 4.3.2 Basic water services delivery according to MLM

As mentioned before it is important that the water for basic human needs is reserved, but also received by the people. According to the MLM’s Water Services Development Plan (WSDP) the WSA has an enormous backlog in provision of basic water services and many households do not get water according to the RDP and FBW standards (see Table 6), especially in the Nsikazi area. The backlog in basic water services supply is 31% in the whole MLM. So, almost one third of the people in MLM do not have access to water according to the standards. In southern Nsikazi the percentage of people not having access to water (according to the WSA’s standards) will be much higher (MLM 2006b). To get rid of this backlog ZAR<sup>92</sup> 200,000,000 is needed for the installation of standpipes. For the full level of services ZAR 60,000,000 is needed. It is not known when water services are fully provided; this depends when financial resources are available<sup>93</sup>.

<sup>92</sup> On the 21<sup>st</sup> of August 2007 one South African Rand (ZAR) is worth €0,10.

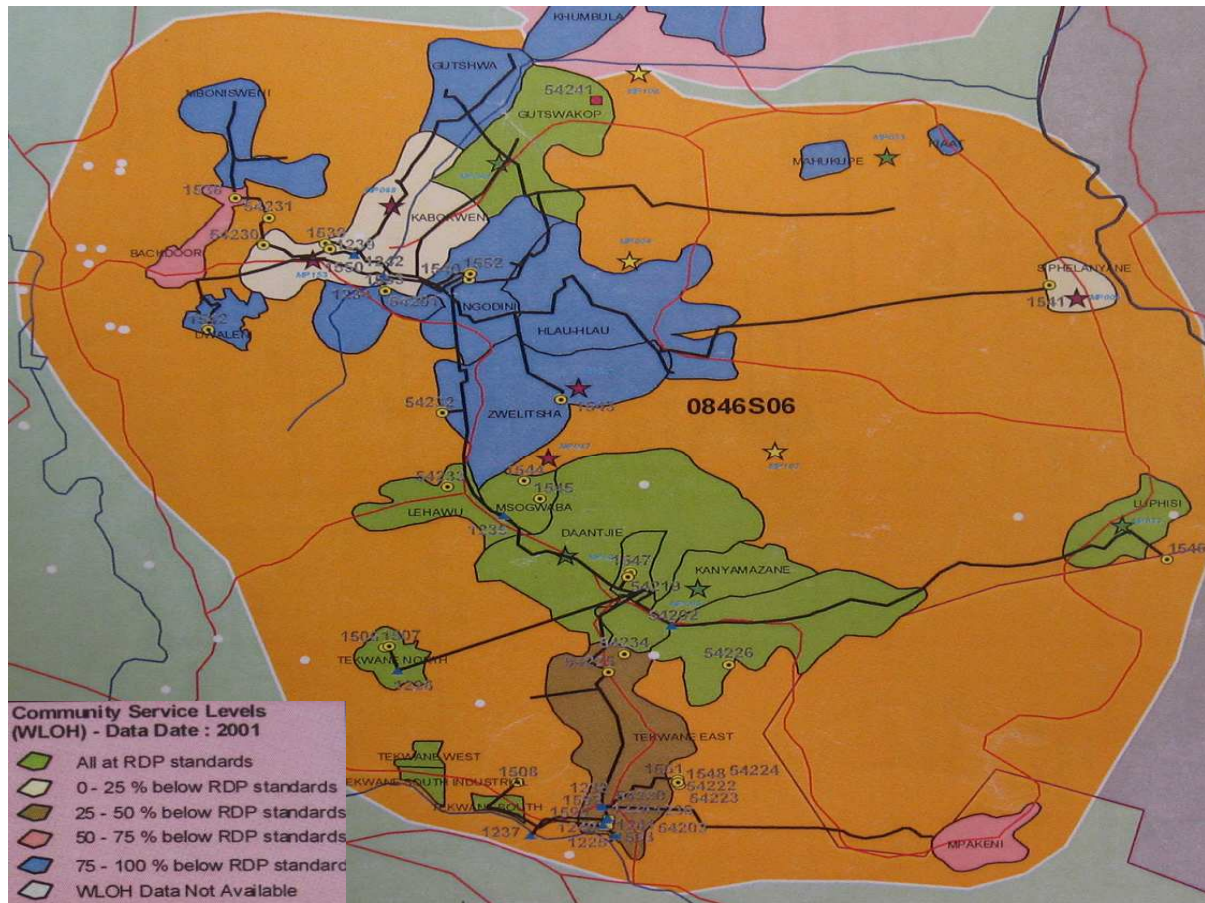
<sup>93</sup> From interview Head of Civil Engineering MLM; Mbombela Local Municipality 2006b.

SERVICE		2005/6	2006/7	2007/8	2008/9	2009/10
TOTAL	Total Households	156,309	162,561	169,064	175,826	182,859
WATER	Backlog	48,711	57,295	61,373	70,463	75,068

**Table 6:** Backlog in water service delivery MLM (Source: Mbombela Local Municipality 2006b)

#### 4.3.3 Basic water services delivery according to DWAF

According to DWAF there are large parts of southern Nsikazi that receive water services below the RDP standards (25 litres per person per day at a maximum distance of 200 meters). In Figure 10 it is shown that in the informal rural/peri-urban villages of Gutschwa, Clau Clau (indicated as Hlau Hlau in the picture), Zwelitsha, Dwaleni, Mbonisweni, Ngodini and Mahukupe 75 to 100 percent is below RDP standards (see blue coloration). The Kabokweni, Msogwaba, Daantjie, Tekwane and KaNyamazane townships are significantly better supplied with basic water services.



**Figure 10:** Water service levels southern Nsikazi (Source: DWAF 2003c)

#### 4.3.4 Basic water services delivery from field work

Although the people are entitled to FBW the required water services are often not delivered, especially in the (southern) Nsikazi area. This is acknowledged by MLM and DWAF<sup>94</sup>. The backlog is confirmed (not quantitatively) by the conducted field work in the

<sup>94</sup> From interviews with MLM and DWAF Nelspruit officials; MLM WSDP 2006, MLM status quo report march 2007 and DWAF 2003c.

southern Nsikazi area (interviews and observations) and interviews with the WSA, Water Service Provider (WSP), councillors, tribal authorities and DWAF. Although the backlog is not quantified by the field work, the amount of people that do not receive basic water services in practice is most likely larger than MLM's estimates as many pipes and taps are broken without the WSA or WSP knowing this<sup>95</sup>. MLM is often not fully aware of the poor services delivery. From the field work it appeared that in several locations services are expected to be supplied, but in fact they are not (e.g. see case Tekataku village). This research is not intending to find out the precise numbers of the backlog in Southern Nsikazi. This is beyond the scope of the research and not the intention of this research; the aim is to get an in-depth understanding of the current situation and difficulties for sufficient basic water services delivery in southern Nsikazi.

The field research mainly took place in rural and peri-urban informal areas where water supply is significantly worse than in more urban areas<sup>96</sup>. See Table 7 for the interview locations with domestic water users in southern Nsikazi. Kabokweni and KaNyamazane are the only townships in which interviews are conducted<sup>97</sup>. In other townships short observations have been conducted (Msogwaba and Daantjie).

<b>Location</b>	<b># interviews</b>
Gutswha	9
Kabokweni	6
Dwaleni	8
Clau Clau	7
Mjejane	2
Newscom	2
KaNyamazane	2
Zwelisha	7
<b>Total</b>	<b>43</b>

**Table 7:** Interview locations fieldwork domestic water users southern Nsikazi

### *Standards often not met in practice*

In short it can be concluded from the field work that the majority of the respondents do not get water according to MLM's standards. The majority of the respondents do not receive basic water services for at least 350 days per year with a maximum interruption of supply of 48 hours. Besides this the basic water quantity received by the respondents is regularly less than the 25 litres per person per day or 6000 litres per household per month (FBW). This water is not always supplied within 200 metres of a household.

When more formal areas would have been included in the field research the outcomes would be different since formal areas usually get higher levels of water services. Water services delivery is context specific and variable in southern Nsikazi and depending on many factors. It is not possible to describe the water services delivery for the whole of southern Nsikazi. Therefore the different contexts and related water services situations are discussed below.

<sup>95</sup> Although the percentage of households not receiving basic water services was not quantified by the field work, field work outcomes confirmed the differences in water services levels as indicated in Figure 10.

<sup>96</sup> It was decided to conduct the field work in these areas because of safety reasons and because poor water services delivery is more apparent in informal areas and therefore more interesting for the research.

<sup>97</sup> These townships are considered formal areas by local government.

### *Formal and informal settlements*

In the formal townships (without tribal authorities) water services delivery is mostly according to the basic standards and usually better. KaNyamazane, Tekwane and Kabokweni are all formal settlements and every household has a pipeline connection which is metered. In KaNyamazane and Tekwane the water delivery is close to 24 hours per day and 150 litres per person per day is allocated. The water allocated per household is more than in the rest of southern Nsikazi because here all households have sewage connections (flush toilets) and therefore more water is needed.

However, within these areas there are also problems with services delivery. For example Tekataku village (part of Kabokweni township) has problems with water delivery and almost no water is delivered by the existing homestead taps (*see case*). In informal areas tribal authorities are in place and decide where people can live. Land is allocated in areas where no water services are provided or where services it is difficult to supply services. These areas are usually supplied with water from standpipes or not at all.

### *Uphill areas and new settlements*

In several areas no water services are delivered. These are usually uphill areas. In the west side of Gutschwa the majority of the people do not receive water services. In the uphill areas of Kabokweni, Newscom, Zwelisha and Clau Clau water services delivery is significantly worse than in the flat areas. In these areas many people have made illegal connections to the pipelines and therefore have homestead connections (see also section water control). In new settlement areas no water services are supplied. This is the case in the Dwaleni and Gutschwa new settlement areas.

### *Reliability of water delivery*

The reliability of water delivery is different between settlements and within settlements. In most areas of southern Nsikazi there is no continuous water services delivery. Usually water is only supplied for 2-3 hours in the morning and sometimes also 2-3 hours in the afternoon or evening. Often water is not supplied every day. In Clau Clau, water is only delivered every second day. The times and duration that water is delivered varies often, sometimes water services are delivered during the whole day. More often the duration of water delivery is shorter. In addition to this, water delivery is unreliable as water sometimes is not delivered for several days. Sometimes people are still waiting at a communal tap to collect water when the water supply stops. In Gutschwa no water services delivery for 2 to 3 days is not uncommon.

