SOUTH AFRICA ACTION PLAN FOR THE ORANGE–SENQU RIVER BASIN

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The Orange–Senqu River Commission – ORASECOM – was established by the governments of Botswana, Lesotho, Namibia and South Africa to promote equitable and sustainable development and management of the resources of the Orange–Senqu River. This joint commitment was sealed through an Agreement on the Establishment of the Orange–Senqu River Commission signed in November 2000 in Windhoek, which conforms with best international practices regarding the joint management of shared rivers.

The highest body of ORASECOM is the Council, consisting of delegations from each country, supported by various 'Task Teams' that manage projects, and a Secretariat. The Council serves as technical advisor to the member states on matters related to development, utilisation and conservation of water resources of the Orange–Senqu River system. The Secretariat, established by agreement with South Africa in 2006 and hosted there, coordinates ORASECOM activities, implements ORASECOM decisions and is the focal point of the institution.

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Golden Gate National Park, Free State Province, South Africa, near the source of the Caledon River with alien invasive poplars (*Populus* spp.) along the river banks in autumnal colours.

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FOREWORD

Being at the top of the food chain, fish-eating birds, such as this grey heron (*Ardea cinerea*), are at risk of accumulating high levels of persistent organic pollutants and heavy metals, making them susceptible to the effects of these substances.

The Orange–Senqu River Commission (ORASECOM) was established by the governments of Botswana, Lesotho, Namibia and South Africa to advise them on water-related issues towards promoting equitable and sustainable development and management of the resources of the Orange–Senqu River basin.

ORASECOM and its four basin states have been supported by a United Nations Development Programme–Global Environmental Facility (UNDP–GEF) programme in the development of a basin-wide Strategic Action Programme (SAP) and an Action Plan for each basin country to address a variety of identified water related environmental concerns. The SAP is a negotiated document that provides a basin-wide framework for the implementation of a prioritised set of national and joint transboundary actions and investments. In the context of the Orange–Senqu River Basin Integrated Water Resources Management (IWRM) Plan, the SAP is specifically focused on addressing priority environmental concerns. At national level, the SAP initiatives are integrated into the respective Action Plan of each basin state.

The South Africa Action Plan for the Orange–Senqu River Basin is based on an assessment of the priority environmental concerns as identified by the Orange–Senqu Transboundary Diagnostic Analysis (TDA), a scientific and technical assessment of the priority environmental concerns and shared management issues in the basin. For the priority issues, the analysis identifies the scale and distribution of the environmental and socio-economic impacts at national and basin levels and, through an analysis of the root causes, identifies potential remedial and/or preventative actions. The Action Plan defines technical and management interventions to address these priority concerns at national level. It was developed through an extensive consultation process and has been validated at national level in order to ensure that it reflects the priorities of the country. It is well aligned with the country's national development and sector plans, as well as the institutional frameworks at national and local level.

Developed under the auspices of ORASECOM, this Action Plan – together with the Action Plans of the other three basin states and the SAP – forms the environmental component of the Orange–Senqu River basin IWRM Plan.

ABBREVIATIONS AND ACRONYMS

CMA	catchment management agency
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
GDP	gross domestic product
ha	hectare
ICID	International Commission on Irrigation and Drainage
IUCN	International Union for the Conservation of Nature and Natural Resources
IWRM	integrated water resources management
m^3/a	cubic metre(s) per annum
MAR	mean annual runoff
MISA	Municipal Infrastructure Support Agency
Mm^3/a	million cubic metre(s) per annum
NBF	National Biodiversity Framework
NDP	National Development Plan
NPAES	National Protected Area Expansion Strategy
NPC	National Planning Commission
NSSD	National Strategy for Sustainable Development
NWRS	National Water Resource Strategy
ORASECOM	Orange–Senqu River Commission
PCN	project concept notes
POPS	persistent organic pollutants
SAP	Strategic Action Programme
SLM	sustainable land management
TDA	Transboundary Diagnostic Analysis
UNDP–GEF	United Nations Development Programme–Global Environmental Facility
UNEP-GEF	United Nations Environment Programme–Global Environment Facility
UNOPS	United Nations Office for Project Services
W_2RAP	wastewater risk assessment plan
WMA	water management area
WUA	Water-user associations
WWTWs	wastewater treatment works
ZAR	South African Rands

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Acacia erioloba, the camelthorn, is iconic of Kalahari Savannah.

EXECUTIVE SUMMARY

The South Africa Action Plan for the Orange–Senqu River Basin is a strategic implementation plan for addressing priority environmental concerns in the South African part of the Orange–Senqu River basin. It is closely aligned with the Orange–Senqu Strategic Action Programme (SAP), a programme addressing priority environmental concerns at the basin-wide level. In the context of the Orange–Senqu River basin, the Action Plans (and the SAP) are closely linked with the basin-wide Orange–Senqu Integrated Water Resources Management (IWRM) Plan, together forming the environmental component of the IWRM Plan. The Action Plans and SAP, like the IWRM Plan, are developed for a ten-year planning time span with targets set for that period.

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A lone flower in the Kgalagadi Transfrontier Park

The South Africa Action Plan was developed through an intensive stakeholder consultation process. This process involved intersectoral dialogue to achieve integration in water resources management and, most importantly, national endorsement of the Action Plan. The political and technical guidance for the Action Plan came from South Africa, through an Action Plan Working Group as well as a broader National Stakeholder Platform, each structure specifically set up for the purpose of Action Plan (and SAP) development. South Africa's delegate to the Orange–Senqu River Commission (ORASECOM) Technical Task Team was appointed as the national coordinator of the Action Plan/SAP process. The National Stakeholder Platforms comprised stakeholders representing a wide range of relevant role-players, including both state and non-state participants. While established initially for the purposes of Action Plan/SAP development, the aim is that the National Stakeholder Platforms and the Action Plan Working Groups are maintained in the long term and become permanent national counterparts for ORASECOM.

The South Africa Action Plan is based on an assessment of the priority environmental concerns as identified by the Orange–Senqu Transboundary Diagnostic Analysis (TDA), a scientific and technical assessment of the priority environmental concerns and shared management issues in the basin. For the priority issues, the analysis identifies the scale and distribution of the environmental and socio-economic impacts at national and basin levels and, through an analysis of the root causes, identifies potential remedial and/or preventative actions. This Action Plan is based on the findings of the Orange–Senqu TDA and is closely integrated with the basin-wide Orange–Senqu SAP.

The South Africa Action Plan is structured around the four environmental priority areas of concern identified in the TDA: increasing water demand, declining water resources quality, changes to the hydrological regime and land degradation. Through the Action Plan consultation process the stakeholders ranked them in order of priority from their national perspective. In South Africa, the following order of priority was determined.

1 Declining water resources quality

The key water resources quality issues in the Orange–Senqu River system have been identified as nutrient enrichment, which is primarily linked to increased phosphorus and nitrogen concentrations; increased salinity from irrigation return flows; effluent discharges and increasingly acid mine drainage; microbial contamination from urban settlements and poorly operated wastewater treatment works (WWTWs); and elevated sediment concentrations resulting from runoff from degraded land. There are growing concerns regarding the impact of pollution on food safety.

2 Increasing water demand

A high percentage of South Africa's economy is dependent on Orange–Senqu River waters. Economic activity in the Orange–Vaal River system is dominated by the urban-industrial centre of Gauteng, the economic hub of southern Africa. Gauteng accounts for 38 per cent

Opposite page: Larger wastewater treatment works in the basin are often well managed. However, the majority of wastewater treatment works serving small towns across the Orange–Senqu basin are not performing to standard.

