

Water, Households & Rural Livelihoods

Catchment management and water supply and sanitation in the Sand River Catchment, South Africa: description and issues

Sharon Pollard & Phillip Walker

Association for Water and Rural Development (AWARD),
Bushbuckridge, South Africa

Research promoting access of the poor to sustainable water supplies for domestic and productive uses in areas of water scarcity

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1 INTRODUCTION

South Africa is a water scarce country and current predictions are that demand will outstrip water availability in the next 15 years. Despite this, the past government of South Africa did little to address this critical issue in any cohesive way, particularly in terms of appropriate water conservation and management measures. Moreover, a combination of socio-economic and political factors superimposed on major physical limitations only served to exacerbate the effects of resource scarcity. Generally, engineering solutions were sought to mitigate declining water resources and dams were built on almost all of South Africa's major rivers. Apartheid policies required the forced removal of large numbers of people into homelands or bantustans. These areas had few natural assets such as water, or land, and consequently people were forced to eke out a living from what little they had, often in unsustainable ways. The "governments" of these homelands, generally considered to be puppets of the South African state, often attempted to gain popularity by seeking high-profile solutions to water shortages, such as large-scale bulk supply schemes. Many of these still do not deliver water today. Certainly, water tariffing was not considered. Within so-called "South Africa", large disparities in access to water, both within and between sectoral groups, was evident. Furthermore, the tariffing system did not reflect the resource limitations with heavily subsidised water supply to specific, strategic sectors. This did little to engender any ethic of "wise water use" amongst all sectors, but particularly amongst the heaviest users of water, such as agriculture and industry. Importantly, political interests were evident in the previous water policy, where access to water was intimately linked to land tenure. In a country where 85% of the population had no land rights, the implications were enormous.

The political changes in South Africa since the elections of 1994 have provided a climate conducive to redressing past disparities, and opened the arena for the consideration and implementation of new approaches to water supply and conservation. The legacy of the apartheid era government on natural resources, and particularly water, required a massive and urgent re-orientation, not only at the political, institutional and policy level, but also at the level of individuals. The response of the ANC-led government was, under the stewardship of Minister Asmal, to completely overhaul the policies regarding water, so as to address the historical disparities of access, and to ensure the long term sustainability of the resource base.

With regard to the purpose of this workshop, three key themes emerged:

- The South African government now subscribes to the management of water on a catchment basis.
- There is formal recognition for water for basic human needs and for the resource base itself
- Water will now be paid for.

This paper seeks to provide an overview and context of the project site, the Sand River sub-catchment, for this research project. Since our collaborative initiative deals with catchment¹ management as a broad theme, it is important to provide a description of the Sand River Catchment which is the geographical area in which AWARD focuses its activities. Issues pertaining to integrated catchment management are currently being tackled through a national pilot project known as the *Save the Sand*, which is described in Section 3.4. It is envisaged

¹ South Africa subscribes to the term *catchment* rather than *watershed*, which is regarded only as the boundary of a catchment

that our collaborative initiative will fall within the remit of the *Save the Sand* project. Information will also be provided regarding land use and water supply, relevant legislation and institutional arrangements and case studies. The paper concludes with a synopsis of issues that require research and that could usefully guide the discussions of the workshop.

Box 1 The South African partner: The Association for Water And Rural Development (AWARD)

AWARD is a South African NGO that operates in the Sabie-Sand Catchment (also known as Bushbuckridge region). With a staff complement of 17 that includes engineers, an aquatic ecologist, educationists, community facilitators, researchers and institutional and development specialists AWARD is structured into four components:

- The Institutional Support Component works on building the capacity of newly emerging water institutions. In particular this component has been involved in the establishment of the Bushbuckridge Water Board, preparation of a proposal to form a Catchment Management Agency, and in the decentralisation of authority for reticulated water provision to five local governments,
- The Environment Support Component promotes the concepts of integrated catchment management and land care. Currently the major activity of this component is managing a national pilot scheme, on behalf of the Department of Water Affairs and Forestry and the Department of Land and Agricultural Affairs, aimed at establishing a sustainable model for catchment management in the Sand River sub-catchment,
- The Community Support Component utilises participatory methodologies to assist communities in leveraging funding and implementing sustainable community-based water and sanitation schemes.
- Management and Administration.

