



Project to Revise the Pricing Strategy for Water Use Charges and Develop a Funding Model for Water Infrastructure Development and Use and a Model for the Establishment of an Economic Regulator

Assessment of Infrastructure and Financing

14 December 2012

WP10465

Submitted by

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Contents

List of abbreviations

AG	Auditor-General
CMA	Catchment management area
CRC	Current replacement cost
DBSA	Development Bank of Southern Africa
DCoG	Department of Cooperative Governance
DM	District municipality
DRC	Depreciated replacement cost
DWA	Department of Water Affairs
EUL	Estimated useful life (of an asset)
IR	Institutional Realignment
IRR	Institutional Reform and Realignment, a DWA initiative
KOBWA	Komati River Basin Water Authority
LHWP	Lesotho Highlands Water Project
LM	Local municipality
MIG	Municipal Infrastructure Grant
NWRI:	National water resources infrastructure.
NWRIA	National Water Resource Infrastructure Agency
O&M	Operation and maintenance
OA	Operating area
ODRC	Optimised Depreciated Replacement Cost
RBIG	Regional Bulk Infrastructure Grant
ROA:	Return On Assets.
RUL	Remaining useful life
RWB	Regional Water Board (term used to identify proposed reformed WBs)
SMP	Scheme Management Parameter
TA	Trading account
TCTA	Trans Caledon Tunnel Authority
WB	Water board
WCDM	Water Conservation and Demand Management
WIF	Water sector investment framework
WMA	Water Management Area
WR	Water resources
WSA	Water Services Authority in terms of Water Services Act
WSP	Water Services Provider in terms of Water Services Act
WTE:	Water Trading Entity.
WUA	Water User Association

1 Introduction

1.1 Purpose of the document

This document serves as an interim deliverable for project *WP10465: Revision of Pricing Strategy and Development of a Funding Model and an Economic Regulator*. The information provided will be used as an input into further deliverables for the Infrastructure finance model.

The purpose of this document is to provide an overview of the existing water resource system assets and the associated operating costs and revenues, as well as the future water resource infrastructure capital requirements and operating costs. The key information provided is:

i) The value and condition of the existing asset base
ii) The projected infrastructure (capital) development and refurbishment requirements
iii) The operations & maintenance budget requirements of the current and projected infrastructure developments
iv) The revenue and recovery (income) associated with this asset.

1.2 Description of the water value chain

The water value chain consists of the "products" of water management, the related water flows, the infrastructure and regulatory instruments to manage this flow, the institutions that are responsible for these instruments and finally the financial flows that enable these institutions to perform their development and operational functions.

Figure 1 is based on the idea that there are fundamentally only three products of water management, and that these link the range of water institutions with the range of clients, namely:

- *raw water*, available for agricultural, industrial, mining, power generation, and household water users;
- *potable water* for domestic, commercial, institutional and industrial consumers provided at point of use, as well as removal of waste water from the point of use; and
- *ecosystem goods and services*, related to the sustainable functioning of the aquatic environment (including biodiversity), providing attenuation, assimilation and instream water use.

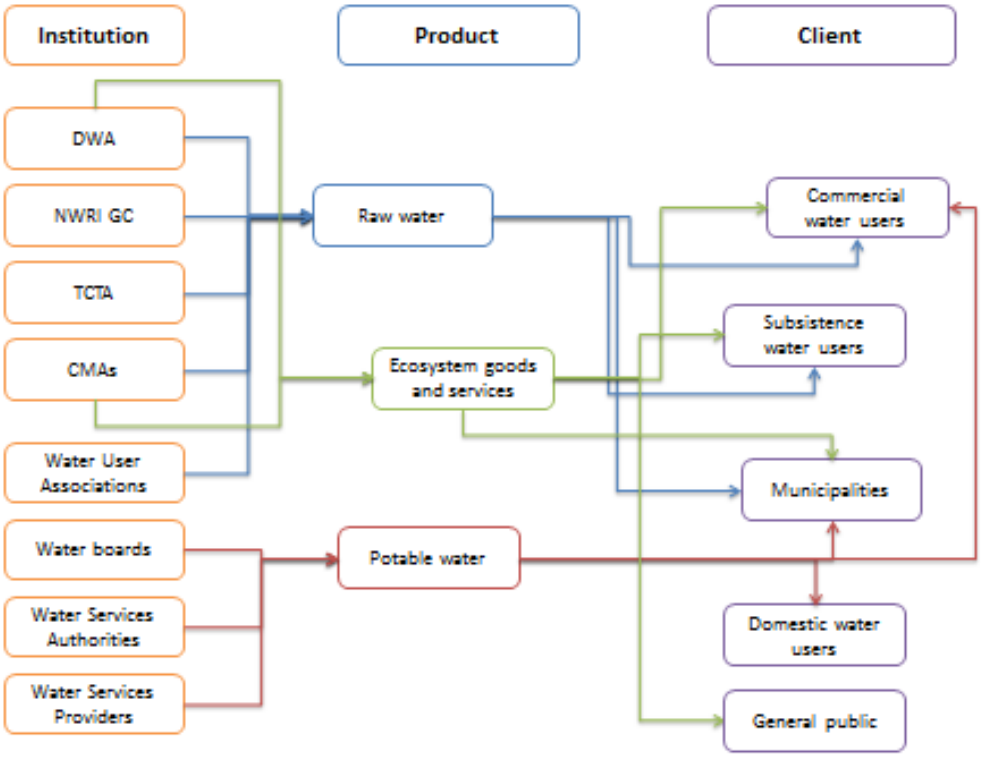


Figure 1: Institutions, products and clients for water management

Figure 2 builds on this by distinguishing four main domains within which water-related management takes place, namely:

- *catchment* (terrestrial land use and ecosystems) which govern the hydrological cycle and the flow and quality of water from precipitation into evapotranspiration, runoff or seepage and then ultimately into water resources;
- *water resources* (aquatic ecological and infrastructure systems) within which water may be used, from which water is provided for consumptive use or into which waste is disposed;
- *bulk water services* (water supply and waste water collection and treatment infrastructure) between the water resources and water services reticulation systems; and
- *water services* (supply distribution and sewage collection infrastructure) providing services to individual municipal customers.

It is important to recognize that this is a closed value chain in that a portion of water supplied returns directly to the water resource (usually with waste). It is further important to distinguish the natural ecosystem infrastructure in the aquatic (and terrestrial) environment that provides waste assimilation and flow attenuation services, from the more traditional built infrastructure.

Different types of water users and consumers may be identified along this value chain, from forestry intercepting rainfall in the catchment, through environmental requirements in the water resources, to agricultural and bulk industrial users from the water resource (or bulk systems) and municipal consumers provided with water services.

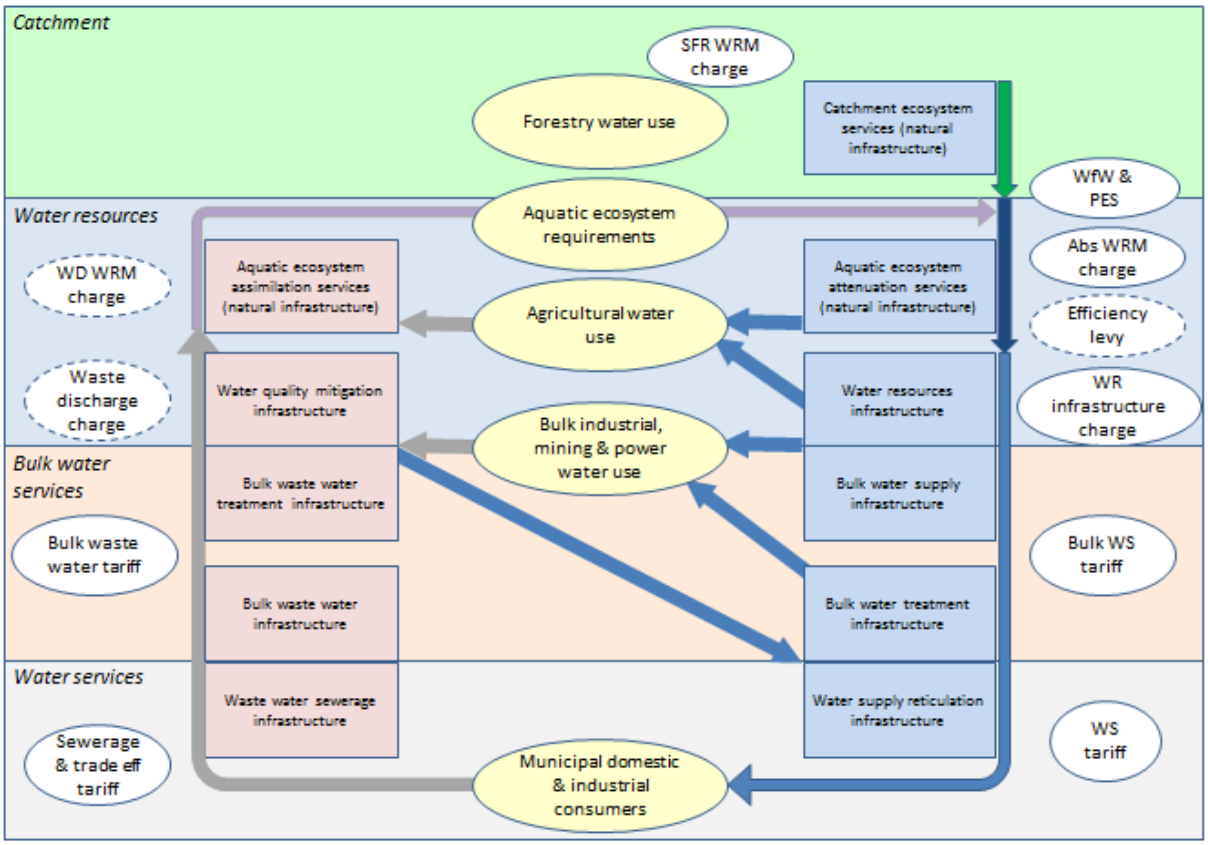


Figure 2: Water flows and infrastructure

Finally, various types of charges and tariffs can be linked to this cycle and therefore apply to the water users / consumers obtaining water from different stages in the value chain (dotted lines indicate those charges or levies that have not yet been implemented). This includes:

- *Water resources management* (WRM) charges to recover water resources management costs from:
  - streamflow reduction activities in the catchment,
  - abstraction (and storage) related users from the water resource, or
  - discharge related water users into the water resource.
- *Payment for environmental service* (PES) schemes (including Working for Water) in which downstream beneficiaries contribute to the cost of ecosystem protection (or rehabilitation) in upstream aquatic or terrestrial environments (not generally applied).
- *Water efficiency levy* to incentivise more efficient use of water resources in stressed catchments (not yet developed).
- *Water resources infrastructure charges* to cover the costs of infrastructure development and operation, for supply augmentation (and distribution for non-municipal/water services schemes).
- *Waste discharge charges* to transfer the costs of water quality impacts to dischargers, through:
  - Enabling mitigation interventions through a cost recovery charge,
  - Discouraging waste discharge through imposition of a levy.
- *Bulk and water services tariffs* associated with the costs of infrastructure and service provision in the supply and treatment of potable water to consumers.

- *Sewerage, trade effluent and bulk treatment tariffs* associated with the collection and treatment of waste water from consumers.

1.3 Scope of Report

Water infrastructure is traditionally categorised according to the nature of the water (water resource infrastructure covers raw water, water services infrastructure covers treated water, and bulk infrastructure covers the in-between treatment and transfer phase). Water infrastructure can also be categorised based on whether it is at a national, regional or local level, which impacts on who is mandated to manage the related infrastructure.

A water resources system includes the dams, weirs and boreholes used to store raw (untreated) water. This infrastructure also includes the transfer infrastructure using tunnels, pipelines and canals and all other associated infrastructure.

Bulk water systems include the transfer systems to transfer the raw water to treatment works, the treatment works itself, and the bulk potable water storage facilities and bulk pipelines, with pumping systems where needed, to transfer water into distribution reservoirs. It may also include bulk wastewater treatment facilities.

Water services infrastructure relates to the pipelines, pumping systems and distribution reservoirs, used to transfer water from distribution reservoirs or point of abstraction to the end user.

Bulk water systems and Water services infrastructure are not included in this analysis. The focus of this report is on water resource infrastructure assets only.

The Department of Water Affairs (DWA) is the main owner of water resource infrastructure. The analysis of the asset base below consists of DWA and the Trans-Caledon Tunnel Authority assets. Water Boards, Local government and Water User Associations may also own water resource infrastructure but this is not included in the analysis below.

1.4 Categories of infrastructure

1.4.1 Traditional infrastructure

Water resources infrastructure assets consist of the following facilities: Buildings, canals, dams, groundwater, measuring facilities, pipelines, power supply, pump stations, roads, on-site treatment works, tunnels and water storage. Land has been included in the analysis in instances where the Department bought and owns the land and needs to recover the cost through tariffs.

1.4.2 Non-conventional Infrastructure

These assets are not on the Department's infrastructure asset base but will increasingly be part of the budget spend.

1.4.2.1 Infrastructure required for Water Conservation and Demand management

Due to the scarcity of water in South Africa, institutions should consider adopting a Water Conversation and Demand Management (WCDM) strategy. WCDM relates to the adoption and implementation of a strategy by a water institution or consumer to meet the objectives of economic efficiency, social development, social equity, environmental protection, sustainability of water

supply and services, and political acceptability by minimising the loss of water, ensuring the care and protection of water resources as well as the efficient and effective use of water. WCDM infrastructure would entail assets supporting WCDM strategies such as water resource management, distribution management, consumer/end user demand management and effluent/return flow management.

1.4.2.2 Desalination

Traditional water resource infrastructure involves abstraction from a river or groundwater. The infrastructure that is required to deal with acid mine drainage, waste discharges, and the purification of return flows is also a form of water resource infrastructure. A critical distinction is the recovery of costs for this infrastructure as the output is traditionally returned to the river rather than a user.