The Ash River outfall, Free State, is part of the Lesotho Highlands Water Scheme. This concrete channel structure is built on a gradient forcing the water to flow uphill, thereby reducing its energy and the environmental damage it could cause as it flows along the natural watercourse towards the Wilge River.

of South Africa's gross domestic product (GDP) and nearly 9 million people, or 20 per cent of South Africa's population live in the province (ORASECOM, 2007).

The competition for water among the various use sectors is likely to increase as the economy grows, requiring a suite of interventions. In addition to pursuing the (limited) remaining supply-side options, emphasis is placed on water conservation and demand management, especially in the irrigation sector, currently the largest water-use sector.

3 Changes to the hydrological regime

Current flow conditions are substantially different to the natural regime. The structure and seasonal pattern of the flows from month to month have changed completely. The frequency of flood conditions is reduced to a trace, with as long as ten consecutive years with no flood season at all. Only extreme events are evident – all other flood events are 'absorbed' by the upstream storage dams. Mean annual flows have been reduced by about 50 per cent, and total flow volumes have a high degree of constancy from year to year and a completely different frequency distribution. Inter-annual variability is a fraction of the former natural regime. The implications of this are significant in terms of the long-term degradation of the riverine environment, the availability and reliability of water resources in the Lower Orange, and the sustainability of the ecological functionality of the mouth.

4 Land degradation

Inappropriate land management of the Orange–Senqu basin has contributed to land degradation which manifests as erosion, loss of biodiversity, invasion by alien plant and animal species, bush encroachment and lowered land productivity. The position is aggravated in most of the South African sections of the Vaal and Orange–Senqu River basins by the concentration of agriculture, mining, and urban and rural settlements along the riparian zone.

In response to each priority area of concern, national targets were set to address the concerns over a ten-year time period. Interventions were then identified that are required to meet the targets. In line with national policies, strategies and plans, project concepts were developed that package the proposed interventions into structured, implementable projects. These project

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Chestnut-banded plover (*Charadrius pallidus*), known from along the Orange–Senqu, prefers salt-pan, soda-lake and the estuarine habitats.

concept notes (PCNs) form the backbone of the Action Plan. The proposed projects identified for South Africa are:

Addressing: Declining water resources quality
- PCN 1: Monitoring priority chemical pollutants
- PCN 2: Mitigation of impact of agricultural sector on water quality
- PCN 3: Support for wastewater treatment upgrade

Addressing: Increasing water demand
- PCN 4: Water conservation and demand management in the irrigation sector

Addressing: Changes to the hydrological regime
- SAP PCN 3: Basin-wide environmental flow regime
- SAP PCN 4: Orange–Senqu River mouth management

Addressing: Land degradation
- PCN 5: Complementary support for LandCare Programme

The implementation of the South Africa Action Plan is project-specific. The mechanism of implementation of a project is determined by the requirements of the lead implementing agent of that project. Overall coordination and monitoring of the Action Plan is through national government structures using their established structures and systems. Therefore, close collaboration between the ORASECOM Secretariat and responsible national structures is necessary to ensure coordination and monitoring between the implementation of SAP and Action Plan activities in the four basin states.

Funding is sought for each project, either individually or for a combination of projects. Potential funding sources are primarily national governments, international cooperation partners and, to some extent, the private sector. Importantly, given the extensive consultation process through which the Action Plan has been developed and its close alignment with national policies and strategic planning priorities, the Action Plan also provides valuable guidance for targeted budget decision-making and spending at national level.

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1. INTRODUCTION

1.1 PURPOSE OF THE ACTION PLANS

The Action Plans are strategic implementation plans for addressing priority environmental concerns in the national part of the Orange–Senqu River basin. They are closely aligned with the Orange–Senqu Strategic Action Programme (SAP), a programme addressing priority environmental concerns at the basin-wide level. The Action Plans are critical tools for the implementation of SAP priority actions at national level and the integration of transboundary and basin concerns into national legislative, policy and budget decision-making processes.

In the context of the Orange–Senqu River, the Action Plans (and the SAP) are closely linked with the basin-wide Orange–Senqu IWRM Plan, together essentially forming the environmental component of the IWRM Plan. The Action Plans and SAP, like the IWRM Plan, are developed for a ten-year planning time span with targets set for that period. Thus, while the IWRM Plan is a comprehensive plan dealing with a wide aspect of water resources management (including water allocation) and economic development aspects pertinent to the basin, the SAP and related Action Plans primarily concentrate on priority environmental issues and form the environmental core component of the IWRM Plan.

The South Africa Action Plan for the Orange–Senqu River Basin was developed through an extensive consultation process in order to ensure that it reflects the priorities of the country. It is well aligned with the country's national development and sector plans as well as the institutional frameworks at national and local level.

1.2 RELATIONSHIP OF THE ACTION PLAN TO THE TDA AND SAP

The Action Plan is based on an assessment of the priority environmental concerns as identified by the Orange–Senqu Transboundary Diagnostic Analysis (TDA) and defines technical and management interventions to address them. The TDA is a scientific and technical assessment of the priority environmental concerns and shared management issues in the basin. For the priority issues, the analysis identifies the scale and distribution of environmental and socio-economic impact at national and basin levels and, through an analysis of the root causes, identifies potential remedial and/or preventative actions. The South Africa Action Plan is based on the findings of the Orange–Senqu TDA and is closely integrated with the basin-wide Orange–Senqu SAP.

Opposite: Namaqualand, Northern Cape, is one of the few areas in the basin that receives the majority of its rain in winter.

Below: Flamingoes at Kamfers Dam, north of Kimberley, Northern Cape. Originally an ephemeral pan, it now receives constant runoff and treated water from Kimberley and, since the construction of an artificial island, has become an important breeding site for lesser flamingoes (*Phoenicopterus minor*).

A windmill near Fouriesburg in the Free State Province. Even in farmlands close to the Maloti Mountains, groundwater is an important source of water away from streams and rivers.

Like the Action Plan at national level, the SAP is a negotiated document that provides a basin-wide framework for the implementation of a prioritised set of national and joint transboundary actions and investments. At national level, the SAP initiatives are based on and integrated into the respective Action Plan. Neither the Action Plans nor the SAP work independently – the SAP reflects basin-wide priorities identified through the Action Plan development processes in the four states, while the Action Plans provide the framework for the national level implementation.

1.3 RELATIONSHIP OF THE ACTION PLAN TO EXISTING RELEVANT NATIONAL PLANS

The highest level planning document in South Africa is the National Development Plan (NPC, 2011). This plan draws together all aspects of South Africa's development path. The plan recognises the threats to environmental sustainability and of climate change in particular, and chooses a low carbon and green economy future. It proposes a high level plan to manage, monitor and protect water resources for growth and sustainability. It also deals in broad terms with demand management, re-use, pollution, conservation and institutional arrangements.

At the sectoral level, the National Water Act (36 of 1998) requires the National Water Resource Strategy (NWRS) to '… set out the strategies, objectives, plans, guidelines and procedures of the Minister and institutional arrangements relating to the protection, use, development, conservation, management and control of water resources …'. The second version of the NWRS was promulgated in August 2013 (refer to section 5). One of the important components of the NWRS II is the National Water Conservation and Water Demand Management Strategy.