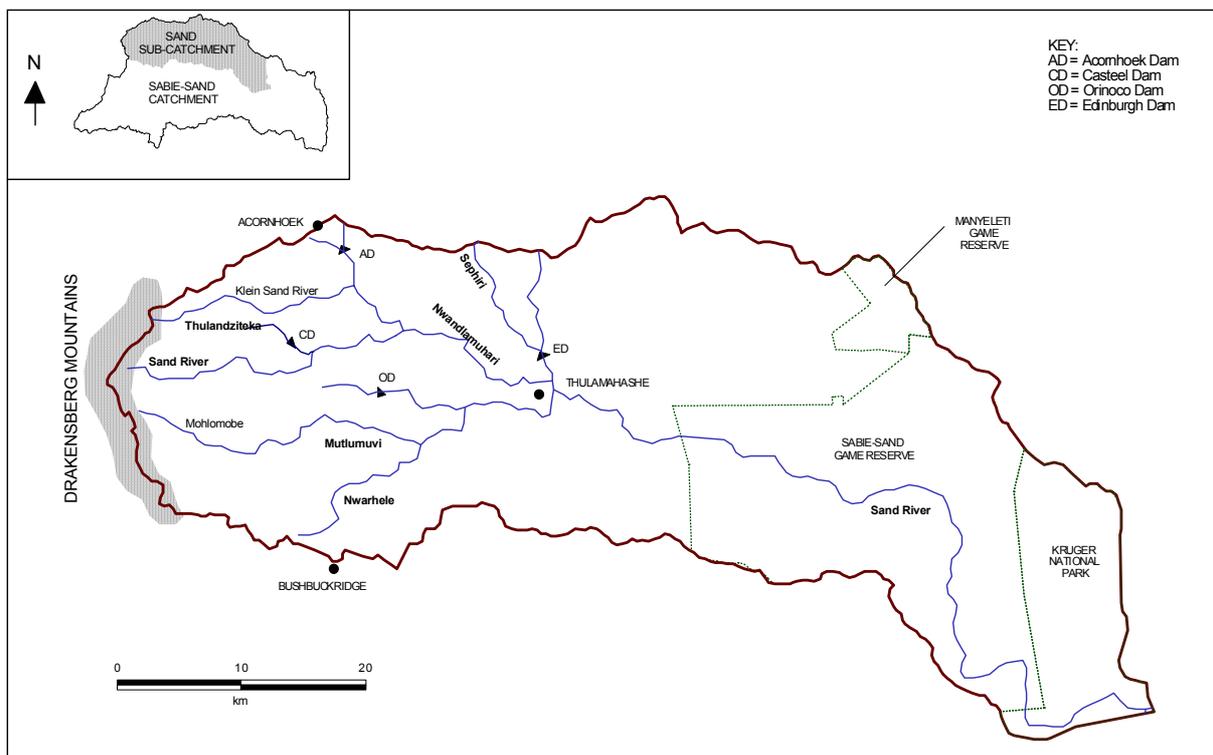


Figure 1 The Sand River sub-catchment, indicating the catchment boundary, major rivers, existing dams and game reserve boundaries

2 PROJECT SITE

The Sand River sub-catchment (SRSC) falls within the Sabie River Catchment, comprising part of the Inkomati system, in the north east of South Africa. A map of the SRSC is shown in Figure 1.

2.1 BIOPHYSICAL DATA

Box 2 Key Characteristics of the SRSC:
<ul style="list-style-type: none">• It is a drought prone semi-arid area located in the north-east of South Africa,• Over half of the water generated in the catchment comes from only 25% of the geographic area,• The lower portion of the Sand River frequently experiences no-flow conditions,• The catchment is in water deficit and there is insufficient water to meet current needs.

The Sabie River Catchment covers some 7096 km², of which the Sand River sub-catchment as the major tributary, constitutes 1910 km² (27%). The Sabie River Catchment now forms part of the new Mpumalanga and Northern Provinces.

The entire Sabie River Catchment is bounded by the Orpen road in the north, conservation areas in the east, and the Drakensberg escarpment in the west (Figure 1). The SRSC lies in the northern portion of the Sabie River Catchment, with the southern border roughly defined by the Mankeli Hills, a gabbro dyke running in an east-west direction.

The Sand River source is situated in a humid, mountainous region of high precipitation where much of the runoff is generated, but thereafter the river rapidly descends into a semi-arid region of low rainfall. The mean annual precipitation (MAP) varies widely over a very short distance of 80 km, from about 2000 mm a-1 in the west, to about 550 mm a-1 in the east. Intra-seasonal drought is common. The dominant characteristic is that nearly half of the runoff is generated in about 25% of the catchment; that is, the mountainous portion. Consequently, the entire catchment relies on this headwater portion to furnish much of the water supplies.

Major drought occurs as often as every 3.5 years in the northern portion of the catchment. The aridity of the area and frequency of drought combined with high population densities and water demands means that there is insufficient water to meet current sectoral needs at the appropriate levels of assurance.

Calculations of the mean annual runoff (MAR) vary between three data sources (Table 1). These indicate that afforestation (exotic pines for timber) have reduced the total water resources by between 10 and 20%

Table 1 Mean Annual Runoff

DEVELOPMENT CONDITION	MAR (M m ³ a ⁻¹) PER CATCHMENT						
	Sabie	Sand	Total	Sabie	Sand	Total	Sand
Virgin	606	158	762	594	122	708	/
Under afforestation	488	145	633	412	96	498	215
Contribution to Sabie	77%	23%					
% decrease from virgin	20%	8.2%	17%		21.4%		
DATA SOURCE	Chunnett <i>et al.</i> (1990)			Hughes <i>et al.</i> (DWAF 1996)		ACRU	

2.2 SOCIO-ECONOMICS

Accurate population statistics are difficult to acquire. In 1998, the population of the SRSC was estimated as 336 638 people, increasing at a 2.4% growth rate, to 447 469 in 2010. The current average density is 176 people km⁻². People live in three small towns and almost 100 villages. Due to population growth many villages have become inter-linked providing a peri-urban effect.

Box 3 Key socio-economic data:

- Population: 336 638 people with a 2.4% growth rate
- Average density : 176 people km⁻²
- Monthly household income varies from R178 to R1138 p.m. (\$25 to \$ 170 p.m.)
- Formal unemployment is between 40% and 80%,
- There is a significant proportion of single headed households
- HIV/AIDS is having a serious impact (estimated at 25%).

The average household size is 6.2 persons. Estimates of average monthly income vary between R178 and R1131. Unemployment estimates are between 40% and 80% with the dependency ratio of 93%. The main source of cash is from wage or pension remittances. These are low and thus most households employ multiple strategies to sustain themselves. This includes harvesting of natural resources (for trade or consumptive use), cattle and so-called “informal” activities or, rather, small-scale businesses. Nonetheless, opportunities are limited by access to water. Where this is available, activities include brick-making, hair salons, small nurseries and the like.