Most respondents do not receive a 350 days per year water supply. Most respondents only get water 2-6 hours per day or every second day.

### *Accessibility*

The distance from the household to the water source was sometimes too far (more than 200 meters). This is especially the case when the usually used water source does not supply water (very common) and water has to be collected from an alternative water source. For the collection of water from communal taps the water fetchers usually have to walk several times since the water cannot be transported all at once. Besides this, queuing at communal taps is common. Because of these reasons the collection of water from (distant) communal taps is regularly time consuming.

### *Quantity*

The quantity of water that people receive from the water services scheme is not always clear. The majority of the respondents receive 25 litres per person per day<sup>98</sup>, however there are areas where less than 25 litres per person per day is received by the people (usually informal and uphill areas). There are also areas where no water services are delivered (usually new settlement areas).

### *Water quality*

According to the respondents and MLM there are usually no problems with water quality. After heavy rainfall the water from the water services system can be brownish and the people first have to flush the tap for a while before water can be collected. In Kabokweni Cholera was identified in the water services supply system in 2006. Cholera infections took place for three weeks. People got ill, no one died from the incidence.

## **4.4 Sufficient Water for Basic Human Needs**

Besides the standards and the observed levels of water services delivery in southern Nsikazi it remains questionable whether the standards for basic water services delivery are sufficient to meet basic human needs. After this discussion the perceptions of domestic water users in southern Nsikazi are presented.

Both the 1997 WSA and the NWA aim to tackle the need for sufficient water for the basic needs of rural populations. In both the NWA and the WSA there is no definition about what is sufficient and it is not stipulated or written in law what water quality, quantity and accessibility of water is sufficient for basic human needs. According to the Merriam Webster Online Dictionary (2007) sufficient can be defined as: *“enough to meet the needs of a situation or a proposed end”*.

The quantity of water supplied to and used by households is an important aspect of domestic water supplies, because it influences hygiene and therefore public health. According to several (senior) officials within the regional Mpumalanga office of DWAF and MLM it is debatable what amount of water is needed per capita per day and this quantity is not determined.

The World Health Organisation (WHO) states that a minimum of 7,5 litres of water per capita per day meet basic requirements of most people under most conditions, based on estimates of requirements of lactating women who engage in moderate physical activity in above-average temperatures. This water needs to be of a quality that represents a tolerable level of risk. However, this volume does not take into account health and well-being-related demands outside normal domestic use like water use in health care facilities, food production and economic activity or water use by people suffering from AIDS<sup>99</sup> (WHO 2003).

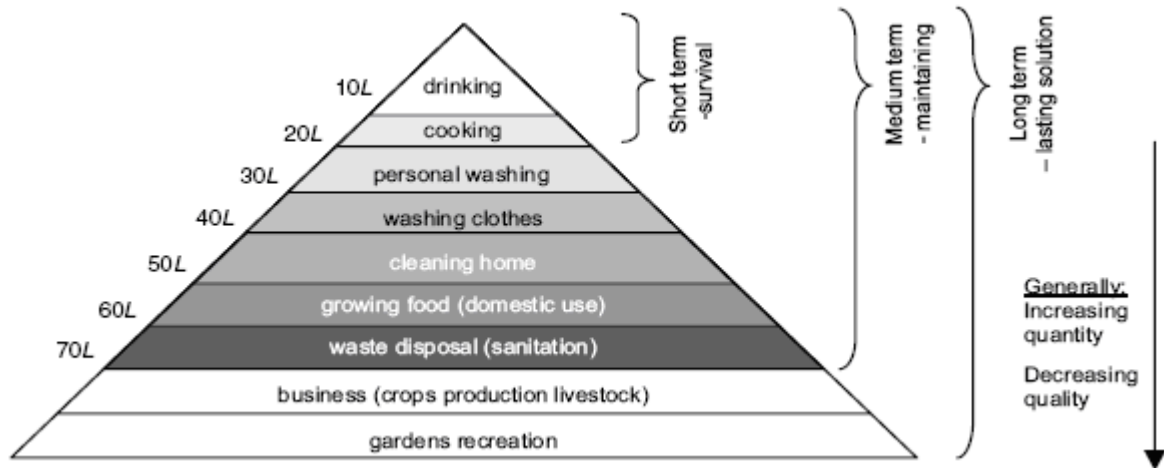
According to the NWA the BHN should provide for the essential needs of individuals including water for drinking, food preparation and for personal hygiene. Therefore more water is needed than the 7,5 litres per person per day. According to Pollard et al. (2002) the World Health Organisation (WHO) comes up with a standard of 40 litres per person per day for basic human needs. As the BHN should provide for the essential needs of individuals including water for drinking, food preparation and for personal hygiene, washing clothes can be interpreted as part of personal hygiene. Then the 40 litres per person

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<sup>98</sup> People know how much water is collected because water is collected and stored by drums and buckets. But when water is used directly from a tap the people usually do not know how much water is received. However, these people indicate that this is mostly more than 25 litres per person per day.

<sup>99</sup> More water is needed for people suffering from AIDS because of health care and hygiene purposes.

per day is indeed the WHO's standard, as can be seen from Figure 11 (World Health Organisation 2005; Pollard et al 2002). Gleick (1996) recommends international organizations, national and local governments and water providers to adopt a basic water requirement standard for human needs of 50 liters per person per day. This amount is needed for drinking, basic sanitation services, human hygiene and food preparation.



**Figure 11:** Hierarchy of water requirements (after Abraham Maslow's (1908-1970) hierarchy of needs) (Source: World Health Organization 2005).

It remains unclear where the BHNR, FBW and RDP standards for basic water services come from. According to a senior official of DWAF Nelspruit the 25 litres per person per day was a guideline by the WHO in the past, however, this could not be confirmed by the author. It remains questionable whether the 25 litres per person per day is sufficient for basic human needs. According to MLM's Head of Civil Engineering and contact person of the WSA the standard of 25 litres per person per day at a maximum distance of 200 meters is outdated. MLM uses 50 litres per person per day at a maximum distance of 200 meters as a standard according to MLM's Head of Civil Engineering. On the other hand the MLM's Water Services Development Plan (MLM 2006b) comes up with the standard of 25 litres of potable water per person per day.

Some important issues should be taken into account by reserving a fixed amount of water for basic human needs. At first there will always be water losses and these should be taken into account in the allocation of water to the BNHR. Secondly, it can be questioned how to guarantee that everyone in a system gets an equal amount of 25 litres per day? This is not possible without highly sophisticated water control measures (see also section on water control). Since this is unrealistic (at least on the short term) more water needs to be reserved for safety so everyone in the system is able to get the 25 litres per day<sup>100</sup>. Finally it is important to know where the water for basic human needs should be set aside for the BHNR and is included in the water use licenses. Is this on the location where people live or where they work? Especially in South Africa with its homeland history most people work and use water during that period in other locations than where they live.

Defining a minimum for basic human needs has limited significance as the volume of water used by households depends on accessibility as determined mainly by distance and time, but also including reliability and cost. The WHO categorised accessibility in terms of service level but does not give a maximum distance for a domestic water source. There is a

<sup>100</sup> From interview Head of Civil Engineering MLM.

high or very high level of health concern when the domestic water source is at a distance between 100 and 1000 meters or 5 to 30 minutes total collection time or more. The level of health concern is low when water is delivered by a tap on the household plot or within 100 m or 5 minutes total collection time (WHO 2003).

#### *4.4.1 The domestic water users' opinions about sufficient water*

From the field work and MLM and DWAF documents it can be concluded that basic water services are often not applied according to the standards. But what if they are? What do the domestic water users in southern Nsikazi think of the water services delivered and what do they think of the standards? There is no straight answer for this question.

The respondents that get water from a tap on their homestead have difficulty with indicating the water quantity necessary for basic human needs. They do not know how much water they are using because the water is used directly from the tap. For the collection and storage of water from other sources usually buckets or drums are used and therefore the users have a good idea of how much water they are using. Water is usually collected with 25 litre buckets or drums.

Most respondents at first believe that the 6000 litres per household per month of FBW is enough for basic human needs. But after cross checking (40 litres per person per day when household size is 5; 25 litres per person per day when household size is 8) most respondents are of the opinion that the 25 litres per person per day or FBW is not enough for basic human needs. Often more water is needed for personal hygiene and the washing of clothes and dishes. The 200 meters distance is too far according to the majority of the respondents (again after cross checking by showing the distance in the field; otherwise respondents often think that the maximum distance of 200 meters is satisfactory). The respondents had difficulty with indicating what maximum distance would be sufficient to them since the majority has difficulty with estimating distances. It takes a long time for people to collect water from other sources than household or homestead taps because they have to walk several times to collect the water needed for the household (water fetching mainly done by women). Water fetchers usually have to wait at communal water sources because of queuing. It is not uncommon that people are waiting in the queue when water delivery stops since water delivery is unreliable. Fetching water from other than household or homestead taps is especially a problem in hilly areas where it is difficult to carry water over a distance. Because of these reasons a distance of 200 meters is too far for the collection of water for basic human needs according to the majority of the respondents.

It can be concluded that the majority of the interviewed domestic water users in southern Nsikazi are not satisfied with the standards for basic water services and the WHO advises a standard of 40 litres per person per day. The 25 litres per person per day that is allocated to the BHNR might be too little to meet basic human water needs and it should be considered to increase the amount of water that is allocated to the BHNR.

#### *Desired level of sufficient basic water services depends on expectations and experiences*

People that are not used to a higher level of water services delivery (usually in the more rural or remote areas) are more often satisfied with 25 litres per day than people in more urban areas. However the maximum 200 meters distance of the water source from the household is too far according to the majority of the respondents. Because of this several respondents have made illegal connections to the pipeline systems.

From the field work it can be concluded that the people in urban or peri urban areas are usually better supplied and expect higher levels of water services. Especially the people that get more than basic water services supply often abstract as much water as possible and

water is spilled. The fieldwork demonstrated that these people are often unsatisfied about the basic water service supply standards.

In short it can be concluded that the majority of the respondents are not satisfied with the standards; 200 meters is too far and 25 litres per person per day or 6000 litres per household per month are not enough for drinking, food preparation and personal hygiene.