Desalination of sea water, whilst requiring similar infrastructure to the purification of waste water referred to above, can be distinguished in that the costs could theoretically be recovered from users. However the costs are typically significantly higher than traditional water resource infrastructure, and tend to be used to address shortfalls in times of water stress.

1.4.3 Green infrastructure

Green infrastructure is the organised network of natural systems to enhance water quality. These include greenways, wetlands, parks, forest preserves and native plant vegetation, that naturally manage stormwater and reduce flooding risk as well as improve water quality.

2 Data collection methodology

2.1 Presentation of data

Water resources infrastructure is managed according to Operating Areas (OA), namely Central OA, Southern OA, Eastern OA and Northern OA. These four areas are sometimes referred to as clusters and are reflected in the colour shaded areas in Figure 3 below. The figure reflects the 19 Water Management Areas (WMAs) listed in numerical order. These WMA's have now been consolidated into nine water management areas.

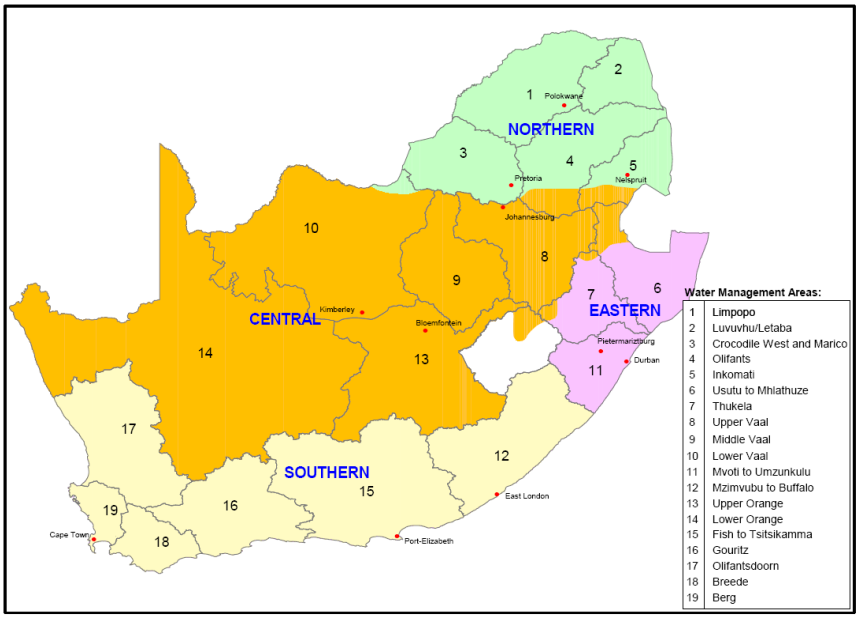


Figure 3: Map of the operating areas

Water Resource infrastructure owned by DWA is grouped into 'schemes' of which there are 255 spread across the country. Many schemes form part of a larger system such as the Vaal system where the water from the different schemes is consolidated for a single user base. In some instances users are charged at a system level and others at a scheme level. The charges are further broken down into Scheme Management Parameters (determined by the abstraction point).

This report covers infrastructure assets in the different schemes based on the four operating areas. Table 2-1 indicates the number of schemes in each of the operational areas.

Operating Area	Number of schemes
Central	35
Eastern	18
Northern	91
Southern	111
Total	**255**

Table 2-1 Number of schemes per operating area

The location of the above schemes and the number of schemes within each area is summarised in the figures below.

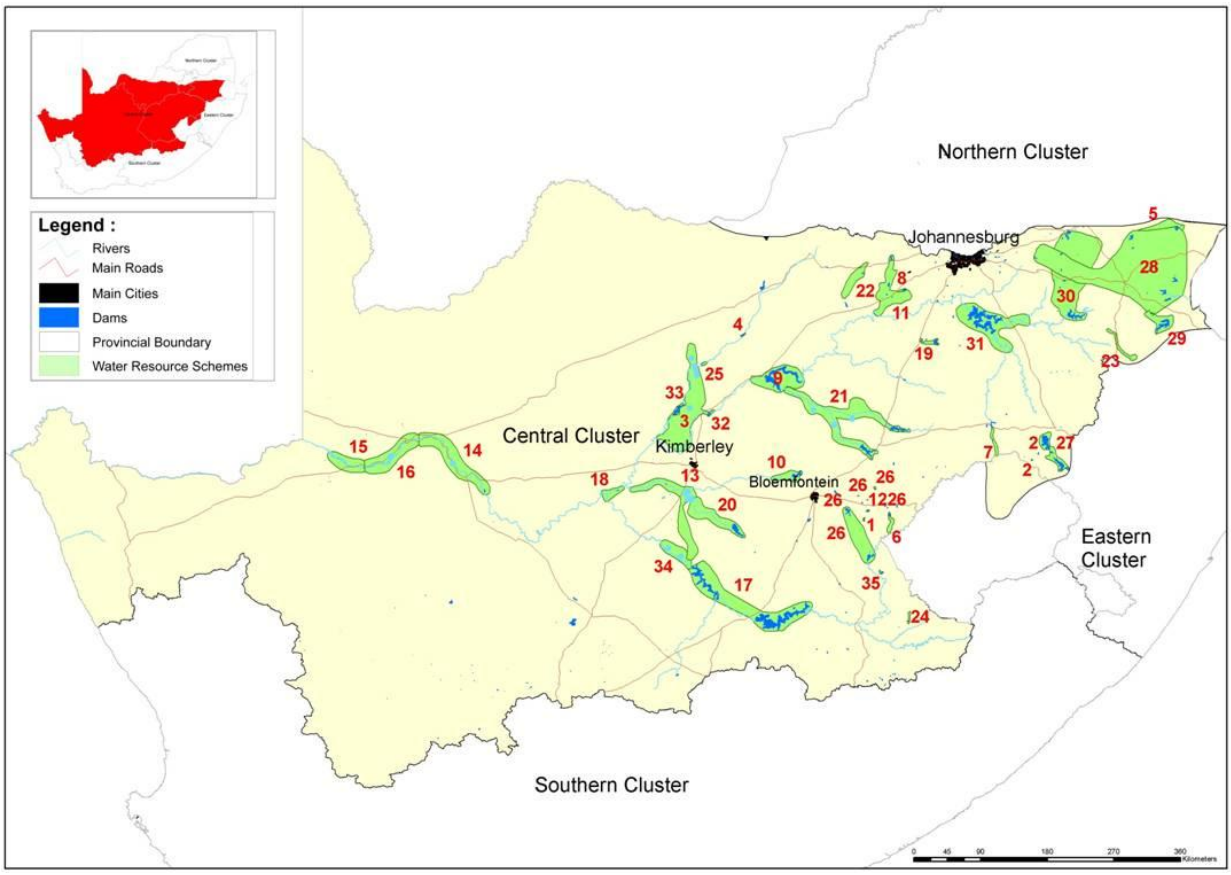


Figure 4: Central Operating Area map of schemes

№	Scheme Name	№	Scheme Name	№	Scheme Name
1	Caledon-Modder GWS	16	Orange River (Upington Islands)	31	Vaal Dam GWS
2	Fika Patso & Metsi Matsho	17	Orange River GWS	32	Vaal River GWS
3	Harts River (Spitskop Dam) GWS	18	Orange Vaal (Douglas Canals)	33	Vaalharts canals
4	Harts River (Wentzel Dam)	19	Rhenoster River	34	Van Der Kloof
5	Komati River GWS	20	Riet River	35	Wittespruit-Egmont Dam
6	Leeu River GWS (Armenia Dam)	21	Sand Vet GWS		
7	Lesotho Highlands Water Project	22	Schoonspruit GWS		
8	Loopspruit (Klipdrift Dam)	23	Slang River GWS		
9	Middle Vaal GWS	24	Sterkspruit		
10	Modder River	25	Taung Dam		
11	Mooi River GWS	26	ThabaN'chu Dams		
12	Moutloatsi Setlogelo Groothoek Dam	27	Tugela-Vaal GWS		
13	Orange Riet Canal	28	Usutu River GWS		
14	Orange River (Boegoeberg Dam)	29	Usutu Vaal Phase 2 GWS		
15	Orange River (Kakamas)	30	Usutu-Vaal GWS		

Table 2-2 Central OA schemes

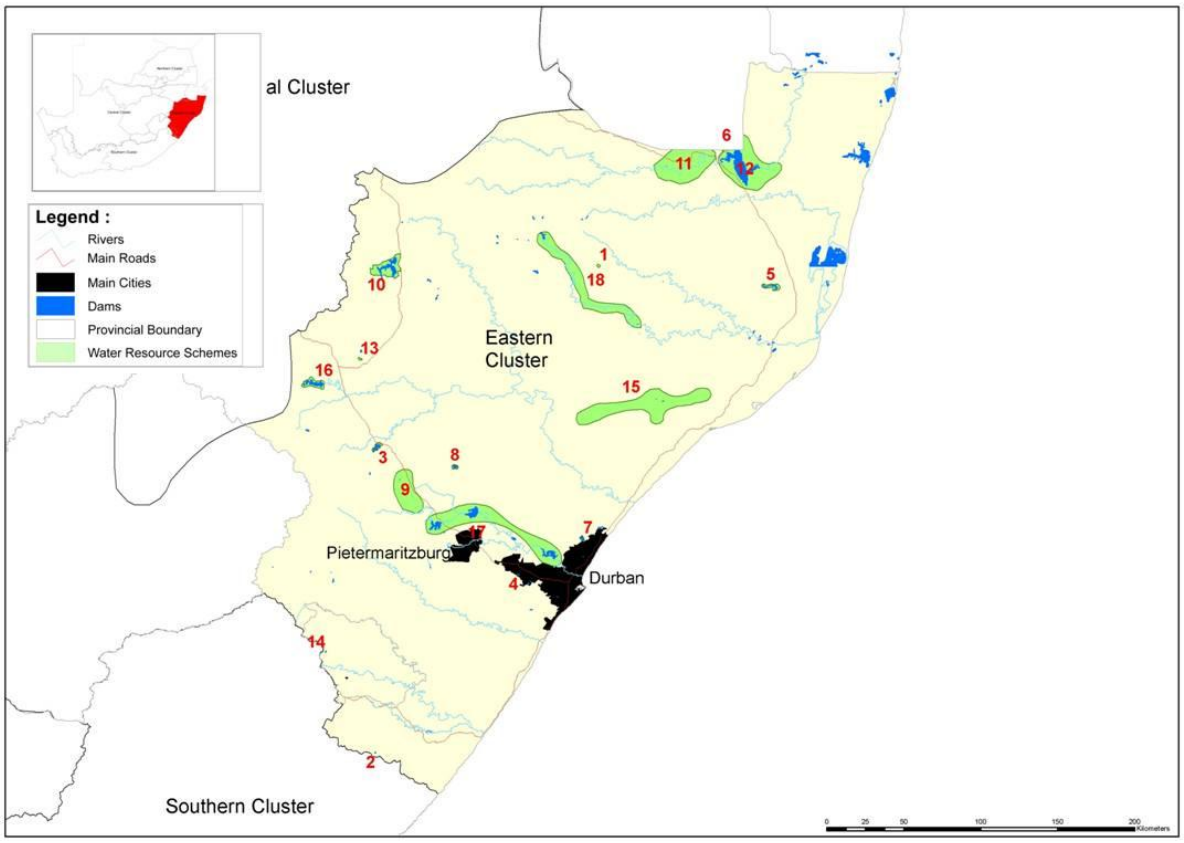


Figure 5 Eastern Operating Area Map of Schemes

№	Scheme Name	№	Scheme Name	№	Scheme Name
1	Bevenson Dam GWS	7	Mdloti River GWS	13	Qedusizi GWS
2	Bizana Dam	8	Mnyamvubu River GWS	14	Singisi GWS
3	Bushmans River GWS	9	Mooi Mgeni Rivers GWS	15	Tugela Mhlatuze Rivers GWS
4	Hammersdale Dam	10	Ngagane River GWS	16	Tugela River GWS
5	Hluhluwe River GWS	11	Pongola River GWS	17	Umgeni River GWS
6	Lavumisa GWS	12	Pongolapoort GWS	18	White Mfolozi River GWS