In response to requirements of the Convention on Biological Diversity as well as national needs, South Africa developed the National Biodiversity Strategy and Action Plan, finalised in 2005. It sets out a comprehensive framework and long-term plan of action for the conservation and sustainable use of South Africa's biodiversity. One of the five strategic objectives sets out to minimise, through integrated terrestrial and aquatic management, the impacts of threatening processes on biodiversity, enhance ecosystem services and improve social and economic security. Various actions were identified to achieve this outcome.

The first National Biodiversity Framework (NBF) which is required by the Biodiversity Act, was published in 2008. The purpose of the NBF is to coordinate and align efforts of the many organisations and individuals involved in conserving and managing South Africa's biodiversity. Strategic Objective 3: Integrated Management of Terrestrial and Aquatic Ecosystems, identified two key propriety actions: i) the implementation of cross sector policy objectives for conserving South Africa's inland waters (a collaborative effort of various water related institutions); and ii) incorporate biodiversity conservation objectives in the work of catchment management agencies.

South Africa's first National Protected Area Expansion Strategy (NPAES) was developed in 2008, with the goal of cost-effective expansion of the protected area network to enhance ecological sustainability and resilience to climate change. The NPAES sets ecosystem-specific targets for protected area expansion, identifies geographic focus areas for land-based protected area expansion, and makes recommendations about mechanisms for protected area expansion.

The actions identified in the Action Plan are aligned with these strategies.

1.4 GEOGRAPHIC COVERAGE

South Africa occupies the southern tip of the African continent. The country is located in a predominantly semi-arid part of the world (DWAF, 2003). The climate varies from desert and semi-desert in the west, to sub-humid along the eastern coastal area. The average rainfall for the country is about 450 mm per year, well below the world average of about 860 mm per year, and evaporation is comparatively high (DWAF, 2003).

The Orange–Senqu River basin is of great geographical and economic significance for South Africa. Rising in the Drakensberg Mountains in Lesotho, it flows westward into South Africa and is later met by the Vaal River, its major tributary. On its downstream areas, the river forms the border between Namibia and South Africa before discharging into the Atlantic Ocean. Because South Africa is already experiencing some degree of water scarcity and increase in demand for water, the sustainable management of the Orange–Senqu River basin will be important for the country's long-term water security.

The Orange River basin is the largest in South Africa and (with the Vaal River) drains almost two-thirds of the interior plateau of the country. This includes most of the densely populated Gauteng Province, as well as the sparsely populated areas of the Northern Cape Province. The basin population in South Africa is estimated to be around 13.4 million.

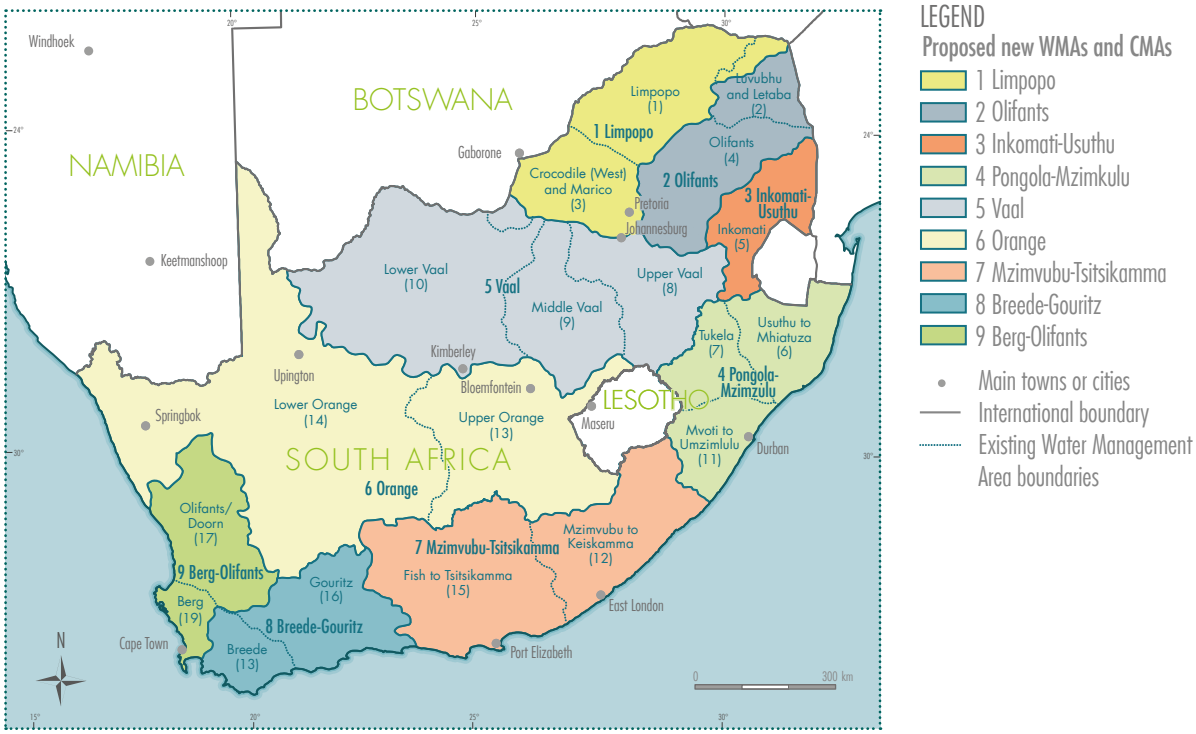

Figure 1: Map of proposed Water Management Areas in South Africa

Note: In the 2011 proposal (yet to be promulgated) areas (13) and (14) form the Orange Water Management Area (WMA) and areas (8), (9) and (10) form the Vaal WMA.

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2. NATIONAL FRAMEWORK

2.1 GOVERNANCE FRAMEWORK

South Africa is a constitutional, parliamentary democracy with three spheres of government: national, provincial and local. These are distinctive, interdependent and interrelated (section 40, South African Constitution). There are nine provincial governments and local government is comprised of 283 municipalities categorised into three types: 6 metropolitan municipalities, 46 district municipalities and 231 local municipalities.

The separation of functions between national and provincial government is regulated in section 44 and Schedules 4 and 5 of the Constitution. Schedule 4 lists functional areas of *concurrent* national and provincial legislative competence, and Schedule 5 lists functional areas of *exclusive* provincial legislative competence. At the core, concurrent competence means that the provincial legislature can enact laws applicable to that province provided such laws do not conflict with national legislation. The concurrent (Schedule 4) functions related to water management include pollution control, agriculture, environment, regional planning and development. Local government may make (non-conflicting) by-laws on any matter over which it has executive authority (section 156(2)), namely the functions in part B of Schedules 4 or 5, and any others that may be assigned. This includes water and sanitation services (limited to potable water supply systems and domestic wastewater and sewage disposal systems). Moreover, the Constitution provides that national and provincial government must, through legislative or other measures, support and promote the development of capacity and regulate the exercise of executive authority by local government.

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Above: Arnot Power Station, Middelburg

2.2 LEGAL, POLICY AND REGULATORY FRAMEWORK

In the water sector, the National Water Act, Act No. 36 of 1998 establishes the principle that, as the public trustee of the nation's water resources, the National Government, acting through the Minister of Water Affairs, must ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons and in accordance with its constitutional mandate. Section 2 (i) of the National Water Act expressly recognises meeting international obligations related to shared water resources as a purpose of the Act.