#### *4.4.2 Need for productive water*

Besides basic domestic water needs it is questionable whether this should be considered to be the only water requirement for rural needs<sup>101</sup>. Most respondents have small vegetable gardens or want to be able to start vegetable gardens and therefore need water for this purpose. The majority of the respondents need more water for these purposes. Most respondents -without a vegetable garden- pointed out not to have a vegetable garden because they do not have access to water needed for watering the crops. The majority wants to start vegetable gardens when they have access to the needed water. The people that get more water than needed for basic human needs also use the services water for watering these gardens. MLM does not want domestic water users to use expensive purified water for these activities, however for the majority of the people this is the only reliable source of water.

According to several senior officials at DWAF Nelspruit and MLM the South African government wants historically disadvantaged individuals (HDIs) to start small scale productive activities like vegetable gardening. However the government does not come up with alternative water sources needed for irrigating the vegetables. According to the chief engineer WRM DWAF Nelspruit DWAF wants to promote people to come up with their own alternative water sources for productive uses (like small dams, boreholes, rain water harvesting (RWH) etcetera). However, from the interviews with domestic water users in southern Nsikazi it can be concluded that the installation of alternative water sources are often unaffordable for the people. Possibly investments could be made when households share costs and benefits. This does not happen because financial means are still inadequate or the people do not know how to do this. Capacity building and awareness creation concerning this is needed. In fact DWAF head office is initiating to assist and subsidise RWH structures for HDIs. However, in practice no signs of this were found on the ground. The government should support the need for productive water; or by supplying more (purified) water, or by supporting the development of alternative water sources.

Recently a new approach emerged in which both domestic and productive water needs are taken into account; multiple-use systems (MUS)<sup>102</sup>. The MUS approach is one that says that people have multiple uses of water, which can come from multiple water sources that people can access by using multiple technologies. For example, for drinking water very good quality water is needed, while for washing clothes or watering the garden different water quality standards apply. Clean water is usually more expensive to provide; bulk water for domestic use must be purified, underground water is often clean but must be pumped, and pipes are needed to bring drinking water close to the people's households. Rainwater is perfectly good for backyard gardening of brick making, and can complement household needs met from the domestic water services system (van Koppen 2006). The MUS approach can be a good response to address the demand for productive water. DWAF should study this approach and in the mean time more water should be supplied because many people do not get the basic water services they are entitled to.

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<sup>101</sup> Pollard et al 2002 have questioned this before.

<sup>102</sup> The Water for Food Movement, IWMI and AWARD (NGO) are currently working with the MUS approach.

In fact the Reserve is not intended to include or address water that is needed for additional household or productive needs, subsistence crops or small-scale productive use (e.g. vegetable gardens, livestock production or small enterprises) but in practice this is an important component of people's livelihoods that has largely been ignored. The productive demands of rural users should form part of allocation plans<sup>103</sup>.

Too little thought has been given to the mechanisms by which allocation of water for use by rural communities above the BHNR will be implemented. Rural communities use water for multiple productive and domestic uses that are important to their livelihoods. There is strong evidence that where water services levels are increased this has a direct impact on poverty reduction. How can more water than the BHNR be allocated to rural communities?

Two options exist, namely schedule 1 and allocation and licensing<sup>104</sup>. The "reasonable use" recognised under schedule 1 is open to interpretation and might accommodate some productive uses, but it is not clear to what level. In the future water can be allocated to rural communities when water use licenses are obtained. However, the question comes up how the voice of rural communities can be brought to the licensing table<sup>105</sup>. In the end it is important that productive water will be allocated to rural communities. It could be considered to include productive water for rural communities in the Reserve. On the other hand, this would not be necessary when the allocation of productive water to rural communities is better specified in the NWA under schedule 1.

#### *4.4.3 Perceptions other water users on BHNR*

From the interviews with water users (other than domestic water users in southern Nsikazi), key stakeholders and other stakeholders in the Crocodile sub-catchment it can be concluded that all respondents agree with the allocation of water for basic human needs. Water for basic human needs is prioritised by all respondents and it is perceived as a basic human right to have access to water for basic needs. Primary water consumption accounts for 7% of the water in the Inkomati catchment. The fraction of the water consumption for basic human needs is considerably smaller; less than 0,5% of the MAR of the Inkomati Catchment<sup>106</sup>. As this is very small it hardly competes with other water users in the Crocodile Catchment and therefore not a problem according to the respondents. All respondents perceive the 25 litres per person per day to be a minimum requirement for basic human needs. The 25 litres per person per day is sufficient as a bare minimum according to all respondents. However, according to the majority of the respondents more water is needed by the people for further development. The majority of the respondents is of the opinion that it is not necessary to include a larger amount of water in the BHNR since people can pay for water after FBW and get more water when necessary. A small minority of the respondents believes that more water should be allocated to the BHNR. All respondents indicated that an increase in the allocation of water to the BHNR would hardly have consequences for other purposes and therefore there would be no problem to them.

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<sup>103</sup> From interview senior researcher International Water Management Institute (IWMI) and Chief Engineer: WRM DWAF Nelspruit; Pollard et al. 2002; Republic of South Africa 1998.

<sup>104</sup> Schedule 1; see NWA (Sections 4(1) and 22(1)(a)(i) and Item 2 of Schedule 3)

<sup>105</sup> From interview senior researcher International Water Management Institute (IWMI) and Chief Engineer: WRM DWAF Nelspruit; Pollard et al. 2002; Republic of South Africa 1998.

<sup>106</sup> The MAR from the Inkomati Catchment is estimated to be 2945 million m<sup>3</sup>/annum (DWAF 2004a). With an estimated population of 1 462 000 in 1995 (DWAF 2003\*) using 25 litres per person per day (basic human needs) about 0,45% of the MAR is used for basic human needs.

## 4.5 Water Control

### 4.5.1 Lack of water control by local government

A major problem with basic water services delivery is that there is a lack of water control by the MLM and the WSPs. This results in highly unequal water distribution in the water services supply scheme of southern Nsikazi. The “*head enders*”<sup>107</sup> in the 24 hour well supplied townships (KaNyamazane and Tekwane) use and spill large quantities of water as well as other relatively well supplied areas (e.g. Kabokweni)<sup>108</sup>. Water abstractions are often uncontrolled. Because the “head end” of the water services pipelines use too much water there is a lack in water and pressure left for users at the “tail end” of the system. From the field observations it appeared that the people that have good access to water that do not have to pay for it often use a lot of water. Water is often spilled and purified drinking water is used for watering the garden, streets (against dust) and (small scale) irrigation. In theory every domestic water user could be able to get 125 litres per day as this is the amount of water that enters the water services system. But, next to losses<sup>109</sup>, this water is distributed very inequitably and most domestic water users do get much less.

*Physical/technical control* by MLM and the WSPs in basic water services delivery is lacking because the technical system (the pipeline system) often lacks water control mechanisms. Most tap connections are not metered. It is not possible to meter communal taps because it is not known who uses what quantity of water unless a prepaid system is used. In Box 5 a contested prepaid water meter system in Soweto near Johannesburg is discussed (outside research area). When taps are metered often they are not read by the WSP and water use is then not billed when more is used than FBW (see Tekatakhu village case below). Most domestic users in southern Nsikazi do not pay for their water after the six kilo litres of FBW.

The money needed for a totally controlled water services supply system is very large and not available by MLM. Besides this, capacity at MLM and WSPs and commitment from the domestic water users is needed<sup>110</sup>.

#### *Water losses*

From studies conducted for MLM it is concluded that around 70% of the water supplied to southern Nsikazi are losses. At first there are distribution losses because of leaks in the pipeline system. Next to this a lot of water is lost because of illegal connections that are not properly connected to the pipeline system<sup>111</sup>. Besides this often people in well supplied areas spill a lot of water<sup>112</sup>. During the field work the spilling behaviour of many domestic water users in southern Nsikazi has been observed. In several cases water was running from a tap but not collected or used and water drained into the soil. Dirt roads bordering the households are watered in order to prevent the dust to enter the house. Also from interviews with domestic water users in southern Nsikazi it was confirmed that water spilling is generally accepted within the communities. From studies done for MLM in Kabokweni Township on average there are about 4.4 leaks per stand (leaking taps, pipes etc). In

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<sup>107</sup> *Head ender* in this context is means a domestic water user that is in the beginning of the water services delivery system instead of at the end (*tail ender*) of the system.

<sup>108</sup> From field observations southern Nsikazi.

<sup>109</sup> According to studies done for MLM losses are estimated to be around 70%, see section water losses.

<sup>110</sup> From interview with Head of Civil Engineering MLM.

<sup>111</sup> From interview Head of Civil Engineering MLM.

<sup>112</sup> The expression “*African washing machine*” comes from this behaviour. A bucket with laundry is placed under a continuously running tap in order to wash laundry. This was also observed during field work.

KaNyamazane the whole system is fixed for 3 times in 10 years however water losses continue. People do not feel responsible to repair leaks or not to spill water<sup>113</sup>. By the field work water losses from leaks in the pipeline system and leaks from illegal connections were confirmed. The water losses were not quantified and it is not possible to define which cause (distribution losses, illegal connections and water spilling) is responsible for what part of the total water losses of 70%. It is questionable and unclear whether (purified) water use for productive purposes were or should be perceived as losses in the studies conducted for MLM.

System losses and other water losses are common in the delivery of water. For this reason a safety factor should be incorporated into the BHNR because the water quantity that is set aside for basic human needs will never be the same as the water quantity that is reached by the consumers.

People can get more water than FBW but have to pay for the water after the 6000 litres per household per month. As payment for water after FBW can be a problem WSPs search for possibilities to restrict water usage after FBW. There are some physical/technical water control options for basic water services delivery that can be used by WSPs, identified by a senior staff member of a WSP (Silulumanzi) in southern Nsikazi:

*Limited time of supply*; water supply is limited to a couple of hours per day and therefore not more water than a certain amount can be extracted (e.g. FBW). This is currently the case in many areas in southern Nsikazi as not more water (or pressure) is available.

*Continuous low flow*; this can be done by supplying 6000 litres per household per month when the tap is open continuously. The flow will be very low; half a cup per minute (140 ml/minute). This will not work in practice and therefore the flow has to be increased.