Table 2-3 Eastern Operating Area Schemes

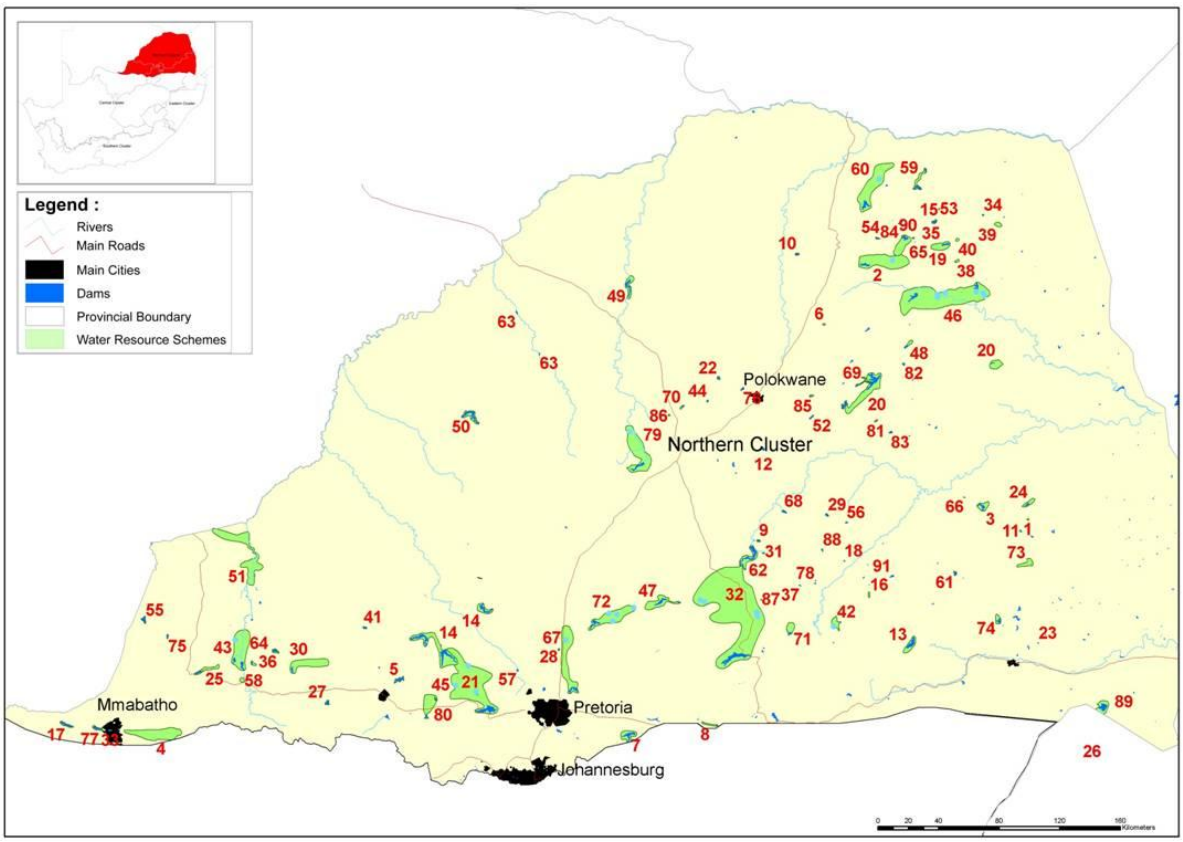


Figure 6 Northern Operating Area map of schemes

№	Scheme Name	№	Scheme Name	№	Scheme Name
1	Acornhoek Dam	31	Lole Montes Dam	61	Ohrigstad GWS
2	Albasini GWS	32	Loskop GWS	62	Olifants River GWS (Flag Boshielo)
3	Blyderivierpoort Dam	33	Lotlamoreng Dam	63	Palala River GWS (Susandale and Visgat Weirs)
4	Bo-Molopo GWS	34	Luvuvhu River GWS (Xikundu weir)	64	Pella Dam
5	Bospoort Dam	35	Luvuvhu River GWS(Nandoni Dam)	65	Phiphidi Dam
6	Botlokwa Dam	36	Madikwe Dam	66	Phiring Dam
7	Bronkhorspruit Dam	37	Mahlangu Dam	67	Pienaars River GWS (Roodeplaat Dam)
8	Brugspruit Pollution Control Works	38	Mahonisi Dam	68	Piet Gouws dam
9	Buffelsdoorn GWS(Mokotswane Dam)	39	Makulele Dam	69	Politsi GWS
10	Capes Thorne Dam	40	Malamulele Weir Scheme	70	Rietfontein Dam I and II
11	Casteel Dam	41	Mankwe	71	Rooikraal GWS
12	Chuniespoort Dam	42	Mapochsgronden GWS	72	Rust De Winter GWS
13	Crocodile River GWS (Kwena Dam)	43	Marico River GWS (Kromellenboog Dam)	73	Sabie River GWS (Inyaka Dam)
14	Crocodile River West GWS	44	Mashashane Dam	74	Sand River GWS (Witklip Dam)
15	Damani Dam	45	Middelkraal Dam	75	Sehuwjane Dam
16	Der Brochen Dam	46	Middle Letaba System GWS	76	Seshego Dam

№	Scheme Name	№	Scheme Name	№	Scheme Name
17	Disaneng Dam	47	Mkhombo Dam	77	Setumo Dam
18	Dr. Eiselen Dam	48	Modjadji Dam	78	Spitskop Dam
19	Duthuni Dam	49	Mogalakwena River GWS (Glen Alpine Dam)	79	Sterk River GWS (Doorndraai Dam)
20	Groot Letaba River GWS	50	Mogol River GWS (Mokolo Dam)	80	Sterkstroom GWS (Buffelspoort Dam)
21	Hartbeespoort GWS	51	Molatedi Dam	81	Thabina Dam
22	Houtrivier Dam	52	Molepo Dam	82	Thapani Dam
23	Kabokweni Dam	53	Mutale Weir	83	Tours Dam
24	Klaserie Dam	54	Mutshedzi Dam	84	Tshakhuma Dam
25	Klein Maricopoort GWS	55	Ngotoane Dam	85	Turfloop Dam
26	Komati River GWS (Driekoppies Dam)	56	Nkadimeng Dam	96	Vaalkop No 2 Dam
27	Koster Dam	57	Nooitgedaght Dam	87	Varswater Dam
28	Leeukraal Dam	58	Northern Region - Marico-Bosveld Scheme Buildings	88	Vergelegen Dam
29	Lepellane Dam	59	Nwanedi/Luphephe GWS	89	Vlakbult Dam
30	Lindleyspoort GWS	60	Nzhelele River GWS (Nzhelele Dam)	90	Vondo Dam
				91	Watersvals River GWS

Table 2-4 Northern Operating Area schemes

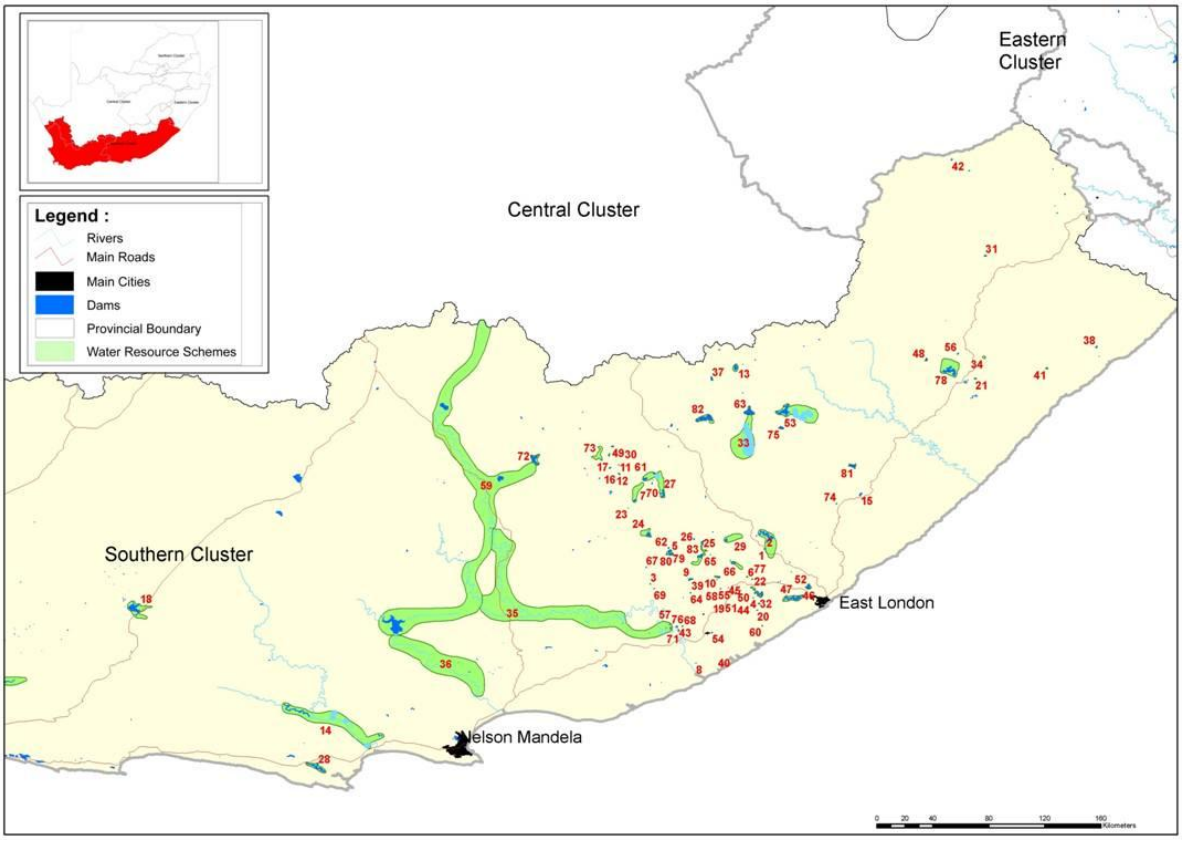


Figure 7 Southern Operating Area- Eastern Cape Map of schemes

№	Scheme Name	№	Scheme Name	№	Scheme Name
1	Amabele GWS (Amatola)	31	Kwabhaca (Ntenetyane Dam)	61	Oxkraal - Ciskei
2	Amatola (Wriggleswade Dam)	32	Laing Dam	62	Pleasant View Dam
3	Balura GWS (Amatola)	33	Lanti	63	Qamata (Lubisi Dam)
4	Bekruipkop - Ciskei	34	Libode (Mhlanga Dam)	64	Qibira
5	Binfield Park Dam	35	Lower Fish Scheme	65	Redhill
6	Blue Crane Dam	36	Lower Sundays Scheme	66	Rooikrantz Dam
7	Bushmanskrantz Dam	37	Macubeni Dam	67	Roxeni GWS (Amatola)
8	Dabi Dam	38	Magwa - TS*	68	Rura GWS (Amatola)
9	Debe Dam	39	Maipase - Ciskei	69	Sheshegu Dam
10	Dimbaza - Ciskei	40	Maitland - Ciskei	70	Shiloh - CS*
11	Donnybrook 1	41	Majola - TS*	71	Sinqumeni GWS (Amatola)
12	Donnybrook 2	42	Maluti (Belfort Dam)	72	Tarka River (Kommandodrift Dam)
13	Doorn River (Doorn River Dam)	43	Mankazana GWS (Amatola)	73	Tendergate - CS*
14	Gamtoos River (Kouga and Loerie Dams)	44	Masela 1	74	Toleni (Toleni Dam)
15	Gcuwa Weir	45	Masela 2	75	Tsojana Dam
16	Geluk GS	46	Mdantsane 1	76	Tyhefu (Ndlambe Dam)
17	Glenbrok	47	Mdantsane 2	77	Tyutyu
18	Groot River (Beervlei Dam)	48	Mhlahlane (Mabaleni Dam)	78	Umtata Dam
19	Gwaba	49	Midfort	79	Woburn 2
20	Gxethu GWS (Amatola)	50	Mount Coke	80	Woburn 3
21	Gxulu	51	Msengeni	81	Xilinxa Dam
22	Jan Tshatshu - Ciskei	52	Nahoon River (Nahoon Dam)	82	Xonxa Dam
23	Kamastone	53	Ncora (Ncora Dam)	83	Zanyokwe (Sandile Dam)
24	Kat River (Kat River Dam)	54	Ngwekazi		
25	Keiskammahoek (Cata Dam)	55	Noncampa		
26	Keiskammahoek (Mnyameni Dam)	56	Nqadu - TS*		
27	Klipplaat River (Waterdown Dam)	57	Nqwelo GWS (Amatola)		
28	Kromme River (Impofu Dam)	58	Nzikizini GWS (Amatola)		
29	Kubusi River (Gubu Dam)	59	Orange - Fish GWS		
30	Kuzitungu	60	Outspan Dam		