Many families were divided under apartheid laws, since “influx control” required “non-whites” to carry a pass, signifying that they had formal employment outside of the homelands (i.e. in “South Africa”). This meant that many of the homes in the former “homelands” were female-headed households. Today, this trend continues. With a lack of employment opportunities 50% of adult males and 14% of adult females engage in migratory labour. This impacts on the sex ratio where in the 20 to 59 age group, the ratio becomes 0.48:1. Women

are marginalised from political life and formal economic activities. Domestic violence is common.

The literacy rate is calculated at 66%, and only 3% of students reach tertiary education. Preliminary indications are that the birth rate is declining, although women still tend to have their first child before the age of 21.

2.3 LEGISLATIVE FRAMEWORK

The White Paper on a National Water Policy for SA (the Policy) is the overarching national water policy statement of the Department of Water Affairs and Forestry (DWA) and therefore underpins all water related legislation. To a large extent, however, the principles and policy embodied in it have been incorporated into the provisions of the National Water Act (No. 36 of 1998) and the Water Services Act (No. 107 of 1997). Constitutionally, the management of water is a national function, while water and sanitation service provision is a local government competencies.

Box 4 Key government legislation
<ul style="list-style-type: none">• The National Water Act deals with the management of water as a national resource,• The Water Services Act relates to the provision of water and sanitation services,• New institutional arrangements are emerging.

The **National Water Act** deals with the management of water as a national resource. It defines National Government's role as the public trustee of the nation's water resources ultimately responsible for ensuring that water is allocated equitably, and used and managed beneficially in the public interest. The Act also legislates for the creation of Catchment Management Agencies to be responsible for water resource management. Box 5 indicates the primary functions of a CMA. The Act recognises that water is a finite resource with an economic value. One of the most far reaching changes brought about by the Act, is the transition from a private use rights allocation system to a public rights system which treats all water-use uniformly and grants rights to use water in terms of an administrative system.

Box 5 Primary Functions of a CMA
<ul style="list-style-type: none">• Investigate, and advise interested persons on, the protection, use, development, conservation, management and control of water resources in its Water Management Area,• Develop a Catchment Management Strategy,• Co-ordinate the related activities of water users and water management institutions,• Promote the co-ordination of the implementation of the Catchment Management Strategy (particularly with local governments Water Services Development Plan),• Promote community participation in its functions,• Manage, monitor, conserve, and protect water resources,• Make rules to regulate water use,• Require establishment of management systems by water users,• Require alterations to water works,

- Temporarily control, limit or prohibit use of water during periods of water shortage,
- Issue and periodically review general authorisations and licences in respect of water use subject to conditions,
- Promote ‘one stop shop’ licensing,
- Require registration of existing lawful water uses,
- Suspend or withdraw entitlements to use water,
- Enforce license conditions,
- Dam safety,
- Monitor releases of waste water and impose penalties for pollution,
- Establish and manage Catchment Management Committees and Water User Associations.

Through the creation of **the Reserve** (Box 6), the quantity and quality of water required for basic human needs and for the maintenance of aquatic ecosystems is effectively removed from the total body of water available for allocation to other uses.

Box 6 The Reserve: Water for the Ecological Reserve & for Basic Human Needs

DWAF, as the custodian of the country’s water resources, has recently reviewed a number of policies pertaining to natural resources. In line with policy reviews, South Africa is still in the early stages of quantifying amounts for a non-negotiable, statutory requirement known as “The Reserve”. This consists of :

- the ecological reserve and,
- the domestic reserve to meet basic human needs.

Calculations for the domestic reserve are given in Table 3. Calculations to determine the ecological reserve are more complex. In this regard the concept of *instream flow requirements* (IFR) for rivers has emerged and a number of approaches have been developed which reside on the assumption that there is a point below which discharge is reduced that results in a disruption of ecological processes and loss of species. The IFR has been determined for the Sand River in 1998 and a full reserve assessment is planned for next year.

The **Water Services Act** deals with the provision of water and sanitation services. The guiding principle of the Water Services Act is that “everyone has a right to basic water supply and sanitation”. The Act deals with the roles of Water Boards, Water Services Authorities and Water Service Providers to manage the operations and maintenance of systems. Importantly, the Act establishes the basis for tariffing on a demand response approach and the establishment of a regulatory framework. Subsequent guidelines have provided directions on how tariffs are to be calculated.

In terms of the Water Services Act, local government is a **Water Services Authority** (WSA). As a WSA local government has to “ensure efficient, affordable, economical and sustainable access to water services” (Water Services Act: 1997). Amongst other activities, a WSA is engaged with planning, establishing the regulatory framework and setting tariffs. A WSA also appoints a **Water Services Provider** (WSP) which is a structure that runs the day-to-day

operations and maintenance of reticulated water schemes. A WSA can perform WSP functions itself, it can outsource or enter into partnerships. Potential outsourcing partners include the private sector, water board, and/or community committees.

3 WATER RESOURCE MANAGEMENT

3.1 DESCRIPTION OF RESOURCES AND WATER USE

Box 7 Key Water Resource Characteristics:
<ul style="list-style-type: none">• surface water comprises the major resource.• groundwater is under utilised.• a major dam construction in the Sabie River Catchment will allow up to 12 Mm³a⁻¹ to be transferred into the SRSC.• afforestation and irrigation are the biggest water users.• there is an institutional vacuum for managing water resources.• the Save The Sand project seeks to rehabilitate the Catchment and establish management models.