*Roof tank*; a mechanical way to restrict to the 6 kilo litres of FBW is by having a roof tank, filled with 6000 litres every month (by trucks). But also this option is impractical; houses are weak and so a construction is needed for the tank. This will make this option expensive, apart from the storage tank which will be costly.

*Electronic devices*; these devices can manage the water supply. A valve will automatically close after the 6 kilo litres of FBW. A problem is that this option is expensive, unreliable and maintenance (batteries) is needed.

*Pre-payment system*; experiments have been conducted in Limpopo Province. This is also done by the WSP Johannesburg Water in Soweto and it seems to be effective from a technical control point of view. However, it is not accepted by domestic water users and the technical system is expensive (installation). Currently there is also a court case between domestic water users from Soweto and the WSP as the domestic water users do not agree with the pre-paid system (see Box 5)<sup>114</sup>.

Water meters are technical components of water control by WSPs. However, a water meter on itself does not control water. The meter has to be read and the more water used than FBW has to be billed. And when the bills are not paid for, there should be enforcement.

#### *Case: Tekatakhu village, Kabokweni Township*

Within Kabokweni Township water supply is generally above the standards for basic water services supply since people can usually use as much water as they want (at the hours that water is available). In this area almost all households have a homestead pipeline connection and the connections are metered. The meters are not read or billed by MLM because of a lack in capacity at MLM and water is often used for irrigating vegetable gardens<sup>115</sup>.

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<sup>113</sup> From interview Head of Civil Engineering MLM.

<sup>114</sup> From interview senior staff member WSP (Silulumanzi).

<sup>115</sup> From observations and interviews in southern Nsikazi and interview with Head of Civil Engineering MLM.

However, in the uphill areas of Tekatakhu village (part of Kabokweni) the homestead taps do not supply water (only a couple of hours per month) because there is not enough water and pressure in the pipelines. Because of this MLM supplies water with trucks to 5000 litre reservoirs twice a week. The households that have to make use of this water source complain about too little water and the distance and amount of time they have to spend for the collection of water. Although hardly any water is received from the pipeline system the water is metered and the people are billed. Because of air pressure (and no water) in the pipes the water meters run and bills are exceeding the amount of water used by far. The people have complained about this and they do not pay their bills.<sup>116</sup>

#### **Prepayment water meters in Soweto**

*“(In July 2006) an application was launched in the Johannesburg High Court asking the Court to declare that the decisions of Johannesburg Water (WSP) to limit free basic water supply to 6 kilolitres per household per month and to unilaterally install prepayment meters are unconstitutional and unlawful. The Court is being asked to order Johannesburg Water (Pty) Ltd. to provide a free basic water supply of 50 litres per person per day, and the option of a credit-metered supply installed at the cost of the City of Johannesburg, to the residents of Phiri, Soweto.*

*Since March 2004 the applicants, along with thousands of residents of Phiri, Soweto, have had their water cut off by Johannesburg Water, while others have been persuaded to accept prepayment meters as the ‘only’ option available besides total disconnection. All of these residents had previously been supplied with unlimited water for which a flat-rate was levied. With the imposition of the prepayment meters, and because the free basic water amount is insufficient to meet the basic needs of the typically large households in Phiri (research undertaken by the Coalition Against Water Privatization in 2004 found the average Phiri household comprises 16 people), Phiri residents are often without water for up to two weeks at a time each month because they cannot afford to purchase additional water once the free basic supply is exhausted (source: CALS 2006).”*

**Box 5:** Contested water control and basic water standards in Phiri, Soweto

*Organisational control and socio-economical or political control* of the WSA and WSPs are also lacking in southern Nsikazi. There is a lack in capacity at the local government. When the technical system is allowing physical water control -when there are well functioning water meters- often the meters are not read by WSPs and the water use is not billed (this was observed in Kabokweni, Dwaleni and Zwelisha). And when the water use is billed, but the water user does not pay, nothing happens<sup>117</sup>. There is simply no capacity to force the thousands of people to pay when more water is used than FBW. Besides this, within the community it is generally accepted to use water inefficiently. There is hardly any social control or awareness about not to spill water. Water spilling is generally accepted while the majority of the domestic water users in southern Nsikazi do not get enough water. There is unawareness of the consequences of the water usage behaviour on other domestic water users<sup>118</sup>. Awareness raising and education is needed for changing the water spilling behaviour.

#### *Culture of no payment*

Most people in southern Nsikazi do not get water bills after FBW. In the formal areas where people receive bills they often not pay for the water<sup>119</sup>. According to the Head of Civil

<sup>116</sup> Ibid.

<sup>117</sup> From interviews domestic water users and observations in southern Nsikazi; interview Head of Civil Engineering MLM.

<sup>118</sup> From observations and interviews in southern Nsikazi and interviews with MLM and WSP staff members.

<sup>119</sup> From interviews with domestic water users southern Nsikazi.

Engineering of MLM in Kabokweni about 10% pays for the water<sup>120</sup>. According to Brown (2005) 21% of the household in KaNyamazane and 8-10% of the households in Matsulu paid for water after FBW in 2005.

There are several reasons for not paying for water services. There is a general believe that water comes from nature and is not produced (like electricity) but is free of costs and freely available for all South Africans (although water has to be purified and pumped). Many people see water as a basic human right and something that should not be paid for<sup>121</sup>.

Then, there is the attitude of not paying for water because water services are unsatisfactory. For example, the people expect continuous water supply because this is promised during elections. Another reason for not paying comes from the ANC's strategy during Apartheid to obstruct the Apartheid regime. A no pay principle was stimulated in order to boycott the government. This principle is still in the minds of the people in southern Nsikazi and they do not want to pay for water services<sup>122</sup>.

#### *Enforcing non payments*

It is difficult to stop non payment and enforce this. By law it is not allowed to stop water supply to the people that do not pay since this is a basic need. Electricity can be cut-off when there is not paid for, this is not the case with water<sup>123</sup>.

The WSP (Silulumanzi) in the concession area of southern Nsikazi let households in Tekwane pay after 12,000 litres per month. From studies in Tekwane it was concluded that the average water use per household per month is 11,000 litres. For this reason the WSP decided to let people pay after 12,000 l because otherwise no one will pay for the water.<sup>124</sup>

MLM lacks staff and technical expertise to fulfil its responsibilities concerning water services delivery. Because of this there is also a lack in the water control of MLM in the water services system of southern Nsikazi and enforcement of water usage after FBW is difficult.

### *4.5.2 Water control and requirements for the future*

#### *Buy-in required at three levels for sustainable water services management*

According to the Chief Engineer Planning and Development at DWAF Nelspruit buy-in is needed at three levels for sustainable water services management:

*Politician level:* Politicians should agree that people have to pay for water. However, this is often not the case because it is unpopular. According to the respondent there is a problem with new politicians. Promises to the people are made that "we will serve you" and everything will get better after the abolishment of Apartheid. But now realisation comes into play and it is clear that the promised goals are difficult to achieve. Therefore it is difficult to let people pay for water services (after FBW).

*Official level:* At official level it is important that capacity and expertise are available. Officials should read the water meters and a certain number of officials are needed. Capacity and (technical) skills are required but are often not available. Technical expertise is difficult to find because many white educated people have left South Africa<sup>125</sup>. In the mean time it

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<sup>120</sup> From interview Head Civil Engineering MLM.

<sup>121</sup> From interviews domestic water users southern Nsikazi.

<sup>122</sup> Ibid; Brown 2005.

<sup>123</sup> From interview with senior staff member WSP.

<sup>124</sup> Ibid.

<sup>125</sup> To illustrate; a friend of the respondent, a 52 years of age Civil Engineer, only has 10 class mates left (of 75) in South Africa. The other 65 class mates have left South Africa.

will take time before black people have the expertise and education that is required to fulfil these tasks<sup>126</sup>.

*Ground level:* There is no real buy-in at ground level. The payment rate is only 40% in KaNyamazane. Nothing happens when you do not pay for water because of politicians. They do not want to start with unpopular measures. There should be enforcement of the rules. The water users should feel responsible and pay<sup>127</sup>.

According to the MLM's Head of Civil Engineering WSA and a senior staff member of a WSP it is technically possible to supply water continuously with the current water services infrastructure. Then more water has to be pumped into the pipeline system. This is not done because all households should at first be metered and everyone should pay for the water usage above the FBW. When there would not be such water control by MLM and WSPs more water would be spilled, costs will not be recovered and the water distribution will remain inequitable within southern Nsikazi<sup>128</sup>.

In the end formal connections are desired, than MLM and WSPs will have control on water and all people have access to the water they need. But financial means are needed for this and capacity and commitment from the domestic water users. Now there is a lack in water control and many people use too much and therefore even more people do not get the water and nothing seems to work. It is unknown when this "full" water control would be operational. This depends on the availability of money and (technical) capacity within local government, but also on the cooperation of the domestic water users.

## **4.6 The Role of Tribal Authorities; no Traditional Systems of Water Management**

### *4.6.1 No traditional systems of water management*

No traditional systems of water management or traditional alternatives to basic water services supply have been identified in southern Nsikazi during the field work (as were identified by Malzbender et al. 2005, see Conceptual Framework). This is confirmed by tribal authorities. Tribal authorities are responsible for land (stand) allocations for people's households and for solving conflicts within the communities by tribal court. Besides this the people can complain to the Chief's Indunas (right hand men) about problems concerning services including water services. The Indunas will check in the field what is going on and then they will report the problems to the local government's councillors. The tribal authorities themselves do not deal with water services and therefore no traditional systems of water management exist. Water services is the responsibility of the local government. The tribal authorities only report to the councillors when issues related to water services (and other services) arise. Therefore the tribal authorities represent the community, but the people themselves can also complain to the councillors directly<sup>129</sup>.

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<sup>126</sup> Under Apartheid it was difficult for black people to receive high level education.

<sup>127</sup> From interview Chief Engineer Planning and Development DWAF Nelspruit.

<sup>128</sup> From interviews Head of Civil Engineering MLM and senior staff member WSP; DWAF 2001b.

<sup>129</sup> During interviews in southern Nsikazi the representation of the community by tribal authorities was questioned by several community members.