Table 2-5 Southern Operating Area-Eastern Cape schemes

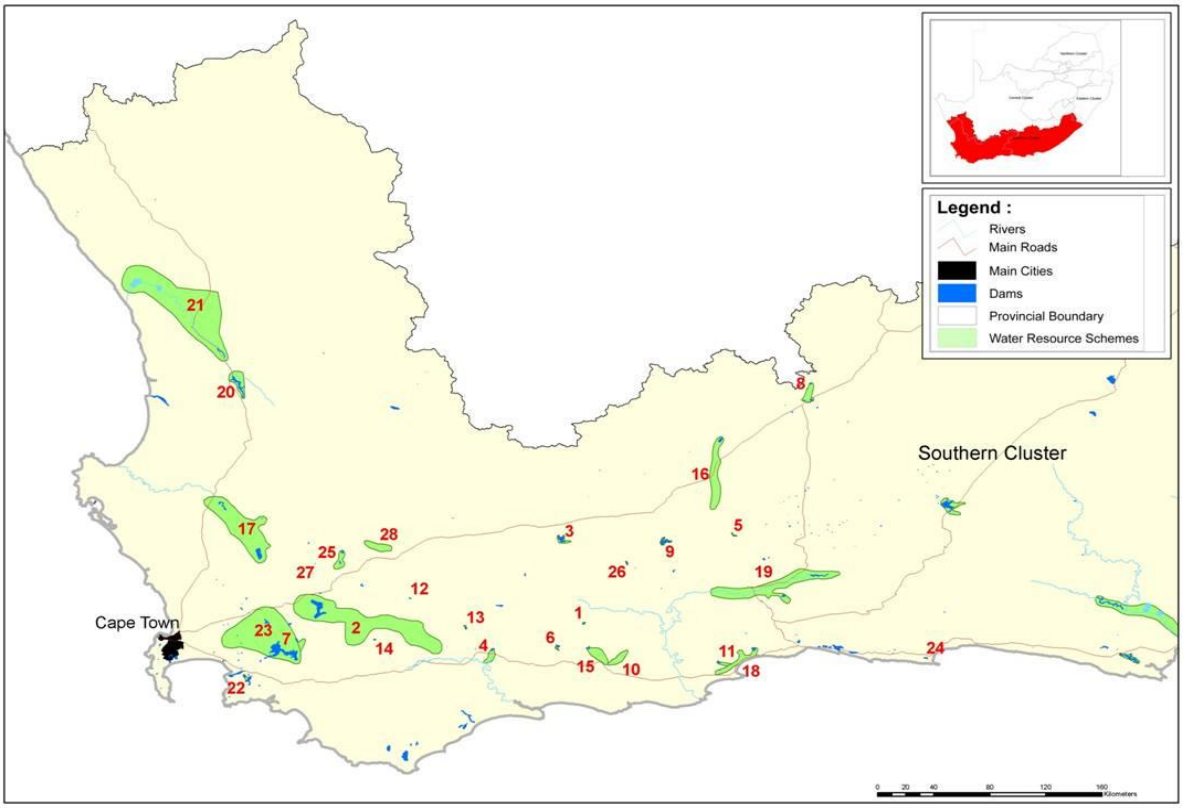


Figure 8 Southern Operating Area- Western Cape Map of schemes

№	Scheme Name	№	Scheme Name	№	Scheme Name
1	Brand River GWS (Miertjieskraal Dam)	11	Hartenbos River GWS (Hartbeeskuil Dam)	21	Olifants River Van Rhynsdorp GWS (Bulshoek Dam)
2	Breede River GWS (Brandvlei & Kwaggaskloof Dams)	12	Keisies River GWS (Pietersfontein Dam)	22	Palmiet River GWS (Rockview & Kogelberg Dams)
3	Buffels River GWS (Floriskraal Dam)	13	Kingna River GWS (Poortjieskloof Dam)	23	Riversonderend - Berg River GWS
4	Buffelsjags River GWS (Buffelsjags Dam)	14	Konings River GWS (Klipberg Dam)	24	Roodefontein Dam
5	Cordiers River GWS (Oukloof Dam)	15	Korente Vette River GWS (Korente-Vette Dam)	25	Sandrift River GWS (Roode Elsberg & Lakenvallei Dams)
6	Duivenhoks River GWS (Duivenhoks Dam)	16	Leeu River GWS (Leeu Gamka Dam)	26	Tierkloof Dam
7	Elands River GWS (Elandskloof Dam)	17	Lower Berg River GWS (Voelvlei & Misverstand Dams)	27	Valsch River GWS (Ben Etive Dam)
8	Gamka River GWS (Beaufort West Dam)	18	Mosselbay GWS (Wolwedans dam)	28	Verkeerdevlei Dam
9	Gamka River GWS (Gamkapoort Dam)	19	Olifants River (Stompdrift & Kamanassie Dams) (Oudtshoorn)		
10	Goukou River GWS	20	Olifants River GWS (Clanwilliam dam)		

Table 2-6 Southern Operating Area- Western Cape schemes

2.2 Source of data/information

All data has been received from the Department of Water Affairs, the details of which is reflected in the table below.

Information	Title and Department
Current asset register	Director: Asset Management
The proposed key infrastructure projects and the associated new build costs	Director: Management Accounting
Operations and maintenance costs	Deputy Director: Budget Planning and Price Setting
Raw water charges	Deputy Director: Budget Planning and Price Setting
Current revenues (Billing, Volumes and Collections)	Deputy Director: Revenue Management

Table 2-7 Source of data for analysis

2.3 Completeness of data/level of detail of the data

The level of resolution of data has been obtained at different levels, the highest level being the Operating Area and lowest level being the Cost Centres within DWA. The range is Operating Area, Water Management Area, System, Scheme, Cost Centre and SMP (for tariff breakdown). An explanation of the level of data received is described below.

2.3.1 Infrastructure Assets

The Department of Water Affairs asset register contains details of the Net book Value and condition of the asset at an asset class and cost centre level at the DWA year-end 31 March 2012. The Current Replacement Cost (CRC) and Depreciated Replacement Cost (DRC) have been obtained from the DWA asset register that contains the Sakhile Asset values at 31 March 2008 and 31 March 2010. This data is also provided at an asset class level and includes details of the scheme and condition of the asset.

The Net Book Value refers to the revalued asset i.e. its fair value at the date of revaluation less any subsequent accumulated depreciation and impairments.

The CRC refers to the value that is assigned to the asset based on what DWA would have to pay to replace the asset at that point in time at its current worth.

The DRC refers to the current cost of replacing the asset (as above CRC) adjusted for depreciation and impairment.

New projects planned by the department have been obtained for all the operating areas besides the North. This is still outstanding at time of writing.

2.3.2 Operating Expenditure

The Operating and Maintenance budget costs for 2013 have been obtained at a cost centre level.

2.3.3 Revenue

The amounts actually billed for water resource management and water resource development for the year-ended 31 March 2012 have been obtained at an Operating Area Level.

Actual Collection data has been received for the years under analysis, in total, but not at a detailed level for analysis.

Theoretical Billing information (what DWA should be billing to the users) can be extrapolated based on the volume data received. However, at time of writing incomplete tariff information has been provided and the theoretical calculations have not been performed.

3 Institutional Arrangements and infrastructure financing

The institutions involved in the development and management of water resource infrastructure are indicated in Figure 9 below.

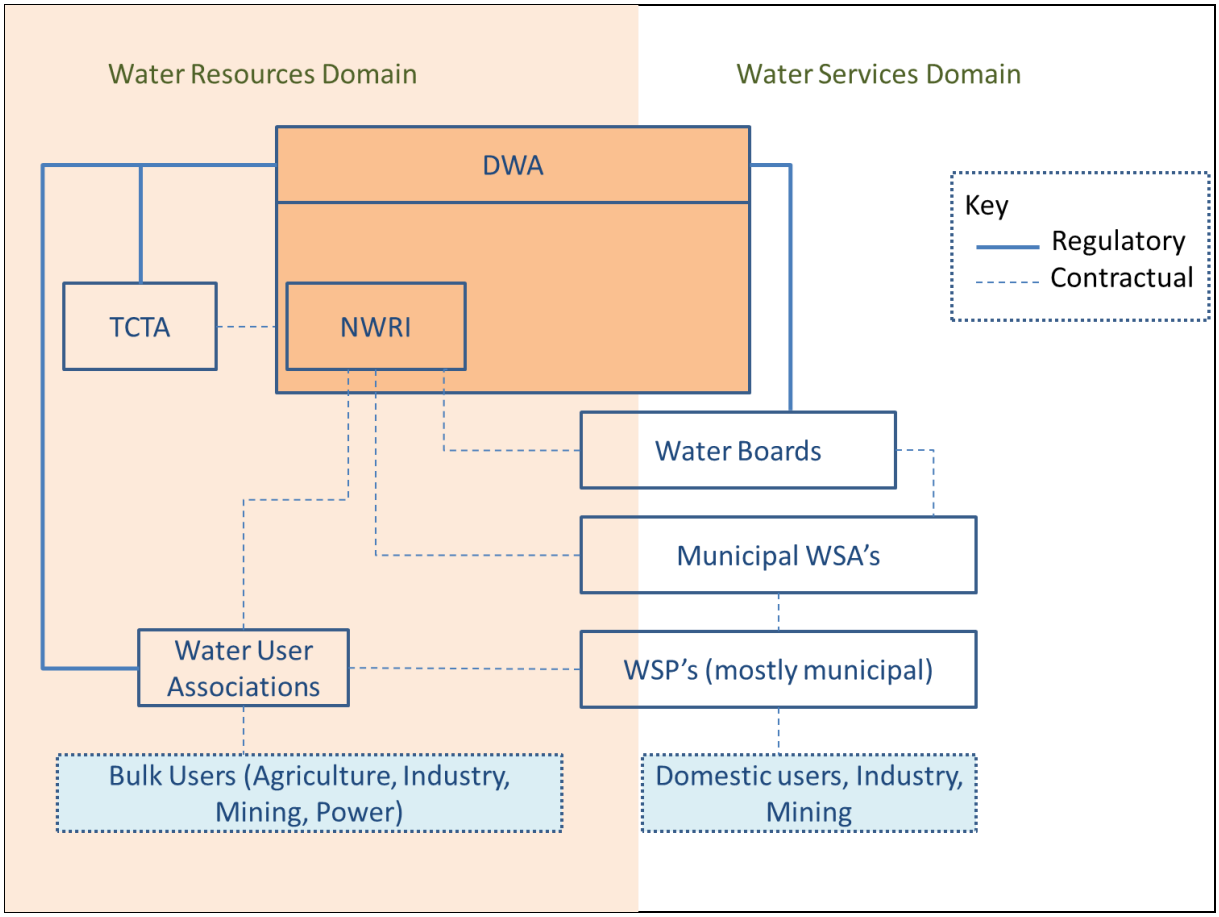


Figure 9: Institutions in the water resource sector

This report is concerned with the shaded area on the left, although for this draft only the DWA and TCTA asset base has been reviewed. Water Boards and municipalities, whilst primarily operating in the water services space, may also have water resource infrastructure such as small dams, desalination plants and acid mine drainage infrastructure.

The solid lines represent regulatory relationships where DWA practices institutional oversight. The dotted lines represent contractual relationships – either involving the provision of water, or the collection of revenue on behalf of DWA or TCTA.

Each of the above institutions is described in more detail below.

3.1 Department of Water Affairs

The Department of Water Affairs has three main types of responsibilities listed below. In order to fulfil these responsibilities, DWA plans, funds, constructs, maintains and operates the water resources infrastructure as well as sets and recovers water use charges.

Responsibilities:[1]

- DWA is the custodian of the water resources of the country and is thus responsible for the allocation and health of the country's water resources;
- DWA has a trusteeship role and is thus responsible to care for the country's water resource infrastructure; and
- DWA has a regulatory and oversight role

DWA, through its Water Trading Entity (WTE) manages the National Water Resource Infrastructure (NWRI) held in the trading accounts. This infrastructure is considered of national significance and is considered beneficial to operate, maintain and develop at a national level.

The WTE is divided into two parts, the Water Resource Management Unit and the Infrastructure Branch.

The water resource management functions include uses, conservation and allocation of water resources in a manner that is sustainable and equitable for the people residing in the relevant water management areas. The funding for the WRM component is through revenue generated from water users and if there is a shortfall in revenue generated to cover the operations, through augmentation from the fiscus.

The Infrastructure Branch deals with the development of new infrastructure and the operations and maintenance of existing infrastructure.

The operations are divided into 2 components:

1) Integrated systems: These are schemes that cut across many provinces. It consists of a number of dams and pipelines which operate as one inter-linked system.
2) Bulk water supply schemes: these operate as standalone water schemes and comprise primarily of the former homeland government schemes.

Funding for the schemes and systems is through revenue generated from water resource infrastructure users and augmentation from the fiscus when insufficient revenue is generated to cover the general operations and develop new infrastructure.

Infrastructure that is funded on-budget is implemented through the Infrastructure Branch of the Department. Some of the infrastructure costs are expected to be recovered through the Infrastructure charge as determined by the Pricing Strategy. This charge is scheme based and consists of three elements:

- Operations and Maintenance (O&M)

[1] January 2010, Water Trading Entity (WTE) Efficiency Drive, Current Status of Infrastructure funding and water pricing in the South African Water sector

- Depreciation
- Return on Assets (ROA)

The O&M charge is based on the actual cost of operating and maintaining the particular scheme. The depreciation and ROA are based on the asset replacement value (or cost) of the scheme, with the ROA being fixed at 4%. The aim of the depreciation charge is to fund the rehabilitation of assets to their original value, while the ROA is meant to fund the betterment of existing assets and the development of new social waterworks.

Through its Institutional Oversight unit, the Department regulates and oversees the performance of the TCTA, Water User Associations and Water Boards.

3.2 TCTA

The Trans-Caledon Tunnel Authority (TCTA) is a state-owned entity, established in terms of Government Notice No 2631 in Government Gazette No 10545, dated 12 December 1986. The notice was replaced by Government Notice 277 in Government Gazette No 21017 dated 24 March 2000, promulgated in terms of the National Water Act, 1988 (Chapter 10).

The Trans-Caledon Tunnel Authority (TCTA) is mandated to implement and fund raw bulk water infrastructure and is empowered to raise funds from the domestic and international money markets. Over the past 20 years, about R21 billion of investment in the Lesotho Highlands, Berg River Dam, and the Vaal River Augmentation projects has been funded from commercial sources (predominantly the bond market) through TCTA. TCTA mostly funds the implementation of infrastructure through debt funding raised from the private sector and from other funding agencies such as the DBSA.

TCTA's mandate is generally to develop infrastructure that has a high degree of economic utilisation, the expectation being that TCTA will be able to recover the full cost of the infrastructure without having to resort to government grants or transfers. This is often referred to as 'off budget' financing in that the capital costs are financed not from the National Revenue Fund (and the national budget allocation) but from alternative sources such as loans raised directly by the public entity.

Some of the more recent projects, such as Olifants, do have an element of social use, and this may have an impact on TCTA's financing model going forward. TCTA works closely with the DWA, the water boards, municipalities and other entities linked to bulk raw water infrastructure. TCTA has a few projects as per explicit directives from the Minister of Water and Environmental Affairs. TCTA raises the finance for the projects as well as manages the design and construction of the infrastructure.

The projects which TCTA funds and implements are:

- Lesotho Highlands Water Project (LHWP) – South Africa portion of the Delivery Tunnel North

The total project cost is R 16.4 billion and is fully covered by the payments from water users via water sales from the Vaal River System. The financing is explicitly government guaranteed. The South African Government is responsible for the full water costs incurred by TCTA and the Lesotho Highlands Development Authority.

- Berg Water Project (BWP)

This project was financed off budget (i.e. not from the National Revenue Fund). Long term loans were received from ABSA Bank, Development Bank of South Africa and the European Investment Bank. Repayment of the loans is being made from the revenue generated from the sale of water to the City of Cape Town.

- Vaal River Eastern Subsystem Augmentation Project (VRESAP)

This project was financed off budget without an explicit government guarantee. The revenue generated from the sale of water to Eskom, Sasol and the Vaal River Eastern Subsystem users will cover the repayments.

- Mooi-Mgeni Transfer Scheme Phase 2 (MMTS2)

The project is funded off budget and the costs will be recovered from the revenue generated from the sale of water.

- Komati Water Scheme Augmentation Project (KWSAP)

This project is funded off budget and the capital costs will be recovered from the revenue generated from the sale of water to Eskom over a 20-year period after commissioning.