3.1.1 *Surface water*

Surface water comprises the greatest portion of the water resources of the Sabie River Catchment, of which the Sand River is the major tributary. The total surface water is estimated to be between 96 and 145 Mm³a⁻¹ (this does not imply that all of this is available for exploitation). Surface water (see Table 1) in the catchment are suitable for irrigation, livestock watering, and, after conventional treatment, for domestic supply.

Water quality conditions of the Sand River are considered to be good, with the exception of some elevated turbidities and nutrient conditions. However, population increases are expected to place extra loads on the wastewater treatment systems, and it cannot be assumed that water quality conditions will remain acceptable in the future without appropriate management measures. Recent information points to poor water quality conditions below treatment works in the SRSC. With regards to groundwater, indications are that the SRSC has relatively poor quality groundwater in the East (high salinities), but acceptable quality in the West, North and much of the South.

3.1.2 *Ground water*

The total available groundwater is estimated as 8.8 Mm³a⁻¹. Probably only less than half of this is practically exploitable. Yield testing of existing infrastructure conducted by VSA in 1997-98, indicated that existing borehole installations within the SRSC currently provide an estimated 3.66 Mm³a⁻¹. Of these, only a small area around Acornhoek and Buffelshoek is regarded as fully exploited. Borehole and bulk supply are the main sources of water for most residential areas in the catchment. In some areas people still have to use water from rivers, unprotected springs, wells dug in the riverbeds, or a dependent upon sales from private vendors.

In 1998 VSA Geoconsult undertook a borehole survey on behalf of DWAF. In total 169 boreholes were tested. The results indicated that the SRSC has relatively poor quality groundwater in the East, but acceptable quality in the West, North and much of the South. Reasonable yields occur over a large portion of the West and across the North, with the exception of the Acornhoek and Buffelshoek areas which are considered fully exploited. Overall, in the SRSC area VSA identified boreholes with a combined potential sustainable yield of 278.45 l s⁻¹. The recommended pumping regime of 10 hours per day translates this into a sustainable supply of 10 024 m³d⁻¹, or 26.2 l/c/d for the SRSC population.

3.1.3 Dams

There are four dams within the catchment, Acornhoek, Edinburg, Orinoco and Casteel dams (see Figure 1). They were built by the former homeland governments. Acornhoek and Edinburg dams are for domestic supply and currently falls under the jurisdiction of DWAF. Orinoco and Casteel dams are for agricultural supply and currently fall under the jurisdiction of the Department of Agriculture. A third dam, the Zoeknog Dam, was built in 1991 but collapsed when it was 30% full. There is no intention to rebuild this dam, nor are any other dams planned.

The major development is the Injaka Dam which, although not within the catchment, will supply water to the catchment through interbasin transfer. Currently under construction and due for completion in 2001, Injaka Dam is being built on the confluence of the Marite and Maritsane rivers, tributaries of the Sabie River. The dam will have a storage capacity of 123 Mm³. This development also includes the construction of the Bushbuckridge Interbasin Transfer (BTP) completed in 1996, which will transfer 12 Mm³a⁻¹ to the SRSC. It is expected that the water transfers from Injaka into the Sand River will be sufficient to meet the Reserve and the domestic water requirements.

3.1.4 Water demand

Estimates of water demand are shown in Table 2. Forestry and Agriculture are the biggest users of water and, like most domestic consumers, do not pay for this. Due to inadequate data it is extremely difficult to calculate demand for these sectors but it was estimated that in 1985 the water requirements for afforestation was 11.3 Mm³ and for irrigation it was 32.3 Mm³ out of a total of 69.4 Mm³ for all sectors (Table 2).

Table 2 The estimated water requirements (Mm³) for the different sectors

USE	SAND SUB CATCHMENT	
	1985	2010
Domestic	3.7	30.8
Livestock & game	1.0	1.0
Ecosystems	10.0	10.0
River losses	11.1	11.1
Afforestation	11.3	
Irrigation	32.3	70.9
TOTAL	69.4	

3.2 LAND USE

Land use patterns have major implications for water demand. The major land use is shown Table 3, and the location of each major sector or land-type in Figure 2.

Table 3 Land-cover in the Sand River Catchment (1996)

LAND-USE	TOTAL (ha)	%
WATER BODIES	926.6	0.49
FORESTRY: planted	5339.6	2.80
FORESTRY: unplanted	656.0	0.34
FORESTRY: indigenous unplanted	5931.7	3.11
RESIDENTIAL: sparse & garden plots	15391.6	8.06
RESIDENTIAL: dense	2750.3	1.44
DRYLAND ANNUAL	7600.4	3.98
DRYLAND PERMANENT	142.6	0.07
IRRIGATED PERMANENT CROPS	438.1	0.23
IRRIGATED ANNUAL CROPS	2145.0	1.12
RANGELANDS	80193.8	41.99
CONSERVATION BUSHLAND	69486.6	36.38
TOTAL	191002.40	