#### 4.6.2 The role of tribal authorities and water services

Conflicts exist between tribal authorities and local government. The municipalities represent the new governments. Chiefs do not want to be part of the new structures and currently there is competition for powers<sup>130</sup>. The role of the tribal authorities is written in the Traditional Leadership and Governance Framework Amendment Act of 2003<sup>131</sup> (Republic of South Africa 2003). However, in practice the role of traditional law is not always clear. Within Local Government this is ignored because it is a sensitive issue. According to several senior MLM staff members tribal authorities do not fit in the political system but Chiefs have authority within the communities. The Chiefs have more traditional authority, while the municipality has the powers<sup>132</sup>. Community members do not always know when to go to the tribal authorities or to the municipality; “*when should one go to the tribal court or to the court in Nelspruit?*” In general people go to the tribal court for small crime issues and conflicts and for larger issues to the formal court. The Chief has indirect political power since the Chief, as an authority within the communities, has influence on the voting behaviour of the community members. Therefore the tribal authorities do have influence on councillors<sup>133</sup>.

According to King (2007) the fact that within the new structures, local government is responsible for development, has contributed to an empowerment of municipal structures at the expense of the tribal authorities and other traditional institutions. However, MLM has to cooperate with the tribal authorities. When the municipality e.g. wants to construct a road it has to consult with the chief and ask for permission because in southern Nsikazi usually the Chief is the custodian of the land<sup>134</sup>.

According to several senior MLM officials the tribal authorities are a political problem; they do not recognise the municipality and as a result cooperation with the Chiefs is difficult. Informal and illegal settlements are a problem in tribal areas since there are no formal residential areas. Chiefs and their Indunas allocate land (stands) to the people everywhere, also in areas where there are no (water) services or where it difficult or impossible to get services (e.g. in uphill or rocky soil areas). The tribal authorities expect MLM to supply the services (including water) while they do not recognise MLM<sup>135</sup>.

According to a Chief and his Indunas they want to cooperate with the councillors and MLM. The Chief tells the Indunas not to allocate land uphill or in other unsuitable areas (flooding areas) because there are no facilities and water services. According to the tribal authorities the problem lies with the ANC because of making promises to the people. The ANC tells the people that they can live everywhere they want; the ANC promises that the services will be provided. The community believes this and is determined to live in these unsuitable areas. Another reason for people living in unsuitable areas (for services supply) is that people move to other pieces of land than the land (stand) allocated.<sup>136</sup> This was confirmed during field work. However, from the field work it can also be concluded that tribal authorities are responsible for the allocation of land that is unsuitable for water services delivery.

Because of the homeland policy of the former Apartheid government the majority of South Africa’s inhabitants (blacks) were forced to live on 13% of the country’s surface area,

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<sup>130</sup> From interviews Chief, Induna, senior officials Civil Engineering MLM, domestic water users southern Nsikazi; King 2007.

<sup>131</sup> Thanks go to Nynke Post Uiterweer because by reading her thesis (Post Uiterweer 2004) I was informed about the legal state of tribal authorities according to state law.

<sup>132</sup> From interviews senior staff members MLM.

<sup>133</sup> From interviews Chief, Induna, senior officials Civil Engineering MLM, domestic water users southern Nsikazi; Waalewijn 2002.

<sup>134</sup> From interviews Chief, Indunas; King 2007.

<sup>135</sup> From interviews Chief, Indunas, MLM staff; King 2007; Waalewijn 2002.

<sup>136</sup> From interviews Chief and Indunas.

usually poor areas from a natural resources point of view. This is also the case in southern Nsikazi. In southern Nsikazi there are many hills and soils are very shallow. The area is densely populated and there is not much space left besides hills and areas far from urban and peri urban areas (people usually do not have means for transportation and therefore cannot live far from facilities like shops etcetera). The estimated growth rate in Nsikazi is 5% per year. Besides this there are many illegal immigrants settling in the area (from Mozambique, Zimbabwe, Swaziland and other countries). Because of these reasons the people often do not have a choice and have to start living in unsuitable areas for water services delivery.

The same Chief said that everything was better in the area before the elections of 1994. At that time only the Chief was responsible for electricity, roads and water services delivery and services delivery in general was better. According to the Chief all houses received water services in KaNgwane. At that time it was easier to solve problems since there was no bureaucracy and corruption. Other sources indicate that water services and sanitation were hardly or not supplied to the homesteads in KaNgwane during the Apartheid era<sup>137</sup>. Several domestic water users confirmed that water services supply was not better before 1994<sup>138</sup>. According to an Induna it cannot be said whether basic water services delivery was worse or better under Apartheid and the KaNgwane government. Basic water services levels are fluctuating all the time according to the respondent, and the current problems are caused by high population growth rates<sup>139</sup>.

Besides conflicts between tribal authorities and local government there is rivalry between the tribal authorities. Most disputes are about boundaries. Chief Mbuyane and Chief Nkosi are in conflict because of the disputed border of their tribal areas. This existence of conflicts between tribal authorities is common and has its roots in the history that tribes were replaced to the homeland on the territory of another tribe<sup>140</sup>.

The authority of the tribal authorities is questioned by some community members. This is an outcome of the links between the tribal authorities and the Apartheid government. In some cases, the tribal authorities expanded in power because of Apartheid which is not forgotten by local residents. The Chiefs were supported during the Apartheid era to be the local government for their area. Chiefs were responsible for the collection of taxes and the government paid salaries of the tribal authority. Some community members think that the Chief does not help the community since he would only get money from the people (by land allocations and tribal court) and is not concerned with the community. According to some community members the tribal court and court outcomes do not make sense; *“how can an uneducated man be a judge? The punishment fines are only income for the Chief and do not solve a thing”*<sup>141</sup>.

Within the communities of southern Nsikazi that were visited during the field work, the views on the role of the tribal authority are linked to age and education. Older and uneducated community members are more likely to perceive the tribal authority as an important structure in rural communities. Younger and more educated community members are often indifferent of the role of the tribal authority and are more likely to embrace the ANC and the new local government structures<sup>142</sup>.

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<sup>137</sup> From interview MLM senior official and interview WSP senior engineer; Waalewijn 2002.

<sup>138</sup> From interviews domestic water users southern Nsikazi.

<sup>139</sup> From interview Induna.

<sup>140</sup> King 2007.

<sup>141</sup> From interviews domestic water users southern Nsikazi.

<sup>142</sup> Ibid.; King 2007.

## 4.7 Society's Behavior Adapted to Insufficient Water Services

Societies can adapt to the physical scarcity of water. Social adaptive capacity is defined as “*the ability of a society to adapt its patterns of (water) resource use to increasingly scarce supplies and achieve a sustainable measure of social stability*” (Turton & Ohlsson, 1999; Ashton and Haasbroek 2002). As basic water services are often insufficiently supplied (*according to MLM's standards and domestic water users' perceptions*) and water is scarce in the research area, community members took initiative and searched for alternative sources of water. This search for alternative sources for basic water needs does not directly fit in the definition of social adaptive capacity because it are not necessarily the water resource usage patterns that are adapted by society. However, society –the people of southern Nsikazi– adapted their behaviour in the collection of water by the search for alternative sources for basic water services. Water from these alternative sources is not necessarily used in a sustainable way. These responses are however not done collectively, but individually, so it can also be questioned whether society adapts to insufficient water services delivery. It are more individual responses.

According to Malzbender et al. (2005) by recognizing and integrating traditional and customary systems in South Africa's formal statutory bodies social adaptive capacity can be increased. Water management then is adapted more easily to physical scarcity and the people are better in coping with water scarcity. However, as was presented in section 4.6.1, during the field research no traditional systems or responses to insufficient water services supply were identified in southern Nsikazi.

Because water services are often delivered insufficiently the people of southern Nsikazi have adapted their (individual) water collection behaviour. Several cases of this “social adaptive capacity” in the search for alternative water sources have been identified during the field work in southern Nsikazi. Firstly many households have made illegal connections to the pipeline system. Most respondents that have an illegal connection believe to have the right to make the connection since water is a basic human right and they do not have sufficient access to it. In many cases the MLM's standards for basic water services supply were not met. On the other hand there are also many people that make illegal connections because they get a higher level of service even if the water services provision is according to the standards or better. Illegal connections are also made to be able to use a lot of water without paying for it. Often it are the better off that have the resources to make illegal connections and abstract large quantities of water for vegetable irrigation, watering the garden, grass or dirt road (to prevent dust)<sup>143</sup>.

In an area in Dwaleni where basic water services standards are not met, a private non registered borehole is installed by a community member and the water is sold to around 120 households for ZAR 0,50 per 25 litres as an alternative water source<sup>144</sup>.

As a response to a lack of or insufficient water services delivery there are people that collect water from the system in a well supplied area and sell it in locations with insufficient water services delivery. In Gutshwa water is sold by water sellers that illegally collect water from the water service pipeline system in Kabokweni/Ngodini. The water is distributed by *bakkies*<sup>145</sup>. ZAR 40 for 1350 litres of water is paid to the water traders by a household in Gutshwa. In several areas water is collected by the use of private bakkies when water services are not provided for a long time. This water is not sold, only the costs of gas are shared amongst the beneficiaries<sup>146</sup>.

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<sup>143</sup> From interviews and observations in southern Nsikazi.

<sup>144</sup> From interviews domestic water users in southern Nsikazi. On the 21<sup>st</sup> of August 2007 one South African Rand (ZAR) is worth €0,10.

<sup>145</sup> *Bakkie* is the Afrikaner word for pick up vehicle. The is generally used by all South Africans.

<sup>146</sup> From interviews and observation in southern Nsikazi.

An important alternative source for water is rainwater. Most respondents collect rainwater. Water is collected from the roof and stored in a bucket or drum. This water is used for washing and irrigation. The amount of water collected is usually not very large since people lack storage capacity (buckets, drums etcetera).

In a new settlement area in Dwaleni trust no basic water services are delivered. In this area the community created its own water sources. Two open drums are installed in the ground in a low lying area and (*very*) shallow ground water is collected (maximum 1 meter deep). From observations the water quality looked bad. The people chlorinate the water before they use it for drinking or cooking purposes and until now no one got ill. The yield of the water sources is very low and people can only get very little water.

In Zwelisha and Dwaleni 2 respondents collect water from rivers for irrigation and other households chores. The water is collected by hand (buckets). The collection of water from rivers and streams only occurs on a small scale. When water services supply to the household's homestead tap in Zwelisha would supply for a longer time the respondent would not collect water from the river. The same applies to the respondent from Dwaleni; when water would be delivered to the homestead tap the respondent would not go to the river to use and collect water.<sup>147</sup>

Finally, water from homestead of household taps is often shared with neighbours in the whole of southern Nsikazi<sup>148</sup>.