- Olifants River Water Resource Development Project Phase 2 (ORWRDP2)

Mining activities and municipalities are the two main user groups. The municipalities, utilising National Treasury grants, will finance approximately 50% of the project and the balance will be raised through off budget mechanisms. The capital costs covered by the off-budget finance will be recovered from the revenue generated from the sale of water to industrial users.

- Mokolo-Crocodile River Water Augmentation Project (MCWAP)

This project will largely be financed off budget and repaid from revenues from sale of water delivered to users in terms of off-take agreements signed in advance of construction.

The TCTA's business model is commercially driven. Charges are set at a rate that will repay the debt while ensuring long-term stability of charges. As debt is repaid, new projects can be undertaken – ideally at charges which are in line with the historic charges for earlier projects. In the Vaal system, charges are not scheme based, but system based, while other infrastructure tends to have charges that are scheme based.

An important element of the model is the requirement to have off-take agreements in place before a project can commence. Extensive negotiation with future users is therefore required.

Some of the key characteristics of the TCTA model:

- Financing is off-budget – i.e. not reliant on allocations from the National Revenue Fund,

- Financing relies only on implicit guarantees from Treasury (excluding Lesotho Highlands (LHWP), which is explicitly guaranteed)
- All projects are ring-fenced, i.e. no cross-subsidisation is allowed
- Debt repayment is funded through water tariffs, over 20 years
- TCTA's up front deficits on a project are intended to ensure on-going affordability for end users; the deficit reverses after a few years, and is not related to TCTA's feasibility as a going concern.

3.3 Water Boards

Water boards are state entities created by the Minister of Water Affairs in terms of Chapter VI of the Water Services Act. The Minister determines the service area of the water board.

"The primary activity of a water board is to provide water services to other water services institutions within its service area" (section 29). In practical terms "activity" has traditionally meant the provision of bulk potable water services to local authorities that depend on a common source of raw water. More recent interpretations suggest that "water services" could include sanitation.

The 12 water boards vary greatly in size and in technical and financial capacity. Rand Water is as large as all the other water boards put together. Rand Water and Umgeni Water together constitute 84% of water board assets (as at March 2011).

A water board is a body corporate, and has the powers of a natural person of full capacity, except those powers which by nature can only attach to natural persons and which are inconsistent with the Act. The financial business model is thus commercial in nature.

A water board must strive to be financially independent and to this purpose must negotiate and set tariffs that ensure the financial sustainability of the water board.

A few water boards make use of DWA subsidies, with Sedibeng and Botshelo Water receiving the largest proportion. Botshelo Water which receives almost 73% of total subsidies disbursed by DWA (to water boards) provides water services to schemes in areas of the North West province which were previously under the homeland of Bophuthatswana. Cost recovery on most of these schemes is low hence the water board's heavy reliance on DWA subsidies.

With regards to borrowing, in 2002, National Treasury established guidelines limiting the borrowing powers of water boards and as a requirement, water boards must obtain National Treasury permission if they wish to exceed their borrowing limits. The aggregated debt: equity ratio of water boards was over 175% in 2004, and has declined each year to be sitting at 50% in 2011. This is attributable to Rand Water and Umgeni Water reducing their debt levels almost every year for the past 7 years. Aggregate long-term debt has decreased from R7bn to R3bn between 2004 and 2011, while equity levels have almost tripled over the same period (from R4.6bn to R13bn).

Debt collection is a major concern for most water boards. In 2011, it was estimated as shown in the table below, that 12 water boards were owed a total of R2.1 billion by municipalities.

WATER BOARDS MUNICIPAL DEBT SUMMARY - DECEMBER 2011							
Name of water board	OUTSTANDING BALANCE	CURRENT	DAYS 30	DAYS 60	DAYS 90	DAYS 120+	ARREARS
Amatola	15 868 304	1 900 197	12 411 440	587 564	1 197 102	(227 999)	13 968 107
Bloem Water	75 661 153	30 600 632	833 292	2 539 039	931 473	40 756 717	45 060 521
Botshelo Water	81 110 478	6 963 829	6 279 376	6 415 398	6 219 322	55 232 553	74 146 649
Bushbuckridge Water	255 335 447	10 737 237	(616 854)	4 030 518	6 853 082	234 331 464	244 598 210
Lepelle Northern Water	325 970 848	23 832 380	10 326 887	10 967 457	9 385 469	271 458 655	302 138 468
Magalies Water	20 777 127	8 657 220	3 447 601	3 396 661	2 696 185	2 579 461	12 119 908
Mhlathuze Water	7 592 444	7 661 213	(69 073)	-	81	223	(68 769)
Overberg Water	945 490	945 490	-	-	-	-	-
Pelladrift Water	342 700	192 603	150 097	-	-	-	150 097
Sedibeng Water	553 368 156	42 713 725	85 319 447	33 296 932	36 019 714	356 018 338	510 654 431
Rand Water	626 912 879	598 444 303	28 468 576	-	-	-	28 468 576
Umgeni Water	156 470 688	152 189 556	4 281 132	-	-	-	4 281 132
TOTAL	**2 120 355 714**	**884 838 385**	**150 831 921**	**61 233 569**	**63 302 428**	**960 149 411**	**1 235 517 329**

Table 3-1 Municipal Debt owed to Water Boards - December 2011. Source: DWA

At a meeting of Parliament's portfolio committee[2] on Water Affairs and Forestry, SALGA noted that this was due to several factors, namely that,

- several municipal billing systems were ineffective and outdated,
- in some cases there was no contract in place between water board and water service institution, and
- the accrual of interest on outstanding amounts.

To summarise, Water Boards play a limited role in water resource infrastructure development. Their development of bulk infrastructure is largely financed by off-budget sources, although this has been placed under some pressure due to delayed payment by municipalities and borrowing restrictions imposed by National Treasury.

3.4 Municipalities

The financial business model of a water service authority is closely regulated by the Municipal Finance Management Act, 2003 (MFMA). Important elements of the business financial model are:

- The Constitution (section 215) requires transparency, accountability and effective financial management and the processes to achieve this are set out in the MFMA;
- A municipality may set taxes and user charges but this must be in accordance with a tariff policy and is subject to any national guidelines;
- Expenditure, except in special circumstances, may only be in accordance with the approved budget;
- A municipality may incur short- and long-term, Rand denominated debt, provided provision is made on the approved budget and further that the former must be repaid during the budgetary cycle and the latter is restricted to purposes of capital expenditure;
- A municipality may, by resolution of its council, provide security for any of its debt obligations;

[2] Parliamentary Monitoring Group. Water Boards' Annual Reports 2006/2007. Available: www.pmg.org.za. Accessed: March 2009

- A municipality receives an equitable share of revenue raised nationally and distributed in terms of the Constitution, the Intergovernmental Fiscal Relations Act and the annual Division of Revenue Act; and
- The budget must be consistent with the national government's fiscal and macro-economic policies particularly those on inflation, administered pricing and equity.

Finance decisions are preceded by the integrated development planning process required by the Municipal Systems Act. The water services development plan (WSDP) required by the Water Services Act becomes part of the IDP. A local authority may only budget for capital items that are included in the IDP.

The Council must approve the annual budget and may not delegate this function. The budget approval is the culmination of planning and budgeting processes that are closely prescribed by the Municipal Systems Act and the MFMA.

Operational decisions are taken in terms of a delegation system and the mandatory service delivery and budgetary implementation plan (SDBIP).

While no breakdown is provided for water, in 2009/10, the municipalities sourced their capex as follows: Government grants and subsidies: R19.5bn (48%), external loans: R9bn (22%), public contributions and donations: R300m (0.7%) and R12bn (30%) from internally generated funds.[3] The high contribution from internally generated funds was expected to decline over the following 3 years, to a level of only 17%, with national transfers expected to make up the difference (by increasing to 58%). The Review indicates an increased reliance on national government transfers to fund local government's infrastructure investment.

Whilst borrowing has increased over the past 5 years, this has been driven by the public sector (almost exclusively the Development Bank of Southern Africa (DBSA)). The National Treasury review indicates that private lenders became more risk averse after the recession in 2008, and a major private lender to municipalities, namely the Infrastructure Finance Corporation (INCA), withdrew from the market in 2009 (citing declining margins due to competition from public sector lenders).

Several pieces of legislation govern aspects of municipal borrowing, notably the MFMA and its debt disclosure regulations. Section 45 of the MFMA allows municipalities and municipal entities to incur short term debt for bridging finance for operational purposes only. This has to be recovered within the financial year in which the debt is incurred. According to the National Treasury expenditure report, short term debt accounted for 6% of total municipal debt in 2010 - 70% of this being in the form of commercial paper – an interesting turnaround from three years before when most of it was simply in the form of overdrafts.

Section 46 of the MFMA permits long term debt for capital expenditure or the re-financing of certain existing long-term debt. The Treasury Expenditure Review reports that long term loans amount to approximately 64% of total local government debt.

[3] National Treasury's Local Government Revenue and Expenditure Review, 2011

To date, only the City of Cape Town, Johannesburg and Ekurhuleni have issued municipal bonds (totalling R11.8bn – the remaining 30% of total local government debt). Bonds have the benefit of allowing municipalities to negotiate the payment periods and interest rate payments whilst offering investors better interest rates than most other savings schemes.

Independent empirical research has been conducted into municipal borrowing[4]. The purpose was to establish the effect of municipal borrowing on infrastructure service delivery. The methodology was based on 66 interviews with stakeholders, including 29 municipalities and some quantitative analysis. The theoretical framework was the triad of a regulatory framework, a supply side of financial institutions and a demand side of borrowers. Together these must create a functioning and liquid sub-national capital market. This follows the Gurria Task Force contention that internationally not enough had been done on the demand side of financing.

As far as the regulatory framework is concerned the research found that legislation and regulation was in general conducive to market formation. It lies between a market-based approach and a co-operative system. The important elements of transparency, competition, sound financial management and accountability are present.

The demand side was limited by capacity constraints, poor tariff collection, insecurity and lack of predictability over future functions and revenues and a legacy of a conservative approach to borrowing by municipalities.

On the supply side there were a number of public and private institutions offering finance but an important aspect was that the DBSA, using concessionary public money, competed strongly and was "crowding-out" the private sector. Consequently, the DBSA held the greatest share of outstanding debt. This was contrary to international opinion that the markets should be led by the private sector.

Other outcomes from the research included:

- the threshold for a municipality to issue bonds, determined largely by cost-effectiveness, was so high, relative to loan rates, as to exclude most municipalities from the market;
- the quantum of government grants available, relative to the capacity to implement infrastructure, was a discouragement to borrowing;
- the much promoted international recommendation for bond pooling is already present in the form of the DBSA ;
- the potential for retail and revenue bonds is mooted but their viability is not established by the research;
- only 25 municipalities had made use of rating services to establish their creditworthiness;

[4] Liebig K et al Municipal Borrowing for Infrastructure Service Delivery in South Africa – a Critical Review. Study 34. German Development Institute. Bonn 2008.

- credit enhancement techniques such as guarantees are evident but their use should be encouraged; and
- the tendency in the South African market to lend against the balance sheet ("general obligation lending") rather than for projects is noted and consequently that lenders only have a limited influence on the way projects are implemented.

To summarise, the financing of municipal infrastructure is dominated by direct on-budget support from the fiscus and internal sources. At the same time the larger Metros have demonstrated their ability to raise off-budget finance through the bond market, whilst the DBSA has effectively played the role of 'debt pooler' for the broader municipal sector.

3.5 Water User Associations

A WUA derives its mandate from the National Water Act, which describes a WUA as a "co-operative association of individual water users" who for the purpose of common gain, carry out water-related functions. Only the Minister of Water Affairs, in accordance with the prescriptions of the Act, can establish or disestablish such an association.

Water User Associations (and their pre-cursor: Irrigation Boards) are entitled to set charges/levies on their members to recover the costs of administration, operation, depreciation and debt repayment of their own schemes, following the requirements of their constitutions. Where they are responsible for the operation of government water schemes, they can act as billing and/or implementing agents for DWA. Some irrigation boards/water user associations have outstanding pre-1994 loans with the Land Bank, while some have taken commercial loans for infrastructure development. There have been difficulties in repayment of all of these debts by farmers over the past decade, which has restricted the willingness of banks to provide loans. Current government policy is that the state will no longer underwrite either private sector or Land Bank loans.

3.6 Users

Whilst users are not part of the institutional arrangements, they are critical to understanding the relationships as they determine the primary source of revenue. COGTA, through its administration of the Municipal Infrastructure Grant, and National Treasury, through its allocation of on-budget funding, are also relevant.

The end users of water resource infrastructure are either bulk users such as power and mining, agriculture (normally through water user associations), and domestic users (after water has normally passed through a water board as well as the water service provider). Of relevance is that costs imposed on end users for water resource infrastructure must also consider the additional downstream costs that will be added to the final tariff.

Of equal relevance is the distance between the owner of the water resource infrastructure and the collection of the tariff from the end user. If there are intermediaries (such as Water Boards and WSPs) then it increases the risk that not all revenue will be collected.

4 Infrastructure Assets

4.1 Current Asset Value and condition

Table 4.1 below summarises the Department of Water affairs' Infrastructure Asset base per asset class as at the financial year-end, 31 March 2012. The asset register indicates an asset base of R59 billion (excluding TCTA assets).

The land values refers to those that have been identified as government owned within the control line and the servitudes refer to the land identified where DWA has right of use or access.