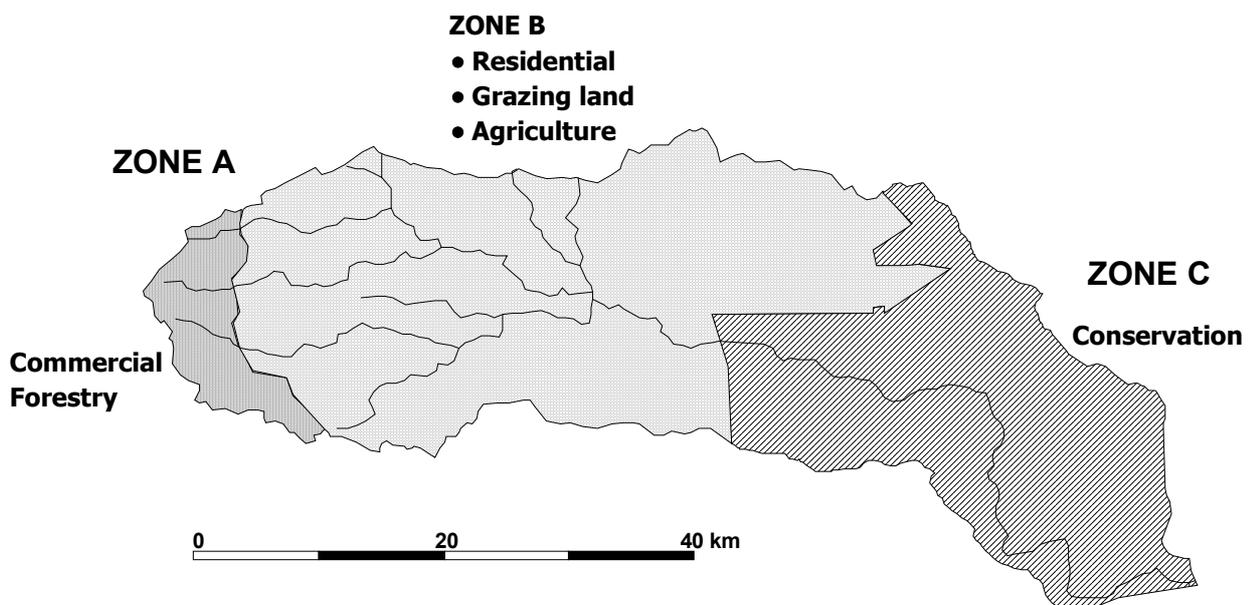


Figure 2 Major land-use in the Sand River Catchment

3.3 INSTITUTIONS TASKED WITH WATER MANAGEMENT

Box 8 Key Institutions and their roles

- The Department of Water Affairs and Forestry (DWAF) is the national custodian of water resources. DWAF establishes legislation, regulations and policies and monitors the application of these,
- A Catchment Management Agency (CMA) is responsible for water resource management in its area of operation. CMA's have 'original functions' and obtain further responsibilities on delegation or assignment from DWAF,
- The Bushbuckridge Water Board is a statutory bulk supply authority,
- Local Government is a Water Services Authority tasked with planning, setting regulations and tariffs for the provision of water and sanitation services to consumers,
- A Water Services Provider acts under contract to a Water Services Authority and manages the day-to-day operations of reticulated water systems.

Currently management responsibility is divided between two DWAF offices (for example: the Mpumalanga office registers water users while the Pietersburg office issues abstraction permits). Boreholes frequently continue to be drilled without permits. There is no catchment management strategy in place. Dams below 250 000 m³ do not require a permit.

The SRSC will fall within the proposed Inkomati CMA. A submission to form the Inkomati CMA is due to be presented to the DWAF Minister, making it the first submission to be lodged in South Africa. Should this submission be successful, a governing board will be formed, with three catchment management committee's (CMC) beneath it. A proto-type CMC has been formed for the Sabie-Sand area. It includes representation from a local Sand steering committee which is also involved with the Save The Sand project (refer Section 3.4). Concurrently with the formation of CMA's, Water User Associations (WUA) are being formed and as from 01 April 2001 they will have to begin paying a Water Use Charge (also known as a Catchment Management Charge).

3.4 THE SAVE THE SAND PROJECT

The SRSC has been selected by the DWAF, in collaboration with the Department of Agriculture (DA), as a pilot project for the design and implementation of an Integrated Catchment Management Plan. This project has been named the *Save the Sand Project*. This catchment was chosen because it was recognised that the ecological integrity, productivity and water resources of the catchment have been severely depleted and in turn have precipitated a suite of socio-economic and environmental consequences.

The catalyst for the project was the 1992 drought, the worst in recorded history. During this period it became clear that the catchment's natural resources had been so taxed that they were unable to sustain catchment needs through this period. The drought also pointed to the need for coordination and integrated planning. For example, during this period, the main agricultural concerns continued to water crops whilst water had to be trucked in for domestic consumption. It also demonstrated quite clearly the ability of a single water-use sector to stop

the flow of the Sand River and, further, to do so with impunity. However, it was only with the election of the new government in 1994 that the mitigatory measures that were required received the political backing that was needed. As mentioned in the introduction, the Minister of Water Affairs rapidly re-orientated water management and conservation strategies. Specifically, the message from the Department was that water resource planning and use could no longer happen in an *ad hoc* fashion. In order to give life to these concepts, the Department was keen to support such approaches, in partnership with other stakeholders (government, communities, NGOs and the private sector). It was in this context that *the Save the Sand* was initiated.

Formally, the principle objective of the Save the Sand initiative is:

- to address the rehabilitation of the Sand River and its sub-catchments, employing the principles of Landcare and Integrated Catchment Management.

This is guided by a number of key objectives, namely:

- Rehabilitation and sustainability
- Social upliftment and equity
- Economic growth
- Co-operative governance

Currently, the project has two phases:

Phase 1. A feasibility report and formulation of specific strategies for the implementation of a catchment plan. This was completed by AWARD in 1998. Key problems centred around:

- The declining flows in the Sand River.
- The impacts of forestry and agriculture on the water resources.
- Inappropriate land and water use practices.
- Diminishing veld resources.
- Un-ordinated developments, planning and management and the need for a CMA.
- Continued degradation of land particularly around the breached Zoeknag Dam.
- Inadequate services to communities, particularly water supply and sanitation.
- Non-payment for services, or extreme variation in costs when payments are made.
- The lack of information to communities concerning the state of the area and new mitigatory policies

Phase 2. Implementation. This was initiated in January 1999 and is co-ordinated by AWARD. As a project that subscribes to partnerships, the Save the Sand has received support from various institutions, government departments and NGOs to implement the major recommendations of Phase I. The main projects that are currently underway are shown in Box 9.