## 4.8 Conclusions

From Chapter 4 it can be concluded that the BHNR and the delivery of basic water services in southern Nsikazi face many difficulties. The BHNR and basic water services are not clearly defined. However, the generally accepted short-term target standard is 25 litres per person per day. The Reserve, and therefore also the BHNR, is not yet implemented. In practice FBW and RDP standards are used.

There is a backlog in the delivery of basic water services delivery in southern Nsikazi. The majority of the respondents do not get water according to the minimum standards for basic water services. Water services levels are context specific and variable in southern Nsikazi and depend on many factors. Especially in informal settlements water services delivery is insufficient. The president of South Africa, Thabo Mbeki, stated that in 2008 every South African will have Free Basic Water. From this research it can be concluded that this is not possible for southern Nsikazi.

It is questionable whether the standards for basic water services delivery are sufficient to meet basic human needs. According to the WHO 40 litres per person per day should be the standard for basic human needs. The majority of the respondents is not satisfied with the standards; more water is needed than 25 litres per person per day and 200 meters as the maximum distance to communal taps is too far. Besides basic domestic water needs, there is a need for productive water. Most respondents need water for watering vegetable gardens. Productive water is not included in the BNHR but should be addressed as now water from the water services system is abstracted for productive purposes.

The distribution of water in southern Nsikazi is highly unequal. This is caused by a lack of water control in basic water services delivery in southern Nsikazi. Besides large system losses due to old infrastructure and losses because of illegal connections there are losses because of water spilling. There is hardly any social control or awareness about not to spill water and water spilling is generally accepted. Strengthening technical, organisational

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<sup>147</sup> Ibid.

<sup>148</sup> Ibid.

and socio-economical/political control is necessary for sufficient (according to the standards) basic water services delivery to all inhabitants of southern Nsikazi.

It should be considered to increase the amount of water that is allocated to the BHNR. The standards for basic water services delivery are doubtful and a safety factor should be incorporated into the BNHR as much water is lost during the distribution of services water.

Conflicts exist between the tribal authorities and local government. Informal and illegal settlements are a problem for water services delivery. Tribal authorities allocate land to the people in areas that are unsuitable for water services delivery.

As basic water services are often insufficiently supplied the people in southern Nsikazi have searched for alternatives to have access to water for basic needs. Several cases of social adaptive capacity as a response to insufficient water services delivery have been identified.

## Chapter 5: Conclusions and Opportunities for the Reserve

In order to ensure equity and ecologically sustainable development the South African government's DWAF wants to re-allocate the national water resources. Water for basic human needs and ecological needs are prioritised. In the new legal framework the Reserve is the only right to water. The strength of this research is that it shows what is taking place on the ground and what the actual outcomes of progressive legislation and policies are. This thesis is relevant for policy makers and practitioners involved in the implementation of South Africa's new water legislation and policies, especially in relation to the Reserve. The issues raised will also be of interest to scholars and others involved in ensuring sustainable water resources and water services in (semi-arid) developing countries.

This concluding chapter is foremost a summary of the findings and answers of the research questions. At first the findings of the ER component of the research are discussed within the conceptual framework and the research questions are answered. The same is done for the BHNR and basic water services component of the research. At last, opportunities for the Reserve are presented and a concluding remark is made.

### *5.1 Conclusions Ecological Reserve*

The ER is not yet determined for the Crocodile River and its tributaries. The determination is highly complex, time consuming and capacity demanding. Almost all DWAF policies and procedures to date cover Reserve determination methods, but there are little guidelines about implementation.

Stakeholder participation in the ER determination process did not (yet) take place but is necessary for decision making and find agreement on a final ER determination. The ER determination process is complex and difficult to understand for participants and by the researchers themselves. Because it is difficult for stakeholders to understand it will be difficult to make decisions about the ER. Some stakeholders are distrustful towards DWAF because of the lack in communication from the DWAF RDM directorate (responsible for ER determination) and because of the complexity. Stakeholders are not always able or willing to participate.

Perceptions of water users and stakeholders on the ER differ and are conflicting. The ER should be realistic and a balance is to be found between ecology, economy and society. This balance between ecology and economy is not found because no stakeholder participation in the ER determination process took place yet.

Water control and flow regulation in the Crocodile sub-catchment are lacking by DWAF Nelspruit. This is needed for the implementation of the ER. Regularly the international obligations with Mozambique and IFRs for KNP are not met. Farmers that use pumps for abstracting water from the system are hardly controlled because of a lack of technical control (no water meters) and organizational control by DWAF Nelspruit (due to a lack of capacity). In the stressed Crocodile sub-catchment some farmers and/or IBs over-abstract water (lack in socio-economic/political control) but DWAF Nelspruit is not able to stop them. In the future the ICMA will be responsible for water resource management in the Crocodile sub-catchment, however this does not yet take place because of a lack of expertise within the CMA. Enforcement is necessary when water is over abstracted and this is noticed. IBs are the actual water managers that are in control of the water (technically,

organizationally and socio-economically/politically). DWAF Nelspruit and (in the future) the ICMA need to increase their water control for a proper implementation of the ER.

Water control technology is socially constructed. This is clearly the case for irrigation infrastructure and water control structures. This was developed and designed by the white commercial farmer sector and IBs. The ecological flows discourse only started recently and was not taken into consideration. The water control technology is not suitable for the implementation of the ER. The international obligations to Mozambique are not complex (a minimum of 1,2 m<sup>3</sup>/s from the Crocodile River), but regularly not met because of a lack in flow regulation. The Reserve, which will be complex (variable in time and probably higher flow rate), cannot be met with the current water control situation. Stronger water control, flow regulation and monitoring by DWAF Nelspruit and/or the ICMA are needed for the ER. All abstractions should be metered and controlled and an extra weir or dam is needed for improved flow regulation.

Water control needed for the implementation and monitoring of the ER will be complex because it is difficult to convert ER determinations to flow rates. The required flow rates for the ER are not constant or proportional. The required flow rate will vary for different weather conditions and seasons. Rainfall information and a monitoring system will be necessary just as a monitoring system in a reference river. Rainfall data should be available in real time and flow rates have to be adjusted immediately. In practice this will be difficult because rainfall data is available months later and water users' allocations cannot be changed immediately. Water management is a sociotechnical system. The water management and control needed for the ER implementation should be realistic and practical. The water control necessary for the ER should match the social requirements for use to make the implementation possible.

In short; the requirements for the ER should be determined and stakeholders should participate in this process. Secondly, the water users should be told what quantity of water at what time can be abstracted from the system. Thirdly, this needs to be enforced by DWAF or the ICMA. Currently there are difficulties with determining the ER and no stakeholder participation takes place. For a successful implementation of the ER practical water management is needed and water users need to know how much water they are allowed to abstract from the system. Finally a body on the ground is needed to enforce that water is not over abstracted. DWAF Nelspruit and in the future the ICMA and WUAs will have to be responsible for this.

Although the 1998 NWA identifies the Reserve to be the only right to water, there are water rights originating from the old water Act that still apply temporarily. Existing lawful use of water under the 1956 Act is identified as lawful causing a temporary legal complex setting. In fact the water rights from existing lawful use will be abandoned after the process of compulsory licensing. But, because of the impermanent legal complex situation this is not understood or accepted by the majority of the interviewed water users in the Crocodile sub-catchment. The common perception is that it is not possible or fair to abolish previous water rights. IBs, farmers and industry will be resistant and can frustrate the ER implementation process by going to court.

The consequences of the implementation of the ER on the water allocations to other water users –or social effects- in the Crocodile sub-catchment are not known yet. The ER is not determined yet and therefore it is not known how much water is needed for the ER. A public participation process will have to take place where decisions are made about the category of the rivers and size of the ER and accordingly the ER will be set for 5 years. Only when this process is finalised it is known what the consequences will be for the water users and other stakeholders in the Crocodile sub-catchment.

A general conclusion of this research is that no IWRM is taking place in the Crocodile sub-catchment and Inkomati Catchment. Water Services are provided by local government while the Water Resources are managed on catchment or sub-catchment scale. The BHNR is reserved on catchment scale while basic water services are supplied by local government. The boundaries of local government (responsible for water services provision) do not fall within hydrological boundaries. Because of water transfers, catchments are not always a suitable scale for water management. Water services for Northern Nsikazi (mainly within the Crocodile Catchment) are supplied from the Sabie sub-catchment.

There are difficulties in the decentralisation of water management. There is little cooperation and integration between DWAF Nelspruit, the ICMA and Local Government. The establishment of the ICMA is delayed as well as the establishment of WUAs. In the Reserve determination process hardly any stakeholder participation took place yet.

The research questions are answered and discussed within the theoretical framework. In the next section the opportunities and recommendations for the Reserve will be discussed.

## *5.2 Conclusions Basic Human Needs Reserve and basic water services*

The BHNR and basic water services are not clearly defined. The NWA does not specify a quantity or an assurance level for the BHNR. In the WSA of 1997 there is no definition of what is sufficient water for basic human needs. The generally accepted short-term target standard is 25 litres per person per day. In 2000, the FBW policy was formulated which makes the provision of six thousand litres of water for free per household per month an entitlement. In the end there is still considerable lack of clarity as to what quantity of water is allocated to the BHNR since it is not specified by law.

Currently no water is set aside for the Reserve and therefore the Reserve, including the BHNR, is not yet implemented. The Reserve will be implemented in the future when water licenses are issued. In practice the RDP and FBW standards are used for basic water services delivery and water allocations to basic water services are never restricted.

Basic water services delivery in southern Nsikazi has an enormous backlog. This is confirmed by MLM and DWAF Nelspruit. From the field work it can be concluded that the majority of the respondents do not get water according to the minimum standards for basic water services. Water services levels are context specific and variable in southern Nsikazi and depend on many factors. Especially in informal settlements water services delivery is insufficient (according to the standards).

It is questionable whether the standards for basic water services delivery are sufficient to meet basic human needs. The BHNR should provide for the essential needs of individuals including water for drinking, food preparation and for personal hygiene. For these needs the WHO advises a standard of 40 litres per person per day. It remains unclear how the BHNR, FBW and WSA's standards for basic water services were determined or where they come from.