Water resources policy is encapsulated in the White Paper on a National Water Policy for South Africa (1997) and the National Water Resource Strategy (2013). The Water for Growth and Development Framework (2009) adds to policy. In September 2013, the minister issued further policy proposals for public comment.

The National Environmental Management Act (1998) further provides for integrated resource management. All legislation that affects environmental protection and management, including biodiversity, must adhere to the principles contained in the Act. Natural resource management is spread over several sectors with attendant legislation. (See Table 1.)

Opposite page: Sociable weaver (*Philetairus socius*) nesting colonies are a common sight in the north-western reaches of the river basin.

Table 1: Environmental legislation by sector

Water resources management	Land management	Biodiversity management	Climate-change mitigation and adaptation
National Water Act (1998) Water Services Act (1997) Mountain Catchment Areas Act (1970)	Development Facilitation Act (1995) Conservation of Agricultural Resources Act (1983) Fertilisers, Farm Feeds, Agricultural Remedies Act (1947) Physical Planning Acts (1965, 1991)	National Environmental Management Act: Protected Areas Act (2003) National Environmental Management: Biodiversity Act (2004) Environmental impact assessment regulations National Forests Act (1998)	National Environmental Management Act: Air Quality Act (2004) Climate Change Response Strategy (2004) National Veld and Forest Fire Act (1998)

2.3 INSTITUTIONAL FRAMEWORK FOR THE WATER SECTOR

Table 2: Institutional framework for the water sector

Institution	Roles and responsibilities
Department of Water Affairs (DWA)	DWA ensures that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner.
Catchment management agencies (CMAs)	CMAs are intended to manage water resources in each of the Water Management Areas (WMAs) (see Figure 1).
Water-user associations (WUAs)	Associations of local user groups within a specific WMA. The irrigation boards that existed before 1998 are being converted to this form of institution.
Water boards	Water boards are established in a defined area to utilise a single, perhaps remote water source, to provide potable water services to several municipalities, and in some cases to other bulk users as well.
Water service authorities and providers	Water service authorities are defined as any municipality, including a district or rural council, responsible for ensuring access to water services.

2.4 SOCIO-ECONOMIC CONTEXT

South Africa has by far the largest and most diverse economy of the four Orange–Senqu riparian states. It is several times the size of the combined economies of its three co-riparian countries. Economic activity in the Orange–Vaal River system is dominated by the urban-industrial centre of Gauteng, the economic hub of southern Africa. Gauteng accounts for 38 per cent of South Africa's GDP and hosts nearly nine million people, or 20 per cent of South Africa's population (ORASECOM, 2007).

While agriculture and mining are important economic sectors, manufacturing and services play a much stronger role in the economy than in the other basin states. Economic growth averaged three per cent per annum between 1994 and 2004. Since 2004, it exceeded four per cent per annum, reaching five per cent in 2005. Beyond 2010, the national target was a growth rate of 6 per cent per annum, although this was not fully achieved due to the slowing of the global economy. As the economy grows, however, the competition for water among the various use sectors is likely to increase.

Table 3: Economic sectors, water use and GDP contribution (for the country as a whole)

Sector	Percentage water use	Percentage GDP contribution
Rain-fed agriculture	5	3
Irrigated agriculture	62	
Manufacturing	5	19
Mining	3	8
Services	7	67
Power generation	2	2
Domestic	15	n/a

Source: STATSSA, 2006.

2.4.1 Economic development policies

The Water for Growth and Development Framework (DWA, 2009) presents a comprehensive response to the water scarcity challenges facing the country while simultaneously responding proactively to the needs of the country's economy. The framework addresses the relationship between water availability and the many forms of economic activity which depend on an available water supply of a specific quality.

Table 4: Economic sector policies and relevance for water resources management

Economic sector	Related policy	Relevance to water resources management
Agriculture and food security	Water for Development and Growth Framework (2009)	Aims at ensuring that water is able to support both economic growth and social development goals in South Africa.
	Integrated Food Security Strategy (2002)	Target is to reduce the number of food-insecure households by half by 2015.
Mining	Mineral and Petroleum Resources Development Regulations (2004)	Deals with environmental regulations for mineral development, petroleum exploration and production.
Manufacturing	South African Water Quality Guidelines – industrial water use	Used as a basis for developing materials to inform water users about the physical, chemical, biological and aesthetic properties of water.
Energy	Integrated Energy Plan for the Republic of South Africa (2003)	Considers the importance of diversifying energy resources to other energy forms and renewable energies (hydropower, solar, wind, biomass) to improve supply security, improve environmental performance and facilitate regional development.

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3. IMPORTANCE OF THE ORANGE–SENQU BASIN AT THE NATIONAL LEVEL

Under natural conditions, about a quarter of all South Africa's mean annual runoff can be attributed to the Orange–Senqu.

Data for the principal sub-catchments is provided in Table 5.

Table 5: Natural runoff of the Orange–Senqu River basin in South Africa

Water management area/country	Naturalised MAR* 1920–2004 (10^6 m^3/a)
Upper Vaal	2,452
Middle Vaal	912
Lower Vaal	201
Upper Orange (including Lesotho)	6,756
Lower Orange	255
Botswana	44
Namibia	651
TOTAL	11,271

Source: Orange–Senqu River Commission Secretariat. 2011. Surface and Groundwater Resources. Contribution to the Final Transboundary Diagnostic Analysis and Built Structures Database for the Orange–Senqu Basin. Technical Report 20. 7 December 2011.

* Estimated mean annual runoff, assuming a system without human influences and interventions.

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The Gariep Dam is the largest dam in South Africa and on the Orange–Senqu River. It is central to the Orange River Project, which regulates flow of the river and increases assurance of supply within along the river and to Eastern Cape Province.

By far the largest proportion of land within the Orange–Senqu River basin lies within South Africa (64 per cent) amounting to over 5.7 million ha. Habitat types range widely from alpine vegetation in the eastern Highlands adjacent to Lesotho, various types of grassland, to a variety of Karoo and false Karoo vegetation types in the arid western regions. High levels of urbanisation and industrialisation in many areas of the Vaal and Orange River basins have meant that land has been altered extensively. Urban settlements, agriculture, mining and rural settlements dominate the riparian zone along the river and its main tributaries, and consequently very little pristine riparian habitat exists. Land is largely privately owned, with the agriculture and mining sectors owning and using the highest proportion.

Irrigation and dry-land crop production of cash crops such as maize, wheat and sunflower are extensive in many of the middle parts, while stock farming utilises most of the remaining central parts of the basin which comprise mostly natural grasslands. To protect crops against flooding, levies have been constructed in many parts of the river valley which disturb the ecology of the floodplains and prevent natural flooding of systems which require flooding for survival.

Mining occurs most notably in the Vaal basin and the Lower Orange River to the mouth, further altering many habitats within the basin. Effective rehabilitation and environmental management by larger mining companies has reduced impacts to some degree. Small-scale mining of alluvial diamonds along the Lower Vaal and Lower Orange rivers has had a significant impact on riverbanks and riparian vegetation. Although regulations largely restrict mining on riverbanks, poor enforcement and lack of capacity to regulate small mining operations have not been able to curb this problem. Extensive earth-moving and other activities with minimal rehabilitation or environmental considerations have degraded much of the habitat along the rivers.