Box 9 Current or proposed projects undertaken under the Save the Sand Project

1. THE PUBLIC AWARENESS CAMPAIGN (PACAM)
 - 1.1 Implementation of stage one of PACAM
2. RE-STRUCTURING OF THE FORESTRY SECTOR
 - 2.1 Cattle grazing in the northern forestry areas (DWAF)
3. RESTRUCTURING OF IRRIGATED AGRICULTURE
 - 3.1 Situation analysis of Zoeknog Farmers Scheme
 - 3.2 Consultation with Allandale & Champagne Farms
 - 3.3 Feasibility study of Dingleydale/ New Forest Farms
4. PROJECTS WITHIN COMMUNAL RANGELANDS
 - 4.1 Determination of the value of livestock to households in the Sand River Catchment
 - 4.2 Community-based institutional arrangements for Natural Resource Management
 - 4.3 Feasibility study :joint natural resource harvesting initiatives between local game reserves and neighbouring user groups
 - 4.4 Planning phase: Current and potential value of the natural resource base of the SRC.
 - 4.5 Land and water conservation within dryland farms
5. INITIATIVES WITHIN CONSERVATION AREAS
 - 5.1 Introduction of water conservation measures to Manyeleti Game Reserve & KNP
 - 5.2 See communal rangelands 4 (3)
6. WATER SUPPLY AND INFRASTRUCTURAL PROJECTS
 - 6.1 Implementation of erosion control at Mamelodi water supply scheme
 - 6.2 Water supply for Clare A
 - 6.3 Water supply: Athol
 - 6.4 Water supply: Welverdiend
 - 6.5 Water supply: Thlavekisa
 - 6.6 Water supply: Acornhoek B
7. PROJECTS FOCUSING ON THE WATER RESOURCE BASE (I.E. THE SAND RIVER AND TRIBUTARIES)
 - 7.1 Planning for the rehabilitation of the tributaries of the Sand River
 - 7.2 Planning for the rehabilitation of the wetlands the Sand River Catchment
8. SPECIFIC LANDCARE PROJECTS
 - 8.1 Rehabilitation of Zoeknog Dam
 - 8.2 Road rehabilitation

4 WATER SUPPLY AND SANITATION

Although the situation regarding access to domestic water in the area has improved during last two years, reliable access to safe water of a sufficient quantity continues to be one of the major problems for many people living in the SRSC, particularly in rural settlements. The national objective, known as the RDP standards, is to **provide 25 l/c/d of potable water from a standpipe 200 m from each household**. Estimates of the domestic demand (by AWARD) are shown in Table 4 (see also discussions on “The Reserve” in Box 6 and Section 5.3). It is estimated that 44% of the population are still below this standard. Most communities in the SRSC have identified adequate and reliable water provision as their major

development need.

Most “villages” in the catchment had basic public standpipe systems installed by the previous homeland governments of Gazankulu and Lebowa. These systems have all been badly neglected in terms of maintenance and repair of the “public” infrastructure, and most have had numerous informal and unplanned private connections made on them. The towns of Dwarsloop, Thulamahashe and Shatale have fully reticulated systems where consumption exceeds 175 l/c/d. Consequently the vast majority of domestic supply systems in the SRSC provide an inequitable and unreliable service to consumers.

Table 4 Estimated domestic demand at two RDP levels

	YEAR			
	1998		2010	
Population	382 864		508 922	
Level of service	25 l/c/d	60 l/c/d	25 l/c/d	60 l/c/d
Domestic Reserve Mm3/a	3.49	8.38	4.64	11.15

It must be noted that the Domestic Reserve refers to water for basic human consumption (reasonably based on 25 l/c/d). However, numerous activities occur at a domestic level that require water over and above that specified under the Reserve. Their importance to peoples livelihoods needs consideration (see Section 5.5).

4.1 SANITATION

The majority of inhabitants of the SRSC have sanitation facilities below the minimum acceptable standard (defined as a Ventilated Improved Pit latrine) for public health protection as indicated in the Sanitation White Paper of 1995. At an average cost of R1 500¹ per house the cost of upgrading or installing sanitation facilities to meet minimum RDP criteria could amount to R 75 673 500. Of this, the household capital subsidy of R600 would account for R30 269 400. Assuming all other factors remain equal, to achieve this by the year 2010 will require an annual investment of R 6 306 125.

Dwarsloop and Thulamahashe towns, and Mapulaneng Technical College all have waterborne sanitation systems, with effluent treatment works. The Tintswalo Hospital works are located within a community just outside the catchment boundary, but dependent upon water supplies from within. None of the treatment plants have been operating at acceptable performance levels. Work on the detailed designs and costings of refurbishments to these plants has been done and upgradings recently performed.

¹ R 1.00 = approximately \$US 7.00

4.2 TYPES OF SCHEMES BEING IMPLEMENTED

Box 10 Key water supply data:
<ul style="list-style-type: none">• 44% of the population are below government minimum levels.• There are gross inequities in domestic supply.• There is an emphasis on expensive high-technology schemes.• Formal payments are not occurring.• Local government has severe capacity constraints.• Adequate water is crucial for any economic development strategy.