Asset Class	Net Book Value: 31 March 2012 (R'000)	Condition					Sakhile: March 2008	
		Very Poor	Poor	Fair	Good	Very Good	Current Replacement Cost (CRC) R'000	Depreciated Replacement Cost (DRC) R'000
Buildings	846	-	3%	36%	48%	13%	1 213 105	535 731
Canals	8 541 547	2%	5%	36%	48%	10%	32 723 976	14 950 077
Dams	30 223 927	-	1%	12%	81%	6%	54 785 109	29 142 220
Pipelines	2 531 795	-	4%	12%	81%	3%	9 338 053	5 515 784
Pump stations	571 825	-	-	18%	71%	11%	3 035 891	1 774 650
Reservoirs	215 973	-	-	60%	40%	-	2 245 165	870 273
Treatment Works	24 363	-	3%	45%	42%	10%	52 138	19 661
Tunnels	6 301 324	-	-	60%	37%	3%	19 380 819	7 146 692
WS: Telemetry	2 195	-	-	-	100%	-	-	-
Other	9 971 982						8 865 738	3 287 681
Boreholes	14 959	-	2%	61%	37%	-		
Land	6 687 132	N/A						
Measuring Facilities	2 479 313	-	3%	42%	49%	6%		
Power Supply	6 395	-	-	43%	27%	30%		
Roads and Bridges	17 153	4%	5%	22%	17%	51%		
Servitudes	767 029	N/A						
Total	**58 385 777**						**131 639 995**	**63 242 769**

Table 4-1 Summary of the Department of Water Affairs Asset Base

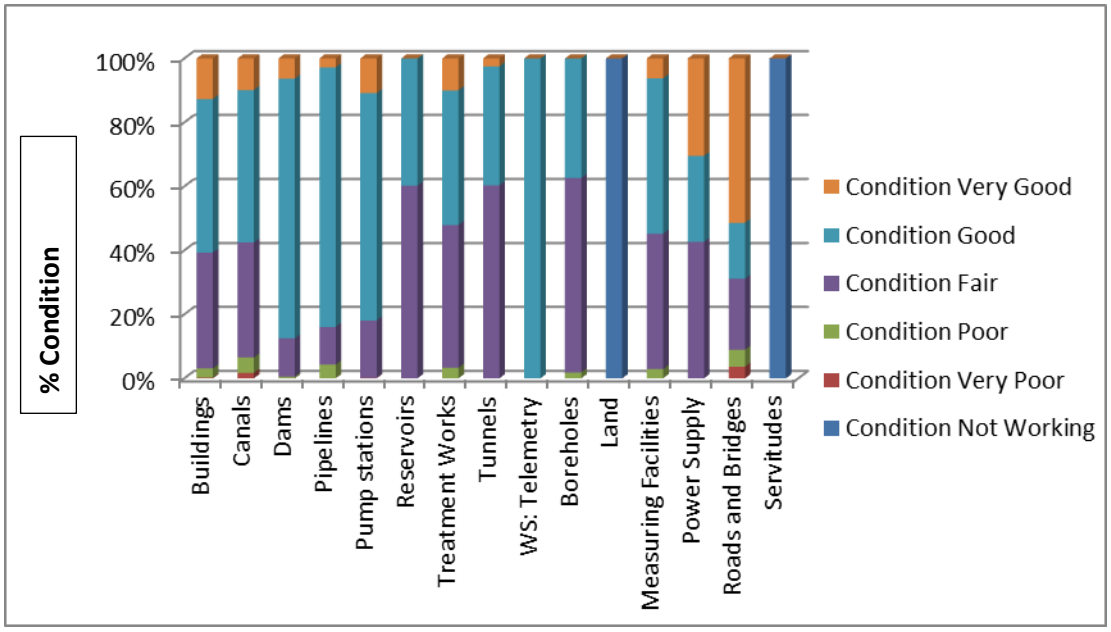


Figure 10 Condition profile of DWA assets at 31 March 2012

Most of the assets are in good or very good condition. However, a significant portion of the reservoirs, treatment works, tunnels and boreholes are only in fair condition.

The Sakhile[5] report provides the asset values (as per the March 2008 financial statements) using the Current Replacement Cost (CRC) and the Depreciated Replacement Cost (DRC). The DRC has been obtained by first determining the CRC and then depreciating the asset based on the ratio of the remaining useful life to the expected useful life.

The Annual Report indicates a value of R67 billion for the Infrastructure Assets. This value does not include Intangible assets. The difference of R7 billion (as compared to the Asset register total of R58 billion above) relates to TCTA Assets. In the 2012 financial year, DWA changed its accounting policy for recording assets. TCTA had previously recorded these assets in its own books. These assets are now included in DWA's (WTE's) Annual Report.

TCTA's Annual Report of 2010 indicates a tangible asset value of R6 billion which is broken down into projects (and not per asset class) as per the table below.

Projects in South Africa	2010 R' m
LHWP	2 057
BWP	1 225
VRESAP	2 853
Advisory Services	23
MMTS2	26
ORWRDP	8
KWSAP	24

[5] Sakhile Project (DWAF WP9233) – Verification and Valuation of Major Infrastructure Assets, State of water resources Infrastructure (Revision 2 – 30 October 08)

Total	6 216

Table 4-2 TCTA Projects as per the 2010 Annual Report

In addition to the assets above, DWA has an intangible asset of R 16 billion relating to a right to receive water (from the LHWP) in perpetuity. This right is capitalised as an enduring benefit.

4.1.1 Other Studies

4.1.1.1 WIF Phase 2

The WIF Phase 2 report estimated the CRC of the water resources infrastructure to be R286 billion in 2011. [6]

4.1.1.2 Water Trading Entity report[7]

The Department of Water Affairs has summarised the water resource infrastructure assets owned and operated by the Department held in Trading Account 2, Trading Account 3 and the Main Account. See the table below for the summary of values. The estimate of the CRC at 31 March 2009 was R142 billion.

	CRC (Mar 09) R'000
TA2	91 024 555
TA3	43 826 226
Previous Main Account allocated to TA	7 471 210
Total	**142 321 991**

Table 4-3 Asset base per the Water Trading entity report

4.2 Refurbishments

As can be seen in Figure 10, infrastructure assets in poor and very poor condition are mainly canals, pipelines, measuring facilities and some buildings and treatment works. These infrastructure assets are regarded as "assets at risk". Using the 2010 Sakhile current replacement cost values of the assets in poor and very poor condition, an estimate of the refurbishment requirement has been determined as R10 billion. The Approved annual expenditure for the four operating areas is indicated below. This amounts to almost R1 billion and represents 1.59% of the total asset base (at Net Book Value. It is only 0.7% of the estimated replacement cost). It would take approximately 63 years to refurbish the total asset base at this rate (or 143 years at CRC values). The average useful life of the infrastructure assets is 45 years implying an under-budget for refurbishment requirements.

[6] WIF Phase 2 final report

[7] January 2010, Water Trading Entity (WTE) Efficiency Drive, Current Status of Infrastructure funding and water pricing in the South African Water sector

Operating Area	CRC 31 March 2010 R' 000	Approved Annual Capital Expenditure: 2012/2013 R'000
Central OA	6 853 511	606 993
Eastern OA	109 465	42 151
Northern OA	1 805 179	162 590
Southern OA	1 493 255	114 970
Total	**10 261 410**	**926 704**

Table 4-4 Current Replacement Cost of Assets in Poor and Very Poor condition and DWA Approved Capital expenditure

4.2.1 Other Studies

4.2.1.1 WIF Phase 2[8]

The WIF model projected rehabilitation costs for the 10 years (2012-2021) based on the asset value divided by the life of the asset. The results indicated that R64 billion would be needed, thus R6.4 billion p.a.

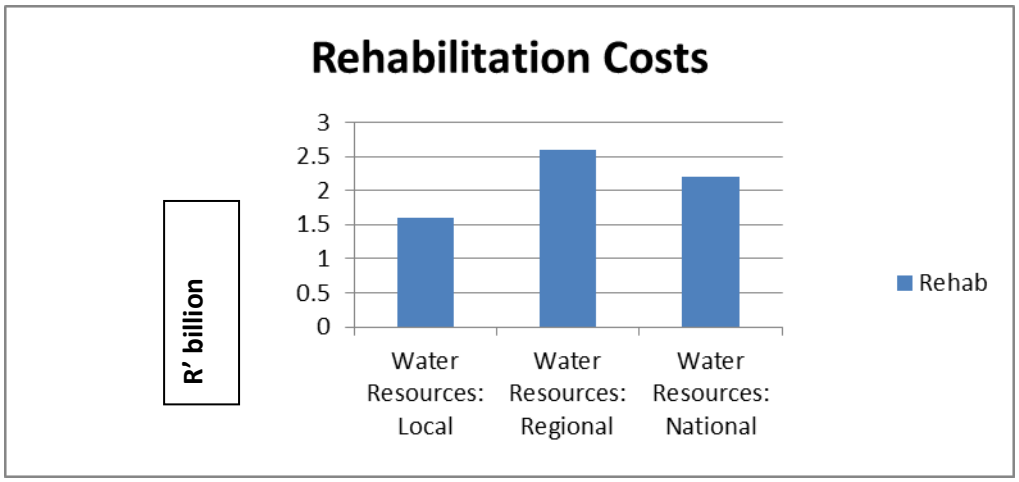


Figure 11 Annual Rehabilitation Costs

4.2.1.2 Water Trading Entity report[9]

The Department of Water Affairs had estimated the annual refurbishment requirement in March 2009 per trading account, the total requirement being R1.3 billion p.a.

Trading Account	Average refurbishment needs pa (Mar 09)

[8] WIF Phase 2 final report

[9] January 2010, Water Trading Entity (WTE) Efficiency Drive, Current Status of Infrastructure funding and water pricing in the South African Water sector

	R'000
TA2	738 599
TA3	493 122
Previous Main Account allocated to TA	89 147
Total	**1 320 870**

Table 4-5 Average annual refurbishment needs

4.3 Projected capital expenditure

The development of new water resources infrastructure has different phases namely:

- Pre-feasibility Phase: Preliminary investigations of alternatives and identify best options for further detailed studies
- Feasibility Phase: Detailed assessment of best options and recommendations of project
- Design/Documentation Phase: Formalise institutional arrangements, secure funding, procurement procedures and engineering design and construction
- Construction implementation Phase: Procurement and construction

The following are new projects under the National Water Resource Strategy (NWRS):

1. **ORWRDP (Ph 2A) - De Hoop Dam**
   This project is at the Construction phase and relates to *SIP 1: Unlocking the northern mineral belt with Waterberg as Catalyst.* The main infrastructure is a dam, to supply the new mining developments, augmentation of domestic water supplies to urban and rural users in the middle Olifants River Catchment area including Polokwane, Mokopane, Lebowaghomo and to various communities on the Nebo Plateau and Sekhukhune.

2. **ORWRDP (Ph 2B-I) - Bulk distribution (Sub Phases 2C and 2D)**
   This project is also in the construction phase and relates to *SIP 1: Unlocking the northern mineral belt with Waterberg as Catalyst.* The infrastructure assets under this project are pumping stations, pipelines, balancing dams, operational infrastructure and appurtenant structures. The assets being procured are bulk distribution works from Flag Boshielo to Mokopane, De Hoop to Steelpoort link, Steelpoort to Mooihoek, Mooihoek to Olifantspoort, De Hoop to Steelpoort, Nebo Plateau and Roossenekal including the incorporation of LWUA infrastructure.

3. **GLeWAP Phase (Nwamitwa Dam)**
   This project is in the feasibility stage and forms part of *SIP 1: Unlocking the northern mineral belt with Waterberg as Catalyst.* The main infrastructure covered under this project is Dam, Water Treatment Plant, Pipelines and Reservoirs. The aim of this project is to meet the projected growing primary supply requirements to the year 2025 and to improve the water availability for the riverine ecosystem by building the Nwamitwa Dam.

4. **Dam Safety Rehabilitation Programme**

This is a continuous project in construction phase and relates to the rehabilitation of assets and dam safety works. This project is not linked to any SIPs.

5. **Water Resources Project: Raising of Clanwilliam Dam**
   This project is in the design phase and relates to *SIP 5: Saldanha-Northern Cape Development Corridor.* This project entails upgrading the existing dam to stabilise the distortion and the augmentation of agricultural water supply to meet increasing demands.

6. **Mokolo and Crocodile River (West) Water Augmentation Project (Phases 1)**
   This project is in the construction phase and relates to *SIP 1: Unlocking the northern mineral belt with Waterberg as Catalyst*. The infrastructure assets are pumping stations, pipelines, balancing dams, operational and national Key Point infrastructure and appurtenant structures. The main reasons for this project are the augmentation of domestic and industrial water supply to the new Eskom/IPP power station(s), extension of associated mining activities and fast growing population in the area.

7. **Mokolo and Crocodile River (West) Water Augmentation Project (Phases 2A and 3)**
   This project is in the feasibility stage and relates to the same infrastructure assets as Phase 1 above.

8. **GLeWAP Phase (Tzaneen Dam Raising)**
   This project is in the design stage and relates to *SIP 1: Unlocking the northern mineral belt with Waterberg as Catalyst.* The infrastructure assets are dam, water treatment plant, pipelines and reservoirs. The reason for this project is to meet the projected growing primary supply requirements to the year 2025 and to improve the water availability for the riverine ecosystem.

9. **Development of Raising of Hazelmere Dam**
   This project is in the design stage and relates to *SIP 2: Durban-Free State Gauteng Logistics and Industrial Corridor*, The infrastructure under this project is the Dam (radial crest gates) and the reason for this project is the augmentation of water supply to Umgeni Water for treatment to KZN north coast (Mdloti to Thukela areas).

10. **Mopani DM Emergency Works**
    This project is in the construction phase to refurbish dilapidated infrastructure and does not relate to any SIPs.

The above project costs and budgets for the next 10 years are summarised in the table below.