Much of the Upper and Middle Vaal basin areas are highveld climax grassland habitats, which have been greatly transformed through commercial agriculture and urbanisation. The remaining grasslands are some of the most threatened habitats in South Africa, and conservation efforts have recently been initiated to preserve them. The Lower Orange River basin also contains parts of the Succulent Karoo ecosystem. This ecosystem contains the highest diversity of arid flora globally, and is a declared biodiversity hotspot.

Opposite page: Maize is one of the most extensively grown crops in South Africa. Much of it in the eastern areas of the basin is rain-fed.

Increased invasive alien species are a significant contributor to land degradation. The more arid part of the basin (the Lower Orange River area) is particularly impacted by growing numbers of mesquite. Dense stands of alien species on riverbanks and floodplains have reduced basal vegetation cover, causing erosion of the clayey soils.

Protected areas in the South African part of the Orange–Senqu River basin make up just three per cent of the area of the basin in South Africa. Of this, one park – the South African part of the Kgalagadi Transfrontier Park – makes up 80 per cent of the area. This is a remarkably small proportion of land given that protected areas make up some 10 per cent of South Africa and the Orange–Senqu River basin comprises about 50 per cent of the country. Two main transfrontier areas in the basin are the subject of international treaties, the Kgalagadi Transfrontier Park with Botswana and the \Ai-\Ais–Richtersveld Transfrontier Park and Conservation Area with Namibia.

The Orange–Senqu River mouth is on the Ramsar Convention list as a wetland of international importance. This is justified by the presence of the many rare or endangered species of waterfowl, and its uniqueness as an ecosystem within the bio-region. Through changes in the flow of the river, and particularly the impact of mining, it is considered to be in a highly degraded state and consequently is on the Montreux Record (which applies to sites where changes in ecological character have occurred, are occurring or are likely to occur). Recent initiatives by the Northern Cape Department of Conservation, Environment and Land in cooperation with the Namibian Ministry of Environment and Tourism have started to rehabilitate the wetland and provide it with statutory protection.

The banks of the lower Orange River in the Richtersveld, Northern Cape

4. PRIORITY ENVIRONMENTAL CONCERNS

The status of river ecosystems in South Africa is cause for concern. South Africa is a water-scarce country, its ecosystems are poorly protected and its freshwater systems are heavily utilised. According to the spatial biodiversity assessment of South Africa's 120 river signatures (National Biodiversity Assessment, 2011):

- 82 per cent are threatened;
- almost half, or 44 per cent, are critically endangered;
- 27 per cent are endangered;
- 11 per cent are vulnerable; and
- 18 per cent are least threatened.

Based on the TDA and related scientific studies, the Action Plan Working Group and Stakeholder Platform identified the following as the priority transboundary environmental problems in the South African part of the Orange–Senqu River basin.

© Ian Smith

Increased nutrients in the water encourage the growth of algae, which in turn reduces oxygen content and stream health.

4.1 PRIORITY 1: DECLINING WATER RESOURCES QUALITY

Water resources quality

The key water resources quality issues in the Orange–Senqu River system have been identified as nutrient enrichment – primarily linked to increased phosphorus and nitrogen concentrations; increased salinity from irrigation return flows, effluent discharges and increasingly acid mine drainage; microbial contamination from urban settlements and poorly operated WWTWs; and elevated sediment concentrations resulting from runoff from degraded land. There are growing concerns relating to the impact of pollution on food safety.

Nutrient enrichment

Nutrient enrichment is perhaps the most significant water resources quality problem in the Orange–Senqu River basin. Nutrient enrichment, or eutrophication, refers to the increase in plant nutrients, chiefly nitrogen and phosphorus, in the water. These plant nutrients are found in high concentrations in effluent from domestic WWTWs, wash-off from urban areas and in agricultural areas where they are applied to fields as fertilisers. The nutrients speed up the growth of aquatic plants and algae, and the excessive growth of these plants poses a range of problems for aquatic ecosystems and water users. Floating aquatic weeds can cover entire rivers and dams, blocking light and preventing oxygen from dissolving into the water. Aquatic weeds can block water intakes and affect the recreational use of water, and algae attached to rocks on the riverbed can affect ecosystem functioning.

In nutrient-enriched river systems, blooms of floating microscopic algae increase the costs of water treatment and can even promote the formulation of cancer-forming substances in the treated drinking water. Certain toxic algal blooms have been known to cause livestock deaths; the toxins can also cause health problems in consumers by passing through the water treatment process.

Nitrogen concentrations, however, do not appear to be as much of a problem, with 85 per cent of the samples taken falling within the 'acceptable' range.

Salinity

Intensive irrigation raises salinity: irrigated crops need the water that is applied, but not the salt dissolved in that water. Irrigation farmers therefore usually apply a little more water than is needed to carry the excess salt back to the river – which is known as irrigation return flow – or into the groundwater (which also means the water carries some of the fertilisers applied to the land). The salt load in irrigation return flows depends on a number of factors: the salt concentrations in the water applied to the crops, the soil

types, and whether drainage systems have been put in place to carry the saline water away. Irrigation return flow is typified by high concentrations of sodium and chloride salts.

Domestic water use increases salinity mostly by introducing sodium and chloride salts through salts in foods. Industrial activities also have an effect on the total salt concentration with some industrial processes, such as chemical manufacturing plants, changing the composition of salts.

In recent years, mining activities have increased salt concentrations through acid mine drainage. Acid mine drainage occurs when rock, containing pyrite, is oxidised to produce sulphuric acid. The acidic water produced contains high levels of salts (mostly sulphate – SO_4) as well as iron and other metals, such as uranium and cadmium.

The salinity levels in the Upper Vaal River area have been at acceptable, albeit increasing levels. Downstream of its confluence with the Riet River, which drains the Johannesburg area, the salinity in the Vaal River has been problematic for several decades. While the salinity of the Orange–Senqu River main stem remains within the 'ideal' range along most of its length, salt concentrations gradually increase downstream.

Microbial contamination

Microbial contamination from faecal matter is caused by failing WWTW and reticulation systems, as well as densely populated but poorly serviced settlements. The sparse data shows that while there is significant contamination in and around the main urban centres, it is localised.

Radionuclides

Radionuclides are a range of potentially radioactive metals, chiefly uranium, thorium and radium. Long-term exposure to radionuclides, when present in sufficiently high concentrations, can increase the risk of cancer. Limited data indicates that risks are low, but transient elevated radioactivity was noted at some sites.

Persistent organic pollutants (POPs)

Certain chemical compounds, such as the pesticide DDT, persist for long periods in soil, sediment, plants and animals. POPs have a variety of impacts on aquatic ecosystems, including reproductive failure and abnormal functioning of the hormone system (feminisation of males and masculinisation of females), behavioural abnormalities and birth defects. In humans, POPs are known to affect reproductive systems, promote cancer and affect the immune system. All of the ORASECOM member states are parties to the Stockholm Convention on Persistent Organic Pollutants.

Very little is known about the presence and concentration of POPs in the Orange–Senqu River system. Previous work in the region had focused on DDT and its breakdown products. Preliminary findings indicate that POPs are not a threat, except that there may be some ecological risk associated with bioaccumulation of POPs that reside in the bottom sediments, and that near the urban areas the concentration of some POPs is higher, and consequently research should be sustained (ORASECOM, 2013).