Associated with the construction of Injaka Dam the Africon Consortium, on behalf of DWAF, prepared a report titled 'Bushbuckridge Bulk Water Distribution: Proposed Master Plan' (1998). The plan proposes expenditure of R370 M (\$ 50 M, at 1998 prices) throughout the Sabie River Catchment to establish an integrated water distribution system pumped from two major treatment plants. At current levels of funding for infrastructure development it will take anywhere between 25 and 50 years to achieve a functional integrated network. The Africon Master Plan provides only scant consideration to the potential of borehole supplies.

Two bulk schemes in the SRSC are currently under construction. The first is the upgrading and extension of existing reticulation systems and will provide to the communities of Dwarsloop, Arthurs Stone and Maviljan. The second is an abstraction from Acornhoek dam, with treatment works and pumping to Acornhoek and Timbavati, with later extensions planned for the Green Valley area. The Acornhoek scheme is valued at R9 Million.

AWARD and another organisation, the Mvula Trust, engage with communities for the construction of small-scale community-based schemes. Currently AWARD has construction projects with the communities of Clare, Weltverdiend, Acornhoek B, Athol, Hlavakisa (see Box 8).

With regards to sanitation, 1999 DWAF had initiated 14 dry sanitation schemes. Most recently the emphasis has shifted towards PHAST training. Currently AWARD is completing a sanitation scheme with the village of Newline.

4.3 INSTITUTIONS TASKED WITH WATER SUPPLY

Linked to the construction of Injaka Dam a bulk supply authority known as the **Bushbuckridge Water Board** has been formed. This is responsible for all bulk supplies in the SRSC and recently accepted the transfer of staff and infrastructure assets from DWAF.

Two **local governments** cover the SRSC although (along with a 3rd local government) these are about to be amalgamated into one municipality. First elected in November 1995, local government is lacking in both resources and experience. It is only partially fulfilling its WSA duties, and (despite a number of workshops) has not yet managed to determine how the WSP will be structured and managed. Consequently, DWAF still performs the WSP and most WSA functions, although it is intending to transfer these responsibilities, along with staff and infrastructure assets, to local government.

Most communities, whether villages or the small urban areas, have **water committees**. These committees are at different levels of functionality. At one extreme they are unelected and simply advocate for improved water supply, at the other extreme they are democratic structures that are managing water supply and tariff collection within their community. Some water committee's have the potential to become community based WSP's (see Section 3.3).

4.4 KEY PROBLEMS AND ISSUES

Water is generally not paid for through a formal system since there are very few functioning formal institutional arrangements regarding payments for water. However, this needs to be qualified to some extent since many households in the SRSC purchase water from private vendors or pay an annual levy to the Tribal Authority. Local government is in the initial stages of establishing a tariff regime. Current estimates of the cost of supply fluctuate wildly but indications are that borehole operations and maintenance can be managed for as little as 0.11c per m³, while supply from the integrated bulk scheme will be at least R7.50 per m³. Whilst households in the towns should formally pay only R0.30c per m³, less than half the households make any form of regular payment. Despite potential borehole yield (refer to section 3.1) there is an emphasis on dam sources for a number of reasons: borehole availability does not necessarily correlate to population locations, population growth patterns mitigate against the long-term sustainability of borehole sources, generally the South African engineering fraternity continue to promote Eurocentric high-technology solutions, and there is a public perception that borehole supplies are of a lower quality than water treated from regional schemes.

There are gross inequities in supply with some communities having abundant free supplies whilst other communities remain below RDP minimum levels of provision. Whilst the catchment may be in water deficit, there is a need to install schemes to improve the water supply to many communities. With the exception of NGO work, new schemes are oriented towards expensive high-technology solutions which makes affordability to consumers questionable.

Local government, as the Water Services Authority, has severe capacity constraints and no revenue base. Basic tasks, such as adopting by-laws, establishing tariff levels, and compiling a Water Services Development Plan, are yet to be completed. New councillors will be elected in November 2000 who will require orientation and training before they can function.

5 CASE-STUDIES

Box 11 Key Case Study Issues:

- Policies linking ICM and WSS are not yet being applied.
- Ensuring community access to, and participation in, the CMA process.
- The Reserve determination and ensuring access.
- Uncoordinated housing projects.
- Productive activities by the poor and allocation to these.

5.1 LINKING WSS AND CATCHMENT MANAGEMENT

There are a number of policies linking WSS to IWRM, although in practice these are not yet functioning. The Water Services Act stipulates that a municipality should prepare a Water Services Development Plan (WSDP). Amongst other things the WSDP should indicate a five year strategy for infrastructure development and revenue collection. The WSDP would become part of a local government Integrated Development Plan (IDP) which would, in turn, indicate not only intended domestic infrastructure development but also plans for agriculture, commercial sectors, industrialisation and any other developments that would require water usage. The WSDP and IDP should be supplied to the CMA to assist them in the preparation of their five year Catchment Management Strategy. On this basis the CMA would be in a position to determine the needs within a municipality over a five year period, and then plan accordingly. The CMA would also be in a position to indicate where any planned developments conform to the principles of IWRM (e.g. preservation of riparian zones) or need to be reviewed. In practice, a draft WSDP was recently completed for local government. This provides an assessment of the current status-quo situation but makes no predictions for any planned developments. No IDP has yet been initiated. Local government has identified a number of Local Development Objectives (which is a prioritised list of desired projects) but has not followed this in terms of implementation (i.e. projects have not been undertaken in terms of the prioritised listing). The CMA is not yet in place and preparation of a Catchment Management Strategy has not started. Section 6.4 indicates some of the dilemmas that arise when coherent planning is not in place.