Table 4-6 Projects under NWRS

Programme/Project name	Total project cost R'm	Audited Outcome			Budget Estimate									
		2009/10 R'm	2010/11 R'm	2011/12 R'm	2012/13 R'm	2013/14 R'm	2014/15 R'm	2015/16 R'm	2016/17 R'm	2017/18 R'm	2018/19 R'm	2019/20 R'm	2020/21 R'm	2021/22 R'm
ORWRDP (Ph 2A) - De Hoop Dam	3 074	689	604	563	324	49	-	-	-	-	-	-	-	-
ORWRDP (Ph 2B-I) - Bulk distribution (Sub Phases 2C and 2D)	13 000	74	267	469	567	773	790	787	2 000	2 100	-	-	-	-
GLeWAP Phase (Nwamitwa Dam)	1 325	-	-	-	68	264	238	344	300	99	-	-	-	-
Dam Safety Rehabilitation Programme	2 800	354	328	300	342	393	455	393	420	441	463	486	511	536
Water Resources Project: Raising of Clanwilliam Dam	1 830	-	-	9	51	359	584	369	440	-	-	-	-	-
Mokolo and Crocodile River (West) Water Augmentation Project (Phases 1)	2 138	30	155	293	-	42	63	27	-	-	-	-	-	-
Mokolo and Crocodile River (West) Water Augmentation Project (Phases 2A and 3)	13 950	-	-	-	-	75	851	2 714	2 920	2 100	580	-	-	-
GLeWAP Phase (Tzaneen Dam Raising)	125	-	-	-	16	69	34	5	-	-	-	-	-	-
Development of Raising of Hazelmere Dam	360	-	11	4	49	194	98	-	-	-	-	-	-	-
Mopani DM Emergency Works	80	-	-	-	40	-	-	-	-	-	-	-	-	-
Total	**38 682**	**1 147**	**1 365**	**1 639**	**1 457**	**2 218**	**3 113**	**4 639**	**6 080**	**4 740**	**1 043**	**486**	**511**	**536**

Some projects are still under planning and are reflected in the table below. The costs and timeframes are only estimates and still need to be confirmed by on-going feasibility studies. The final capital cost for the Mzimvubu Water Project is likely to reduce substantially. The cost for the Raising of Clanwilliam Dam does not include conveyance infrastructure and on-farm developments - this will be determined in the Utilisation of Additional Water Study currently undertaken jointly with the Western Cape Provincial Department of Agriculture. As these projects are still in the planning stage, there is still some uncertainty with regards to the construction date, duration and costs.

Scheme	State of Investigation	Begin Construct	Duration (months)	Cost R m
LHWP Ph 2	Feasibility complete	2013	60	11 384
Clanwilliam Dam (raising + distribution)	Implementation planning	2014 ?	36	1 900
MMTS-2B	Implementation planning	2014	18	400
Zalu Dam (+ distribution)	Feasibility study	2015	36	500
Mzimvubu Water Project	Feasibility study	2015	48	20 000
Foxwood Dam	Feasibility study	2015	36	300
nCwabeni OCS Dam	Feasibility study	2015	30	650
AMD - long term infrastructure	Feasibility Study	2015?	?	?
Vioolsdrift Dam (Orange River) 260 million m3	Prefeasibility Study completed	2017 ?	36	561
Voelvlei Dam augmentation	Feasibility study	2018	24	500
uMkhomazi Water Project Phase 1	Feasibility study	2018	48	10 000
Crocodile East Water Project	Feasibility study to start	2019	38	1 000
Mvoti Water Project	Feasibility study to start	2019	36	1 000

Table 4-7 Projects in Planning

The expected cash flow of these projects in NWRS and planning is reflected in the table below[10]. The years 2015 to 2018 will require a significant amount of financing as an average of R13 billion p.a. is required in these four years.

[10] At time of writing, no information was received for the AMD project

Table 4-8 Cash flow of projects in Planning

Scheme	Cash Flow R'm									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
ORWRDP (Ph 2A) - De Hoop Dam	324	49	-	-	-	-	-	-	-	-
ORWRDP (Ph 2B-I) - Bulk distribution (Sub Phases 2C and 2D)	567	773	790	787	2 000	2 100	-	-	-	-
GLeWAP Phase (Nwamitwa Dam)	68	264	238	344	300	99	-	-	-	-
Dam Safety Rehabilitation Programme	342	393	455	393	420	441	463	486	511	536
Water Resources Project: Raising of Clanwilliam Dam	51	359	584	369	440	-	-	-	-	-
Mokolo and Crocodile River (West) Water Augmentation Project (Phases 1)	-	42	63	27	-	-	-	-	-	-
Mokolo and Crocodile River (West) Water Augmentation Project (Phases 2A and 3)	-	75	851	2 714	2 920	2 100	580	-	-	-
GLeWAP Phase (Tzaneen Dam Raising)	16	69	34	5	-	-	-	-	-	-
Development of Raising of Hazelmere Dam	49	194	98	-	-	-	-	-	-	-
Mopani DM Emergency Works	40	-	-	-	-	-	-	-	-	-
ERP system upgrade from version 4.7 to ECC6	80	99	-	-	-	-	-	-	-	-
NWRI Support/ Project management	223	245	266	274	288	303	318	334	350	368
Financial Management/Project support	175	175	214	221	232	243	256	268	282	296
LHWP Ph 2	2 277	2 277	2 277	2 277	2 277					
Clanwilliam Dam (raising + distribution)		633	633	633						
MMTS-2B		267	133							
Zalu Dam (+ distribution)			167	167	167					
Mzimvubu Water Project			5 000	5 000	5 000	5 000				
Foxwood Dam			100	100	100					
nCwabeni OCS Dam			260	260	130					
AMD - long term infrastructure										
Vioolsdrift Dam (Orange River) 260 million m3					187	187	187			
Voelvlei Dam augmentation						250	250			
uMkhomazi Water Project Phase 1						2 500	2 500	2 500	2 500	
Crocodile East Water Project							316	316	316	53
Mvoti Water Project							333	333	333	
Total	**4 211**	**5 913**	**12 163**	**13 571**	**14 460**	**13 223**	**5 202**	**4 237**	**4 292**	**1 252**

4.3.1.1 Other Studies: WIF Phase 2[11]

The WIF model projected capital costs for water resources for the 10 years (2012-2021). The capital costs make provision for expenditure to upgrade existing infrastructure and providing new infrastructure.

The WIF studies indicate an increase in water demand of 1.2% over the 10 years (2012 to 2021). The modelled results for the water demand are shown in the figure below.

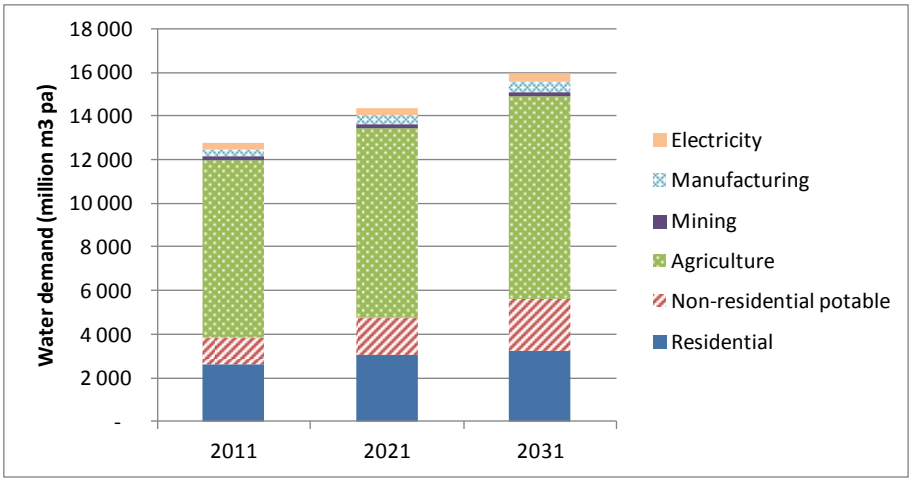
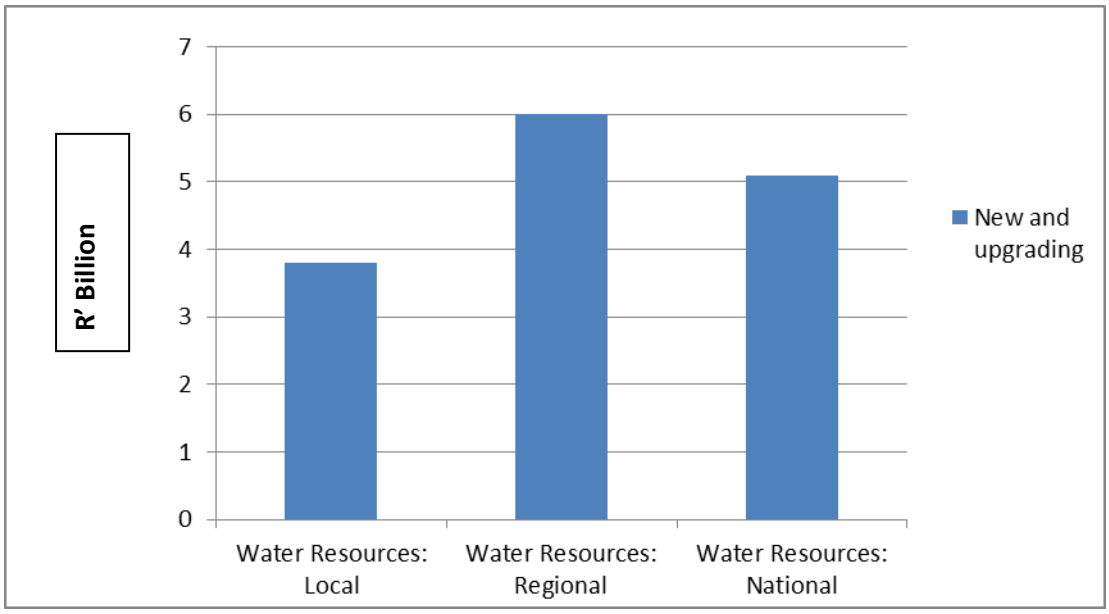


Figure 12 Projected Water Demand

The new infrastructure requirements are calculated based on the increased water requirements.

The model results indicated capital expenditure of R149 billion would be needed for new infrastructure. Assuming that the capital is spent uniformly over the 10 years, the capital expenditure requirement of R14.9 billion p.a. is represented in the figure below.



[11] WIF Phase 2 Final report

Figure 13: Average annual capital expenditure for 10 years (constant 2012 prices) for new and upgrading infrastructure

5 Operating Expenditure

5.1 Current Operations and Maintenance

The following table represents the Operations and Maintenance budget expense for the 2013 financial year per operating area. This estimate is based on the cost to operate and maintain all DWA assets. Approximately R1 billion has been budgeted for.

Operating Area	Budgeted O&M R'000
Central	491 272
Eastern	136 913
Northern	210 070
Southern	143 539
Total	**981 793**

Table 5-1 Budgeted O&M per Operating Area

As a comparative, a model was used to estimate the total operations and maintenance cost using a percentage of Current Replacement Cost per annum on all DWA assets, based on industry norms and standards. The model indicates that R1.1 billion should be budgeted for Operations and Maintenance on an annual basis. The breakdown of the expenditure into the asset classes is in the table below. The current budget seems to be in line with expectations.

Asset Class	Operations & Maintenance R'000
Buildings	105 799
Canals	175 592
Dams	480 733
Pipelines	63 785
Pump stations	11 902
Reservoirs	6 100
On site Treatment Works	1 144
Tunnels	113 963
Boreholes	3 760
Measuring Facilities	109 833
Power Supply	596
Roads and Bridges	1 717
Total	**1 074 922**

Table 5-2 O&M per Asset class based on industry norms

5.2 Projected O&M

Using the average industry norms and standards percentage of 0.74% (calculated average for the assets in Table 5-2)Table 5-2 O&M per Asset class based on industry norms an estimate of the Operations and Maintenance cost has been determined for the new projects in 4.3 Projected Capital

expenditure. This amounts to approximately R285 million for the projects under NWRS and R356 million for projects under Planning, a total of R641 million on an annual basis.

6 Revenue

6.1 Raw water pricing[12]

6.1.1 Raw Water Infrastructure Charge

Financing of the development and operation of water resources infrastructure is done primarily in terms of the Pricing Strategy, with different institutions involved at different levels. A differentiation between infrastructure to meet social versus commercial demand can be made. Typically the former is funded on-budget from the fiscus with charges set to recover operational and nominal asset costs. Infrastructure for commercial demand on the other hand is funded using commercial off-budget finance with charges set to recover the full financial cost of operation and debt repayment.

6.1.1.1 National Raw Water Infrastructure Charges for Government Funded Schemes

The raw water charge for existing publicly financed infrastructure consists of three elements calculated for each scheme in the country, namely:

- **Operation and Maintenance Charge**: to cover the direct (personnel and materials) and indirect (overhead) costs associated with administering, operating and maintaining that scheme, estimated through the annual budgeting process.

- **Depreciation Charge**: to cover the typical refurbishment costs associated with loss of functional performance that is not restored by current maintenance. This charge is estimated on a straight line basis on the depreciable portion of the replacement value of the asset over its total useful life. The replacement value is the revalued asset value as determined by a technical revaluation process. A revaluation is undertaken every 10 years and in the intervening years, the PPI is used to escalate the base value of the infrastructure assets. The calculation of the annual depreciable cost is as below:

  Replacement Value * Depreciable Portion% / expected useful life

  The depreciable portion and useful life over which the asset is depreciated is reflected in the table below.

[12] June 2012, Review of Water Pricing, WP10465

Component	Depreciable Portion %	Estimated Total Useful Life (years)
Dams & Weirs	10	45
Canals	40	45
Tunnels	10	45
Pump Stations	40	30
Syphons & Concrete pipelines	30	45
Steel pipelines	75	30
Buildings	100	40

Table 6-1 Depreciable Portion and Useful life per asset component

- **Return on Assets (ROA) Charge**: to cover the social opportunity cost of capital (partially covering the financial costs) to government for publicly funded infrastructure, to be used for funding augmentation planning studies, new schemes or betterments of existing schemes for social purposes or dam safety betterment, estimated as a percentage (currently 4%) of the depreciated replacement value.