Heavy metals

A total of 42 different heavy metals across 61 sites were analysed for the special survey commissioned for the TDA. The research was, however, inconclusive with higher concentrations of some heavy metals observed from background causes, such as the dolomitic geology of the area around the Molopo Eye, than from mining areas. The agriculture sector regards heavy metals as one of the higher priority pollution problems.

Turbidity

In a number of areas, mining for diamonds and river sand abstraction create high levels of turbidity that persist for significant distances downstream of the disturbance. Many of these activities are uncontrolled. High turbidity destroys eco-habitats and increases the cost of purification.

4.2 PRIORITY 2: INCREASING WATER DEMANDS

Demand

The 2005 report from the Permanent Water Commission provides the summary of projected demands in Table 6. By comparison, the natural runoff is about 11,300 Mm^3/a.

Table 6: Summary of water demands

	Expected water demand (Mm^3/a)				
	2005	2010	2015	2020	2025
LESOTHO					
Irrigation	9	9	9	9	9
Urban, industrial, mining	11	12	14	15	17
TOTAL (Lesotho)	20	21	23	24	26
NAMIBIA					
Irrigation	60	103	150	197	227
Urban, industrial, mining	16	31	47	47	48
TOTAL (Namibia)	76	134	197	244	274
SOUTH AFRICA					
Irrigation	3,273	3,328	3,381	3,381	3,381
Urban, industrial, mining	2,115	2,204	2,266	2,348	2,487
TOTAL (South Africa)	5,389	5,531	5,647	5,729	5,868
GRAND TOTAL	**5,485**	**5,687**	**5,867**	**5,997**	**6,168**

Source: Permanent Water Commission, 2005.

Demand management

The irrigation sector is noted as the highest consumer of water in the Lower Orange River Management Study area and it also has the largest potential for savings.

A somewhat dated estimate of the potential benefits and costs of Water Demand Management initiatives identified in the Lower Orange River Management Study are summarised in Table 7.

Secondary falls at Augrabies, Northern Cape, South Africa, before the water disappears underground to emerge further downstream.

Table 7: Expected savings through water demand management

Activity and location	Volume Mm^3/a	Estimated costs/ m^3 saved (ZAR cents)(2004)	Remarks
Water efficiency unit (Upington)	Unknown	Unknown	
SCHEDULING			**IMPROVES WATER PRODUCTIVITY**
Upstream Vanderkloof	7.2	6.95	10 per cent savings less 30 per cent return flow
Downstream Vanderkloof	63.9	3.20	7.2 per cent savings less 30 per cent return flow
Common border	3.6	10.24	5 per cent savings less 30 per cent return flow
METERING AND PRICING			**IMPROVES WATER PRODUCTIVITY**
Upstream Vanderkloof	6.7	5.13	7 per cent savings on the reduced consumption after the implementation of scheduling
Downstream Vanderkloof	84.3	3.12	
Common border	6.9	2.88	
IRRIGATION SYSTEMS			**IMPROVES WATER PRODUCTIVITY BY 24.1 PER CENT**
Gifkloof/Neusberg	53.4	89.70	
CONVEYANCE LOSSES			
Orange-Riet canal	Unknown	Unknown	Requires a detailed investigation

Source: Preliminary TDA citing Permanent Water Commission 2005b. Pre-feasibility Study into Measures to Improve the Management of the Lower Orange River and to Provide for Future Developments along the Border between Namibia and South Africa. Hydrology, Water Quality and Systems Analysis, Volume A. DWAF Ref. PB D000/00/4303, February 2005.

The success of any water conservation development measures will depend on:
- the creation of clear policies and guidelines pertaining to tariffs;
- effective monitoring and control of water use;
- advice on scheduling; and
- training of farmers.

These are important measures for which a clear programme of interventions is essential. It is recognised that such programmes will take some time to yield results and cannot be expected to be fully effective in less than five to ten years. The expected total savings from water demand management in the irrigation sector in South Africa are estimated to be 226 Mm^3/a.

Existing infrastructure

While managing the demand side of the equation has to be a priority, a number of options for increasing the efficiency of using the existing system have been identified.

Hydraulic river modelling and improved system operation

Results from the Water Resources Yield Model showed that, at 2005-development level, on average, 1,680 Mm^3/a enters the Orange River from the Vaal. The monthly flows vary from almost zero to extremely high flows during periods of high runoff when the major dams are spilling. Currently, these flows are not taken into account when releases are made from Vanderkloof Dam to supply downstream requirements. It is possible that the surplus yield in the system could be increased by 80 Mm^3/a when real-time modelling is used to utilise inflows from the Vaal more effectively. This potential increase was included in the water balances derived from the water resources planning model analyses.

Utilisation of Vanderkloof low level storage

There is a significant volume of storage in Vanderkloof Dam below the level of the outlets to the irrigation systems. This storage can be accessed by installing a pumping system to lift the water into the irrigation canals. However, this will impact on the energy that can be generated by the hydropower plant at the dam. An increase in yield of 143 Mm^3/a can be achieved by the utilisation of the lower level storage in Vanderkloof Dam.

New infrastructure

Two main opportunities have been identified for inter-basin transfers to augment the Vaal system:

i) Further phases of the Lesotho Highlands Water Project which transfers water within the greater Orange–Senqu basin. South Africa and Lesotho have signed an agreement on the implementation of Phase II of the project, which would increase the Orange–Senqu system yield by about 182 Mm^3/a, but which could transfer 465 Mm^3/a to the Vaal River system.

ii) The expansion of the Thukela–Vaal transfer scheme, which transfers additional water into the greater Orange–Senqu basin.

Opportunities for limited imports from other basins may exist. A number of possibilities for new infrastructure to increase the Orange–Senqu River system yield have been identified and studied. The two favoured options are:

- a re-regulating dam at Vioolsdrift that could increase yield by 170 m^3/a; and
- a dam on the Upper Orange at Boskraai, just downstream of Lesotho.

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The Vanderkloof Dam, 130 km downstream of the Gariep Dam, is the second-largest dam in South Africa. It supports requirements all the way to the mouth some 1,400 km away, including controlling flow, water storage for urban and irrigation requirements, and hydropower generation.

4.3 PRIORITY 3: CHANGES TO THE HYDROLOGICAL REGIME

The changes to the hydrological regime of the Lower Orange–Senqu, particularly below Vanderkloof Dam, have as a consequence of upstream development been dramatic and are summarised in Figure 2.

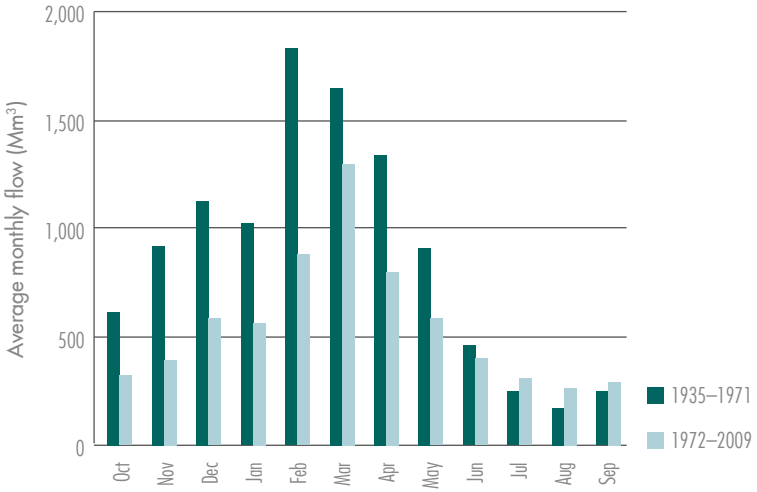

Figure 2: Average monthly flows at Vioolsdrift

The structure and seasonal pattern of the flows from month to month have changed completely. The frequency of flood conditions is reduced to a trace, with as long as ten consecutive years with no flood season at all. Only extreme events are evident when there is significant spillage from Vanderkloof Dam, although the peak and duration of these floods are generally halved. All other flood events are 'absorbed' by the upstream storage dams.