5.2 ENSURING COMMUNITY ACCESS TO, AND PARTICIPATION IN, THE CMA PROCESS

Many of the reasons as to why community issues are, or may be, inadequately addressed on the CMA agenda may be due to inappropriate or inadequate information flow to stakeholders. There are various facets to this that could be usefully explored. One issue is that the information is largely inaccessible to key stakeholders in the community. How do communities assess the consequences of different land-use, and hence, water-use scenarios? How do they raise issues regarding allocations to productive use (see 5.5), for example? It is naïve to assume that meetings alone fulfil this role. We would suggest that this is a problem that will be faced by all communities and CMAs and therefore would constitute a useful direction for the project to explore.

5.3 THE RESERVE: ENSURING ALLOCATION AND ACCESS

The reserve has been described in Box 6. Nonetheless, there are a number of key issues pertaining to these figures. Firstly, a full determination of the ecological reserve has yet to be undertaken. Secondly, to our knowledge, there has been no formal calculation of the domestic reserve other than the estimates provided in the Save the Sand feasibility study (see Table 2). Thirdly, whilst allocation amounts may be finalised by DWAF, *this still does not ensure access to the Reserve*. Furthermore, questions still remain as to how this will be achieved and what mechanisms will be put in place to monitor that these amounts are not only secured, but remain so.

5.4 RDP HOUSING SCHEMES

A good example of some of the problems that occur when integrated development planning is not in place is highlighted by what is known as the RDP Housing schemes. In this case, 3,333 houses were built at five sites - Acornhoek, Shatale, Ludlow, Casteel, Agincourt. At each site there was an internal reticulated water supply system with each house being fitted with an

unmetered yard connection. At none of the sites was water provision adequately considered. For example, at Acornhoek three boreholes were drilled despite a report indicating that the water table was 'fully exploited' with the result that the table has been further depleted. At Agincourt the building contractor was caught making an illegal connection to a bulk supply system. Other sites have no water supply. The consequence has been that local government has allocated funds towards improving supply to these sites, and in instituting cost recovery. For example, at Acornhoek a R 9 million scheme to extract, treat and pump water from the nearby Acornhoek Dam is nearing completion. This will supply the Acornhoek housing site and neighbouring communities. At Ludlow an additional connection is being made to the highly utilised supply line from Edinburg Dam. Permission to abstract water is currently being granted by Northern Province DWAF. Given the perceived urgency in providing water to these areas, a full environment impact assessment appears not to have been performed. And whilst the needs of these new communities are slowly being provided for, other communities, who have had an inadequate supply for up to twenty years, continue to go without.

5.5 PRODUCTIVE ECONOMIC ACTIVITIES BY THE POOR

In conventional approaches to water demand, a sector that is constantly overlooked is that of "informal activities". This includes small-scale economic activities. Given the high levels of unemployment and the high poverty levels in the area, the importance of these activities, and hence their access to water supplies, cannot be underestimated. A recent research initiative undertaken by AWARD to address the returns to water of these so-called "informal" activities revealed that by simply furnishing people with an additional 15 l/c/d over the RDP minimum, water is made available for productive use. Nonetheless, this important sector is still not being considered by government in their allocation budgets. It would be fruitful to fully explore this issue and advocate for its inclusion in planning exercises.

6 KEY RESEARCHABLE ISSUES

The aim of this section is to prioritise the key issues and to assess whether there is a demand for research on these issues. Identified research issues include:

6.1 WATER RESOURCES ISSUES

- the catchment is in water deficit.
- the forestry and agriculture sectors are the highest consumers of water but are not paying for the use of water. Afforestation alien vegetation has invaded riparian zones and wetlands. Irrigation abstractions are not being used optimally.
- the potential for ground water as a water source in conjunction with surface water has not been fully investigated.
- in the same sense, rain water harvesting, even as a secondary source, has not been fully investigated.
- the area is drought prone. At the same time it recently suffered from the worst floods in over 100 years. Planning to manage these extremes does not appear to be occurring.
- water quality is declining and population increases will put further pressure on this downward trend,
- whilst the catchment is in water deficit many communities are still below the government minimum level of water provision.

6.2 INSTITUTIONAL ISSUE

- are ICM/ WSS well poorly integrated at present? Why? Should they be better integrated in the future? What is required for this to happen (e.g. institutional, technical interventions etc.)
- poor planning, lack of an allocation system
- institutional linkages - planning - decision making - GIS, etc
- how do WSDP's/IDP's influence CM strategies and vice-versa?
- community management versus top-down decision making - MCP's, Community-based natural resource management.
- what WSS benefits will be delivered by ICM? If none, why is ICM being promoted (e.g. employment, industrial, agricultural, environmental interests)?
- what are the costs of participating in ICM (e.g. CMAs etc) to institutions engaged in provision of WSS services
- CMA user-friendly data-base, how do communities make decisions?
- local government capacity constraints

6.3 COMMUNITY ISSUES

- will ICM/CMAs help reduce the costs/ increase the sustainability/ quality/ reliability of WSS provision? Over what timescales?
- ICM and rural local economic development - informal economic activities, sustainability gap
- community knowledge of ICM - means to disseminate information,
- community perceptions that groundwater is poor quality
- rainwater harvesting
- inequity of domestic supply
- introducing a demand responsive approach(DRA) - economic value of water, affordability, cross-subsidisation, ability to pay.
- community-based natural resource management.