The majority of the interviewed domestic water users from southern Nsikazi is not satisfied with the standards; 25 litres per person per day or 6000 litres of FBW is not enough for basic human needs. More water is needed especially for personal hygiene and washing of clothes and dishes. The 200 meters of maximum distance of a basic water services abstraction point is too far to collect water from according to the majority of the respondents. The desired level of basic water services levels depends on expectations and experiences.

Besides basic domestic water needs most respondents need water for watering vegetable gardens. The Reserve is not intended to include or address water that is needed for additional household or productive needs, subsistence crops or small-scale productive use, but in practice this is an important component of people's livelihoods. For the majority of the people in southern Nsikazi purified water from the water services delivery is the only reliable source of water. The government should support the need for productive water; or by supplying more (purified) water but preferably by supporting the development of alternative water sources.

From interviews with other water users and stakeholders in the Crocodile sub-catchment it can be concluded that the BHNR concept is generally accepted and that it is acknowledged by the respondents that water for basic human needs should have the highest priority in the allocation of water. According to the majority of the respondents the 25 litres per person per day is accepted as a minimum for emergency situations. But the majority of the respondents states that more water is needed for people under normal circumstances.

There is a lack of water control by local government and WSPs in basic water services delivery in southern Nsikazi. This results in highly unequal water distribution in the water services supply scheme. Because of losses and the domestic water users in the "head end" of the water services pipelines abstract too much water there is a lack in water and pressure left for users at the "tail end" of the system.

Physical/technical control of MLM and WSPs is lacking because the technical system (the pipeline system) often lacks water control mechanisms. Most household and homestead tap connections and all communal taps are not metered. Illegal connections to the water services pipeline system are not removed.

Organisational control and socio-economical or political control by MLM and WSPs are also lacking in southern Nsikazi. There is a lack of capacity in local government. When the technical system is allowing physical water control -when there are well functioning water meters- often the meters are not read by WSPs and the water use is not billed. When water use is billed (after FBW) and the water user does not pay, nothing happens. By law it is not allowed to stop water delivery to the people that do not pay. There is a culture of no payment. In the formal areas where people do get water bills the majority of the people do not pay for water (after FBW). It is not possible for MLM and WSPs to force the thousands of people to pay when more water is used than FBW. Within the communities it is generally accepted to use water inefficiently. There is hardly any social control or awareness about not to spill water. Water spilling is generally accepted.

Strengthening technical, organisational and socio-economical/political water control by MLM and WSPs is necessary. Technically it is possible to supply water continuously at all tap connections. This is not done by the WSA/WSP because all households should at first be metered and all water users should pay for the water usage after FBW for cost recovery purposes. In the end formal connections are desired, then there will be water control by WSAs and WSPs and all people have access to water for basic human needs. However, financial means are needed by MLM for this technical control. But also capacity at the WSA and WSPs (organisational control) and commitment from the domestic water users (social control) are needed. Social requirements for use are required for the necessary water control before continuous water services delivery can work effectively. Water use should be metered and paid for (after FBW) in order to have the desired social effects; to make basic water services delivery equitable and sustainable.

About 70% of the water supplied to southern Nsikazi are losses. Besides this the standards for basic water services are insufficient according to the majority of the interviewed

domestic water users in southern Nsikazi. The WHO advises a significantly larger amount of water needed for basic human needs; 40 instead of 25 litres per person per day. A safety factor should be incorporated into the BHNR because of water losses and it should be considered to increase the amount of water that is allocated to the BHNR.

No traditional systems of water management or traditional alternatives to basic water services supply have been identified in southern Nsikazi. Water services delivery is the responsibility of local government. Informal and illegal settlements are a problem in tribal areas for water services delivery. Tribal authorities allocate land to the people in areas that are unsuitable for water services delivery. Often there are no (water) services or it is difficult or impossible to get services (e.g. in uphill or rocky soil areas). The tribal authorities expect MLM to supply (water) services while they do not recognise the local government.

The often insufficient supply of basic water services has social effects on the people in southern Nsikazi on the collection of water. Several cases of social adaptive capacity as a response to insufficient water services delivery have been identified. Water is collected from illegal connections, a private borehole water seller, water sellers that collect water from the water service pipeline system and illegally sell the water, private cars collecting water from distant water source, shallow ground water and the neighbours' tap. Most households collect rain water as well for productive purposes. Water is collected from the roof but the people lack storage capacity.

### *5.3 Opportunities for the ER*

- Stakeholder participation is needed for a desirable implementation of the Reserve. Decisions about the size of the ER have to be made by stakeholders. Since water allocations are contested, stakeholders need to be consulted and should participate in the ER determination process. Then consensus can be found and resistance against the ER is prevented. The ICMA is the new body that is responsible for stakeholder participation. While lacking technical capacity the ICMA has institutional capacity and is able to deal with the participation processes.
- Current illegal water abstractions will be deleted after the compulsory licensing process. More water in the Crocodile sub-catchment will be available for the Reserve.
- Water control and regulation of DWAF Nelspruit (and in the future the ICMA) have to be strengthened for the implementation of the ER since the current water control by DWAF Nelspruit does not allow the ER to be implemented. Water control is in the hands of IBs. DWAF Nelspruit of the ICMA should be the water managers in the Crocodile sub-catchment since they are responsible for implementing the ER.
- All water abstraction pumps in the Crocodile sub-catchment will be metered before the end of 2007 or beginning of 2008. Practical handholds are needed for monitoring and water control once the Reserve is implemented.
- The degradation of the Crocodile River and tributaries can be prevented by maintaining a minimum flow in the river. The international obligations should be met always. When there temporarily is no flow there are major impacts on ecology. Minimum ER requirements should always be met. High flow ER requirements can be discussed.
- Awareness raising by DWAF about water rights and licenses is needed for water users to get a better understanding of the current temporary legal complex situation. In the near future all water rights will be abandoned, however this is not always understood or accepted by the majority of the water users. Awareness raising and stakeholder

consultation in the ER determination process is needed to decrease resistance against the ER and find consensus about a future ER in the Crocodile sub-catchment.

- The Crocodile Catchment Forum is successful. Many stakeholders and water users voluntarily come to the forum meetings and open communication and cooperation takes place. Stakeholder participation takes place however not yet in the ER determination process. Stakeholders participation in the forum should be broadened since little emerging farmers and HDIs participate.
- DWAF Nelspruit is currently studying the feasibility and viability of constructing an extra dam in the Crocodile sub-catchment. The water users should pay for the dam as the government does not give financial support. By dam development an increase in the water storage capacity is generated resulting in a decrease in the water stressed situation in the Crocodile sub-catchment. Also flow regulation is increased which is necessary to meet the international obligations with Mozambique and IFRs for KNP. It is to be studied whether the water users can afford an extra dam.
- An extra weir is needed for improved flow regulation for meeting international obligations and IFRs. Within DWAF Nelspruit WRM there are ideas of constructing a weir upstream of KNP. The weir will not be constructed next to KNP and the park would benefit because IFRs will more often be met.
- Irrigation efficiencies could be improved by incentives. This can either be government subsidies or taxes. The government lacks the financial means for subsidies. When efficiencies are increased there will be less return flows and less water will get back in the Crocodile River system. However evapotranspiration is the major loss and this will then be decreased. Increasing irrigation efficiencies by taxing should be studied by DWAF.

#### *5.4 Opportunities for BHNR and Basic Water Services*

- Water services levels should be increased by MLM and WSPs in combination with strengthening water control. Water use should be metered and paid for (after FBW) in order to make basic water services delivery equitable and sustainable. This can be done by making agreements with domestic water users. Service levels need to be increased since they are often below standards but also for enabling stronger water control and willingness to pay.
- The need for productive water should be addressed. The assistance of DWAF in the creation or subsidising of alternative water sources would have positive effects on many livelihoods. Less purified water from the water services infrastructure will be used for irrigation. DWAF can cooperate with Local Government and WSPs being beneficiaries. DWAF should study the MUS approach as it can be a good answer to address the need for productive water. DWAF's assistance and subsidies for rain water harvesting should be put into practice and communicated to the people that need help. RWH is a good option since many households in southern Nsikazi already collect rainwater and are familiar with this. However more storage capacity for the collection of rainwater is needed. This should be addressed by DWAF.  
The "reasonable use" recognised under schedule 1 of the NWA might accommodate some water for productive uses, but it is open to interpretation and it is not clear to what level water is allowed to be allocated to productive use. The allocation of productive water under schedule 1 to rural communities should be better specified in the NWA.
- Education and awareness raising is needed for changing the behaviour of domestic water users in southern Nsikazi. Water spilling can be decreased.

Finally a concluding remark is made. Although the Reserve is the priority in the allocation of water there is still a long way to go. However, the Reserve and the internationally renown NWA are ambitious. It will take time before all NWA components and the Reserve can be implemented and have the desired effects. The Inkomati Catchment is a pilot case in water reform of which a lot is learned. It is a learning process. In the end it might be concluded that the Reserve -as it is currently defined- is a bit too ambitious.