Mean annual flows have been reduced by about 50 per cent from 11,300 Mm^3 to about 5,800 Mm^3, and total flow volumes have a high degree of constancy from year to year and a completely different frequency distribution. Inter-annual variability is a fraction of the former natural regime.

Within the year, monthly flows show the same order of reduction and a much less distinct seasonal pattern. Peak flow conditions are now over a month later than in previous years, and the seasonal variance of flows from month to month is far less.

Clearly, current flow conditions are substantially different to the natural regime. The implications of this are significant in terms of the long-term degradation of the riverine environment, the availability and reliability of water resources in the Lower Orange and the sustainability of the ecological functionality of the mouth. The black fly infestation problem is ascribed to the change in hydrological regime and particularly that ascribed to hydropower operations.

4.4 PRIORITY 4: LAND DEGRADATION

Inappropriate land management of the Orange–Senqu River basin has contributed to land degradation which manifests as erosion, loss of biodiversity, invasion by alien plants and animal species, bush encroachment and lowered land productivity. The position is aggravated in most of the South African sections of the Vaal and Orange–Senqu River basins by the concentration of agriculture, mining and urban and rural settlements along the riparian zone.

Priority areas for counter-measures are: (i) the upper reaches of the Orange–Senqu River and its tributaries where gradient and soil structure are most likely to cause erosion of land and sedimentation of the rivers; and (ii) the arid lower reaches of the basin where poor land management will impact most negatively on threatened ecosystems.

The arid Northern Cape landscape

5. CONTEXTUAL NATIONAL PLANS AND PROGRAMMES ADDRESSING CONCERNS

Most of this section is taken from Department of Water Affairs, Strategic Plan (Annual Performance Plan) 2011/12 to 2013/14, accessed at www.dwa.gov.za. It has not been possible to disaggregate the information for the Orange–Senqu basin.

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The Vaal River near Parys, Free State Province, is heavily infested with alien invasive trees along its banks.

5.1 THE NATIONAL DEVELOPMENT PLAN

The two guiding objectives of the National Development Plan (NDP) are to eliminate poverty and to sharply reduce inequality by 2030 (NPC, 2011). It plans to achieve these objectives by creating a 'virtuous circle' of expanding opportunities, building capabilities, reducing poverty and involving communities in their own development, all leading to rising living standards.

The following points are pertinent to the water sector and included in the targets for economic infrastructure:

- Ensure that all people have access to clean potable water and that there is enough water for agriculture and industry, recognising the trade-offs in the use of water.
- Reduce water demand in urban areas to 15 per cent below the business-as-usual scenario by 2030.
- Complete the Lesotho Highlands Phase II by 2020.

The NDP suggests the key policy issues in the water sector are:

- Investments to support economic uses of water should be funded by users through appropriate pricing measures.
- Enhanced management capacity will be needed.
- Institutional arrangements need to be finalised, specifically on Water Management Areas.
- A review of existing allocations is needed.
- The need for an independent regulator should be assessed.
- The norms and standards for basic water supply and sanitation services should guide the allocation of funds.

The NDP recognises that there are trade-offs that will have to be made in managing water resources:

- The costs associated with environmental protection objectives (for example, those associated with enforcement of pollution standards and abstraction restrictions should be set against social and economic needs).
- A balance has to be achieved between allocating water for productive needs (industry and urban development) and less productive uses in agriculture and conservation, but which have strong social and environmental values.
- Greater water-use efficiency in agriculture tends to be capital intensive, but may in turn support job creation.

5.2 THE NEW GROWTH PATH

The New Growth Path was announced in 2009 (South African Government Information Service, 2010). It is proposed that creating decent work, reducing inequality and defeating poverty can only be achieved by a restructuring of the South African economy to improve labour absorption and growth. Government will lead by:

1. Identifying areas where employment creation is possible on a large scale as a result of substantial changes in conditions in South Africa and globally.
2. Developing a policy package to facilitate employment creation in these areas, above all through:

a. A comprehensive drive to enhance both social equity and competitiveness;
b. Systemic changes to mobilise domestic investment around activities that can create sustainable employment; and
c. Strong social dialogue to focus all stakeholders on encouraging growth in employment-creating activities.

5.3 NATIONAL WATER RESOURCES STRATEGY

The second edition of the South African National Water Resources Strategy was promulgated in August 2013. The NWRS II has separate strategies for desalination and water re-use attached to it. The framework in which NWRS II is formulated is shown in Figure 3.

From an environmental perspective, the NWRS II outlines key principles to ensure water resource protection:
- Sufficient water must be left in the rivers to sustain ecosystem functioning.
- Water quality must be protected at the source.
- The water environment has an intrinsic value for economic and social growth.

The key principles are listed as:

Principle 1: Protection of the resource through classification of the resource with the Reserve as a prior right.

Principle 2: Water resource protection should be based on a participatory approach, involving users, planners and policymakers at all levels.

Principle 3: The value of water resources must be recognised from an economic point of view and the social and environmental benefits of the resource.

Principle 4: Water resource protection must guide setting conditions for water use authorisation.

Principle 5: Incentive based protection of the water resources.

Principle 6: Integrated protection of aquatic ecosystems.

The strategies that are derived from the situational analysis and the above principles are:
- Manage for sustainability using resource-directed measures.
- Invest in strategic water source areas.
- Strategic investment in the maintenance and rehabilitation of water ecosystem.
- Maintain defined Freshwater Ecosystem Priority Areas in good condition.
- Protect riparian and wetland buffers and critical groundwater recharge areas.
- Rehabilitate strategic water ecosystems to support water quantity and water quality.
- Monitor ecological health to inform management.
- Minimise of pollution from wastewater treatment works.
- Establish commitment to sustainable water resource management.
- Target actions with immediate benefits.

The NWRS II also proposes greater equity in the allocation of water to individuals and sectors, which includes reallocation mechanisms. This aspect of water resource management is also evident in recent policy reform proposals.

Figure 3: National Water Resources Strategy Framework (2nd edition)

5.4 NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

The National Biodiversity Strategy and Action Plan, which is about to be reviewed, was conducted in terms of obligations as a party to the Convention on Biological Diversity and has five interacting strategic objectives (DEA, 2005):

SO1: An enabling policy and legislative framework integrates biodiversity management objectives into the economy.

SO2: Enhanced institutional effectiveness and efficiency ensures good governance in the biodiversity sector.

SO3: Integrated terrestrial and aquatic management across the country minimises the impacts of threatening processes on biodiversity, enhances ecosystem services and improves social and economic security.

SO4: Human development and wellbeing is enhanced through sustainable use of biological resources and equitable sharing of the benefits.

SO5: A network of conservation areas conserves a representative sample of biodiversity and maintains key ecological processes across the landscape and seascape.

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Preparing fields for the late rains in the marginal rainfall areas of the North West Province near Coligny.