The Department calculates these charges annually for each government water scheme on a volumetric basis (Rand per cubic metre) and invoices water users according to their sector, with the following general rules:

- Municipal, bulk industrial, power and mining users are charged O&M, depreciation and ROA charges and are typically billed on a monthly cycle.
- Agricultural users are charged O&M and depreciation charges and are typically billed on a six monthly cycle; the argument for not applying ROA to agriculture for existing schemes is that future social infrastructure will be primarily for domestic and livelihoods use.
- Water users associated with off-budget schemes are charged an O&M charge by the department only until the debt has been repaid whilst the capital repayment is done through the agreement with the financiers.

Infrastructure charges are capped (by the 2007 pricing strategy) at PPI plus 10%.

The charges are set at scheme level but further broken down at Scheme Management Parameter (abstraction point) (SMP) level. An extract of the approved Domestic & Industrial Raw water Tariff is reflected below. The Olifants River scheme is an example where a scheme can have dramatically different rates based on the different SMPs.

Regional Office	Scheme ID	Scheme Description	SMP ID	SMP Description	Sector	2011/2012 Charge (c/m^3)	2012/2013 charge (c/m3)
Western Cape	89	Olifants River (Stompdrift Dam)	23	Canal	D&I	94.96	110.72
Western Cape	89	Olifants River (Stompdrift Dam)	96	Dam	D&I	15.17	17.69

Table 6-2 Extract of the Approved D&I Raw Water Tariffs

6.1.1.2 Infrastructure and Capital Unit Charges (CUC) for Off-budget Funded Schemes

Since 1994, the development of water resources infrastructure (particularly the large schemes) has predominantly been funded off-budget and costs recouped from water users. This was mainly done through TCTA. TCTA's funding model remains sound with its long term debt sufficiently covered by long term assets, even though it has capitalised interest over the past few years.

The setting of a "capital unit charge" (CUC) for debt repayment is specified in the Pricing Strategy, which reflects the revenue stream required to pay off the debt over a reasonable time (between 18 to 25 years). In practice this must consider:

1. stability in tariffs in real terms, but growing with inflation (CPIX);
2. the debt profile, acceptable growth and level of debt of the project;
3. overlap with and funding requirements of future augmentation projects in the basin; and
4. financial strain to end users or unhealthy financial balance in the water sector.

Before capital can be raised off-budget, off-take agreements must be signed with DWA by the commercial recipients of the water guaranteeing to purchase a specified amount of water at the set price for the duration of the project debt repayment. In turn, DWA signs a revenue agreement with TCTA, which provides a guarantee for the agreed charges and reduces TCTA risk. The CUC is then billed and collected from users by DWA as a line item on the infrastructure invoice and transferred to the TCTA. The O&M charge on off-budget infrastructure is payable to DWA or the appropriate operator of the infrastructure. It is intended that a water resource development charge will be set by the Minister (which in principle will be less than the ROA) once the project debt has been paid off, and that this will be applied with a depreciation charge.

6.1.1.3 Irrigation Board and Water User Association Scheme Levies

Though this is not explicitly covered under the raw water pricing strategy, irrigation boards and Water User Associations are entitled to set charges/levies on their members to recover the costs of administration, operation, depreciation and debt repayment of their own schemes, following the requirements of their constitutions. Due to the fact that these charges are levied under the Pricing Strategy, the charges are charges upon the land and successors-in-title stay liable for unpaid charges.

Where they are responsible for the operation of government water schemes, they can act as billing and/or implementing agents for DWA. Some irrigation boards/water user associations have outstanding pre-1994 loans with the Land Bank, while some have taken commercial loans for infrastructure development. There have been difficulties in repayment of some of these debts by farmers over the past decade. Although banks are willing to provide loans, the viability of the projects and revenue stream is carefully adjudicated. Current government policy is that the state will no longer underwrite either private sector or Land Bank loans.

Water User Associations and Irrigation Boards can apply for billing agent status. This not only provides the opportunity to improve efficiencies of collection of water use charges, which are very low in some water management areas, but it also provides for more localised regulation and oversight. The approach applied incentives to improve efficiencies of collection, based on the level of collection and age of arrears collected. However, difficulties arose when DWA insisted that all

money collected be paid to them first, with the Association/Board only being remunerated later. This could result in significant delays in payment which was of concern to the agent. In addition, the Associations/Boards would be "jointly and severally liable" for an outstanding debt although DWA will provide administrative and legal support in difficult cases. Delays were experienced from DWA to finalise agreements, but this has now been sorted out.

Where functions to perform water resource management functions have been delegated to water user associations, part of the water resources management charge can be refunded to the institution.

6.1.1.4 Water Board Bulk Infrastructure and Local Government Water Supply Tariffs

Water Boards and Local Government in South Africa often own and/or operate water resources infrastructure as part of their bulk water supply systems. The recovery of operation, maintenance and refurbishment costs for this infrastructure is usually through the institutions' water supply tariffs. Some water boards (such as Umgeni Water) and local governments operate water resource infrastructure in their area of jurisdiction and thus may be involved in water supply to irrigation as well.

6.1.2 Water Resources Management (WRM) Charge

The water resources management charge was introduced to recover the governance costs in a Water Management Area, including but not limited to:

- Planning and implementing catchment management strategies.
- Monitoring and assessing water resource availability and use.
- Water use allocations.
- Water quantity management, including flood and drought management, water distribution, control over abstraction, storage and stream flow reduction activities.
- Water resource protection, resource quality management and water pollution control.
- Water conservation and demand management.
- Institutional development and enabling the public to participate in water resources management decision-making.

A policy decision was made to apply a single charge to all users within each sector (urban-industrial, agriculture and forestry) in a water management area, considering assurance of supply, while excluding some functions for forestry (such as dam safety and Working for Water). Only approximately 15 to 20% of the Working for Water funding is derived from the trading account and allocated to be recovered from charges for irrigation water users. The balance is obtained from poverty relief funds and not subjected to recovery from water user charges. Urban-industrial users are paying the full allocated Working for Water cost whilst Agriculture only pays 10% of the allocated cost.

The intent was for the WRM charge to recover the Catchment Management Agency (CMA) costs related to management of water resources in the Water Management Area (WMA), but in practice with the delayed establishment of CMAs, the charges have been calculated and collected by the regional offices of DWA in their capacity as "proto-CMAs".

6.1.3 Current Revenue

Revenue is generated from two main sources for the WTE – water resources management and water resources development.

The WTE recognises revenue on an accrual basis of accounting which implies that revenue is recognised when it is billed to the user (or when a user makes use of the water), and not when they make payments against their invoices. The revenue thus reflected is not a reflection of the cash receipts of the WTE, rather of the potential income if all users billed were to pay their charges.

The WTE billed its customers R5.5 billion and R4.6 billion in 2012 and 2011 respectively (all amounts exclusive of VAT). The main region being the Central Operating Area with 83% of the billings. The split of the Billings into the different operating areas and between WRM and WR development is indicated in the table below.

Operating Area	2012			2011		
	Total Billing R' 000	WRM Billing R'000	WR Development Billing R' 000	Total Billing R' 000	WRM Billing R'000	WR Development Billing R' 000
Southern OA	405 868	70 580	335 288	310 243	-63 558	373 801
Central OA	4 551 013	115 611	4 435 402	3 764 545	94 498	3 670 047
Eastern OA	211 754	35 641	176 112	216 769	29 370	187 399
North OA	314 146	78 025	236 121	298 323	73 236	225 087
Total	5 482 779	299 856	5 182 923	4 589 880	133 546	4 456 334

Table 6-3 Billing for the Water Trading Entity

DWA collected R2.4 billion from its customers in 2012 and R1.1 billion (all excluding VAT) in 2011. This is a recovery of 43% and 25% for 2012 and 2011 respectively. See the figure below for comparison of the billings vs collections.

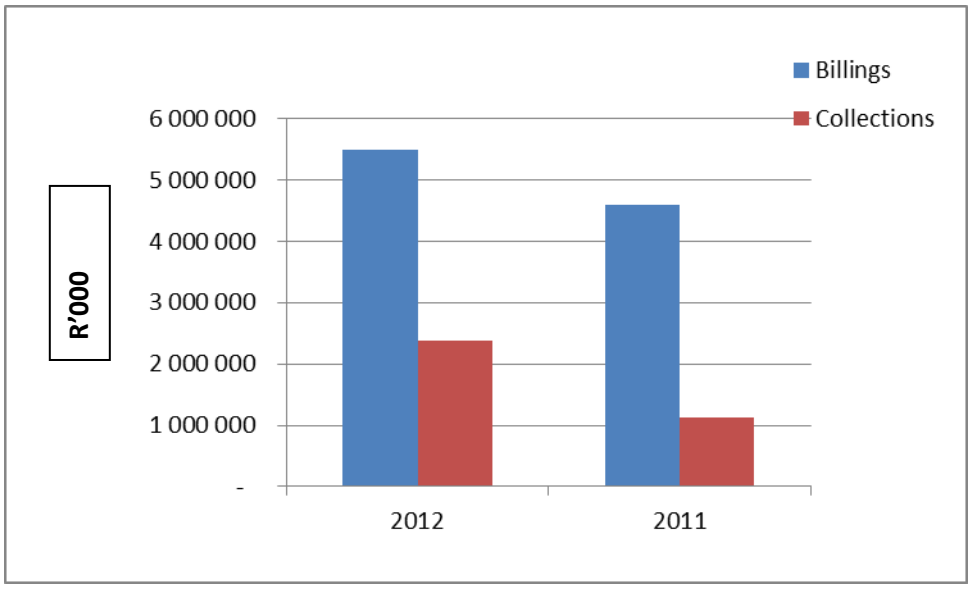


Figure 14 Comparison of Billing and Collections

Further analysis will be conducted on the revenue billed versus the theoretical amount that should have been billed based on registered water use/consumption data. However even before this

analysis it is clear from the above that there is significant under-recovery on the current billing. This will impact severely on the ability to recover the full cost from users, and will also impact on the ability to raise private sector financing on the back of potential revenue streams.

7 Conclusion

The information collected for this first draft report, whilst still not complete, is beginning to provide a picture of the water resource infrastructure base, what it costs to refurbish, operate and maintain it, how much additional capital investment is required, and what the source of revenue is from users.

Early conclusions point to the significant investment required, not just to deal with augmentation, but to maintain (refurbish) the existing asset base. This points to a continuing need for significant investment in water resource infrastructure. The current augmentation and refurbishment budgets, whilst significant, are not sufficient based on the project requirements.

Another finding is that there appears to be limited analysis of O&M data and it is therefore difficult to form a complete picture of annual O&M spend and how this compares to both budget and industry norms. There is also no trend analysis available to provide an early warning of under (or over) spend within each scheme. The 'snapshot' of O&M reviewed to date implies that expenditure is not far below what is suggested by industry norms, but due to significant variation between different sources of data, it is not straightforward to reconcile the different sources and therefore to verify this.

The initial revenue analysis indicates that revenue from users is not sufficient to cover the investment costs required as well as the annual costs required for operations and maintenance – even without bad debts. This points to a need for external sources of funding (grants and donations) or increased tariffs.

The first draft of this report has been developed in parallel with the development of the financial model, and will continue to be refined as additional information is retrieved in each area, and as the model allows for further analysis. The financial model is being structured along the following lines:

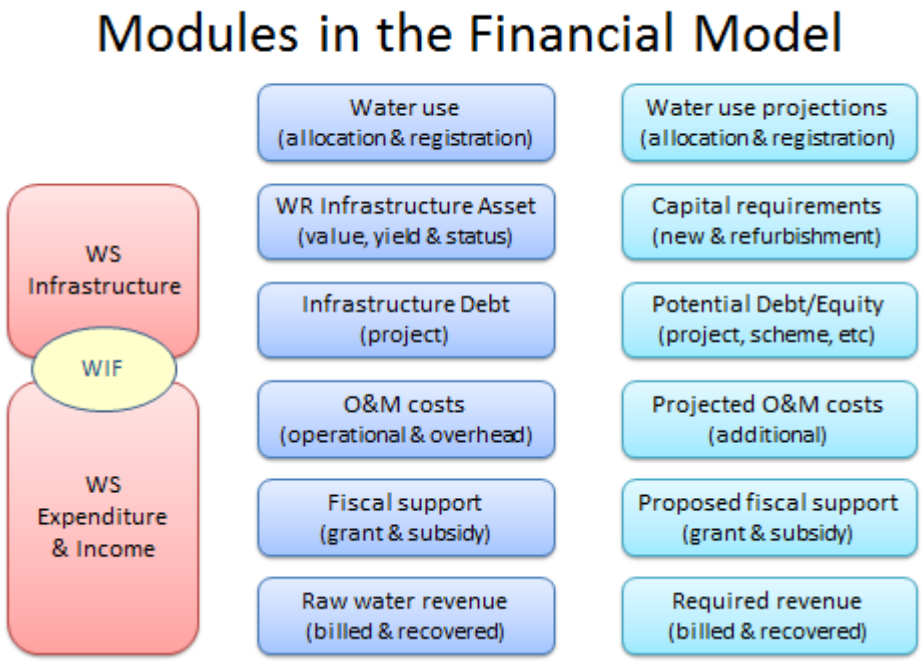


Figure 15 Modules in the WR Financial Model

The model is a Water Resources model and does not contain Water Services data. However, as indicated by the pink blocks on the left of the above figure, the model will be linked to WS data, in order to gauge the impact that Water Resources has on the downstream infrastructure and users. This is especially critical given that revenue for water resources is ultimately recovered from the users of water services.

The model will allow for analysis on three levels:

1. Operational focus – it will allow the user to look at a scheme and determine: costs and cost recovery of a proposed new capital investment (to determine viability of new infrastructure).
2. At a strategic (or portfolio) level the model will be able to evaluate an entire build scenario across the country, on a scheme by scheme basis, to determine the overall costs, sources, funding model, and institutional arrangements of the whole build – not just individual projects.
3. Pricing Strategy: The model will demonstrate the impact of scheme charges versus system charges versus a national tariff. Or impacts of changes in the pricing strategy (e.g. change in ROA).