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## **Annexes**



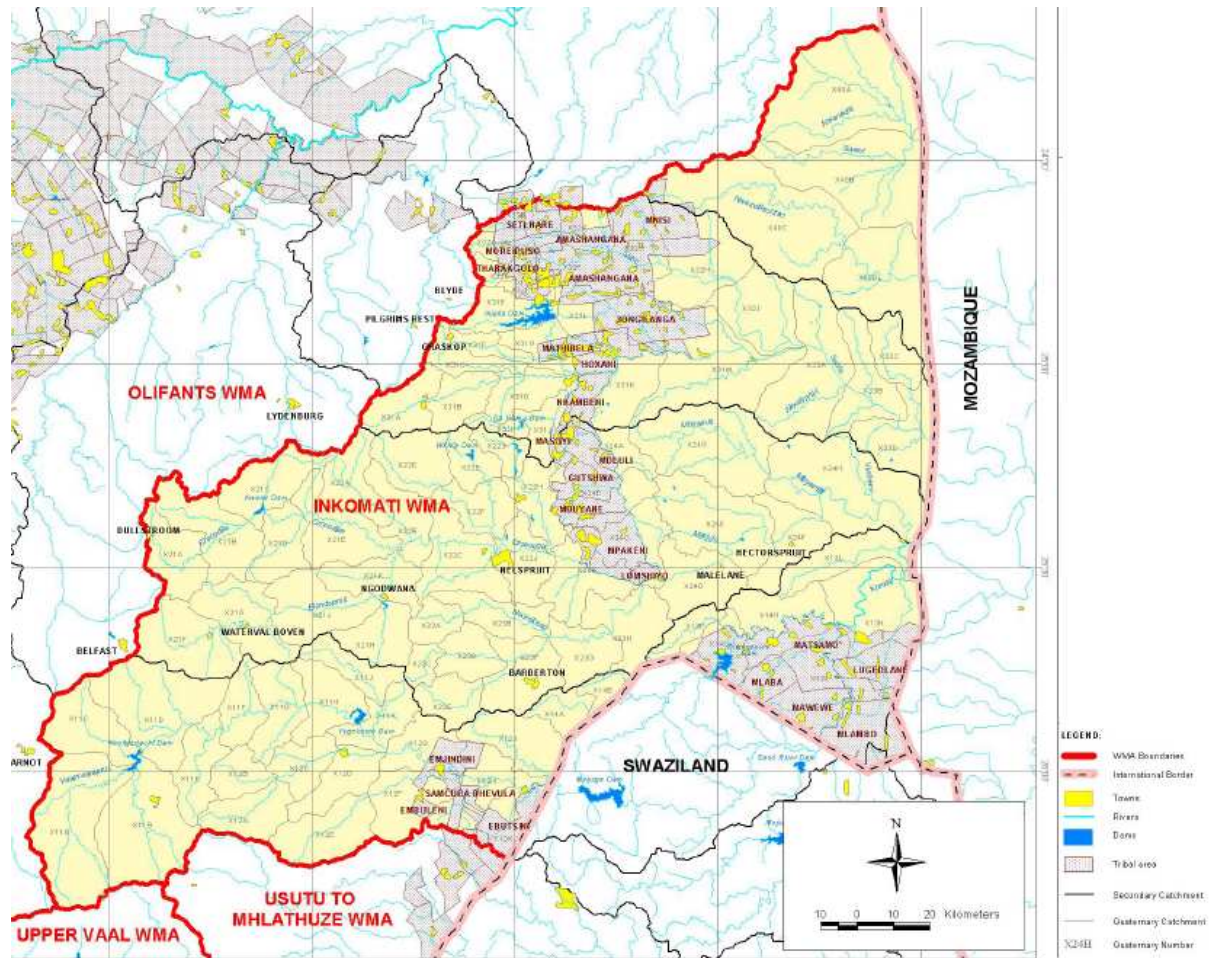
**Annex 1: The 19 Water Management Areas of South Africa (provinces included)**



(Source: DWAF 2004a)

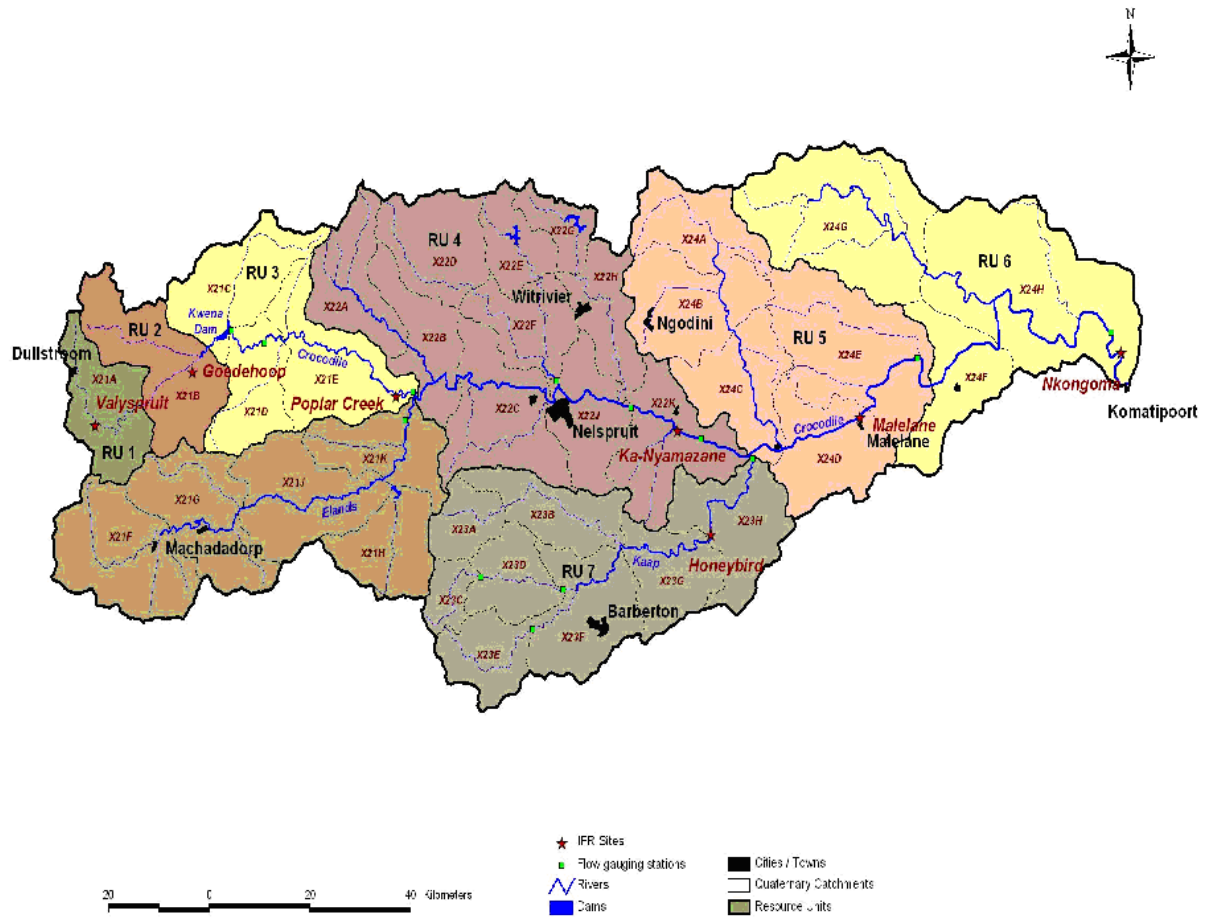


### Annex 3: Tribal land in the Inkomati WMA



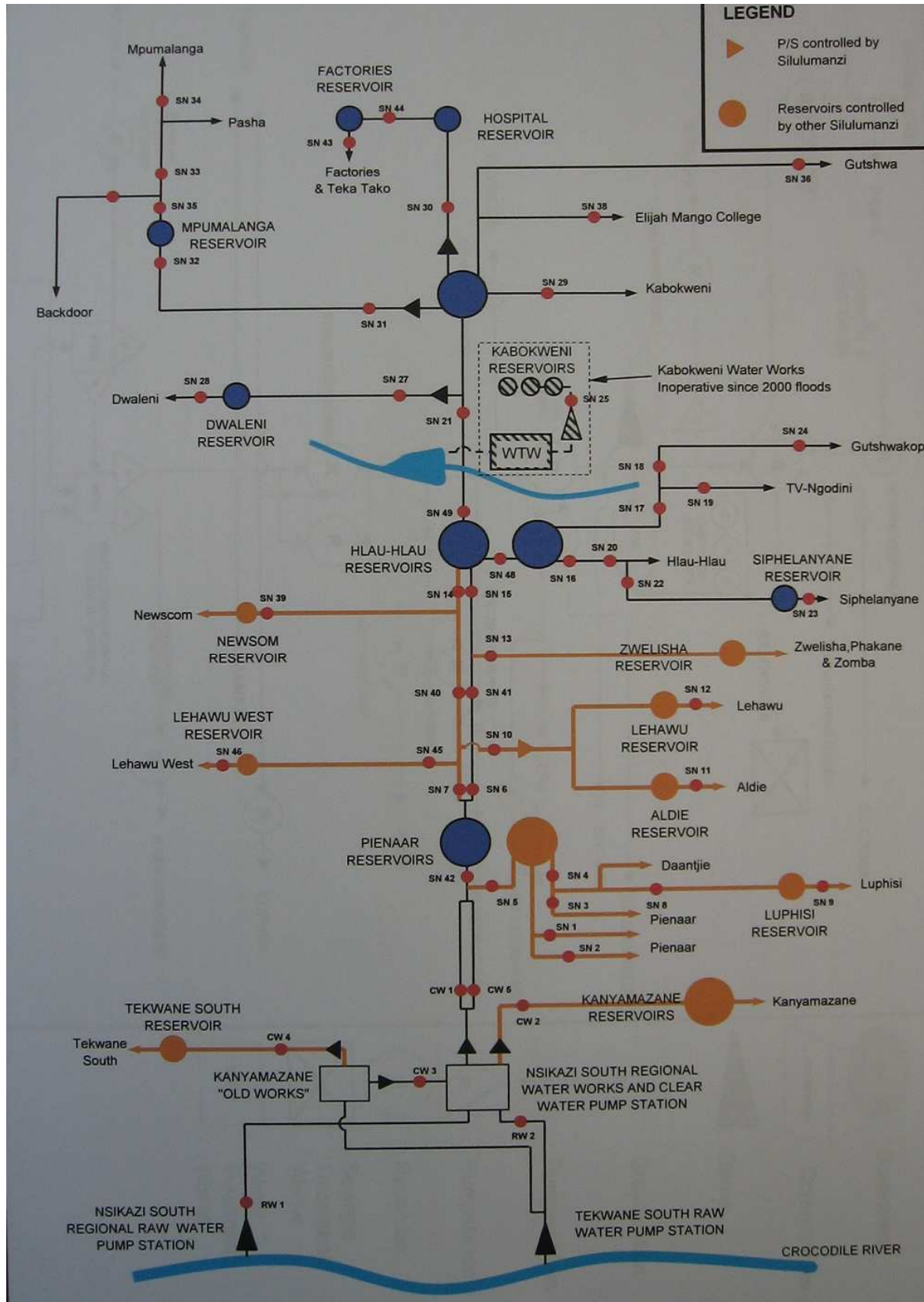
(Source: DWAF 2004a)

## Annex 4: Map of the Crocodile sub-catchment



(Source: DWAF 2007)

## Annex 5: Schematic overview of water services infrastructure of southern Nsikazi



(Source: DWAF 2003c)