5.5 NATIONAL STRATEGY FOR SUSTAINABLE DEVELOPMENT AND ACTION PLAN

The National Strategy for Sustainable Development and Action Plan (DEA, 2011) – also referred to as NSSD 1 (2011–2014) – was approved by Cabinet on 23 November 2011. In respect of water resources, it sets the following interventions in Table 3.2 of the Action Plan: Priority 2: Sustaining Our Ecosystems and Using Natural Resources Efficiently:

- Implementation of water demand management via a staggered tariff structure, water-loss management and conservation measures (water-wise activities).
- Establishing and strengthening catchment management agencies.
- Undertaking reserve determinations for priority rivers and estuaries, and incorporating ecological requirements into water resource planning.
- Determining sustainable use levels for strategic aquifers.
- Integration of water availability concerns into economic development planning, water allocation reform and water reconciliation strategies for each Water Management Area.
- Enhancing the water resources base by investing in desalination plants and water harvesting where appropriate.
- Strengthening invasive plant management in catchments.
- Addressing the backlog in the issuing of water use licences.

It is thus apparent that the proposals made in this action plan for the Orange–Senqu correlate well with NSSD 1 (2011–2014).

5.6 NATIONAL ACTION PROGRAMME COMBATING LAND DEGRADATION TO ALLEVIATE RURAL POVERTY

South Africa is a Party to the UN Convention to Combat Desertification, ratified in 1997. The Department of Environmental Affairs is the focal point. South Africa has produced the National Action Programme (DEAT, 2005) that is encouraged by the resolutions of the Conference of the Parties. This builds on a number of existing initiatives, including the poverty relief programmes as mentioned above. Its initiatives on the topic of desertification are also incorporated into the Department of Agriculture, Forestry and Fisheries Integrated Growth and Development Plan, 2012.

5.7 DEPARTMENT OF WATER AFFAIRS STRATEGIC OBJECTIVES

The Department of Water Affairs defines its strategic objectives for five-year time periods. The most recent action plan lists the strategic objectives as (DWA, 2013):

1.1 Improve and increase the skills pool and build competencies in the Department and within the sector.
1.2 Effective and efficient internal control environment.
1.3 Implement programmes that create job opportunities (New Growth Path).
1.4 Improve water resources and water services information.
1.5 Coordinate regional and global water cooperation.
1.6 Ensure effective performance of water management and services institutions.
2.1 Ensure the availability of/access to water supply for environmental and socio-economic use.
2.2 Improve equity and efficiency in water allocation.
2.3 Strengthen and implement strategies for water management in the country.
2.4 Improve water use efficiency.
3.1 Ensure compliance to water legislation (local government/water services).
3.2 Support the water sector.
4.1 Ensure compliance to water environmental legislation.
4.2 Improve the protection of water resources and ensure their sustainability.

The proposed activities in this action plan fall squarely within this strategic objectives framework.

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Boegoeberg Dam, on the Orange River near Prieska, in flood. The dam supplies a number of irrigation schemes in the area and the Gariep settlement.

5.8 LANDCARE PROGRAMME

The question of land degradation is addressed by the LandCare Programme of the National Department of Agriculture, Forestry and Fisheries. The LandCare Programme, operating under the Expanded Public Works Programme (EPWP), participates within the land-based livelihoods category of the Environment and Culture sector. The programme deploys labour intensive mechanisms within its project implementation under the SoilCare, VeldCare and WaterCare themes. The labour intensiveness of the LandCare Programme is among the best in the country: more than 30 per cent of the project budget is allocated to wages for labour and the remainder is put towards skills development of the beneficiaries (DAFF, 2013).

The vision for the National LandCare Programme (NLP) is to have communities and individuals adopt an ecologically sustainable approach to the management of South Africa's environment and natural resources, while improving their livelihoods. This means people use the soil, water and vegetation resources in such a manner that their own quality of life is improved and future generations will also be able to use these resources to meet their needs. This implies that cultivation, livestock grazing and harvesting of natural resources should be managed so that degradation (for example soil erosion, nutrient loss, loss of components of the vegetation, increased runoff of water, etc.) is curtailed.

Funding of the LandCare Programme has, however, been a challenge and only ZAR115 million was allocated to it in 2012/2013 out of a total departmental budget of ZAR5 billion. The proposed activities in this action plan addressing land degradation are building on and closely aligned with ongoing and planned work under the LandCare Programme.

5.9 WORKING FOR WATER PROGRAMME

The Working for Water Programme (located within the Department of Environmental Affairs) encompasses two aspects, namely the reduction of alien flora and the consequent beneficial effects this has on water flows. The programme is expected to continue into the foreseeable future. It now includes terrestrial and aquatic weeds. Social development is an integral part of Working for Water, affecting all operations of the programme. The social development thrust is aimed principally at poverty relief, but it also seeks to optimise benefits in general. In the process of clearing alien invasive species, especially woody species from river systems and catchments, jobs are created, skills are developed and secondary industries are promoted using the wood for charcoal and furniture.

5.10 WORKING FOR WETLANDS PROGRAMME

This programme aims to facilitate the conservation, rehabilitation and sustainable use of wetland ecosystems, while at the same time fulfilling functions such as poverty alleviation, job creation, training and empowerment.

5.11 WORKING ON FIRE PROGRAMME

Working on Fire is closely aligned to the Working for Water Programme, as invasive alien trees greatly increase the impact of fires due to increased biomass that in turn

generates higher fire temperatures, leading to more destruction of indigenous vegetation. It is a public–private partnership aimed at promoting an integrated approach to fire management in South Africa, and it involves collaboration between a number of national departments, statutory bodies, the private sector and civil society. It also integrates fire management with livelihoods strategies, training and research.

5.12 COASTCARE PROGRAMME

The CoastCare Programme assists in increasing awareness regarding coastal management while at the same time addressing poverty. The programme has various components, ranging from rehabilitation of the coast to education. CoastCare works towards:

- implementation of the White Paper on Sustainable Coastal Development;
- creation of Sustainable Coastal Livelihoods;
- unlocking the potential value of our coastal resources;
- protecting marine and coastal resources.

5.13 OTHER NATIONAL PLANS BY PRIORITY AREA

In addition to the main plans described above, a number of other plans can best be noted according to the identified priority areas.

Priority 1: Declining water resources quality

The DWA plans to:

- Implement the recommendations of the Inter-Ministerial Committee on acid mine drainage.
- Continue with and extend its successful Green Drop programme as part of its regulation strategy. Green Drop provides local government with an incentive to achieve wastewater discharge standards.
- Increase the number of water resources quality sampling points and specifically extend its programme of monitoring mines for wastewater management compliance.
- Add to the number of significant river systems meeting ecological water requirements.
- Implement a waste discharge charge system that will discourage the discharge of certain substances into natural water courses in four selected basins during 2013/14.

Priority 2: Increasing water demands

Table 8: Large water infrastructure projects planned in the Orange–Senqu basin

Project name	Type of infrastructure	Service delivery outputs	Estimated completion date	Current project status
Lesotho Highlands Water Project Phase II	Dam, tunnel and associated works	To augment the Vaal River system which supplies water to Gauteng and surrounding areas	2020	Feasibility (joint agreement with Lesotho)
Lower Orange River – Vioolsdrift and/or Boskraai dams	Dam	To increase the yield of the Orange River to cater for increasing demand in the area	2020	Pre-feasibility

Source: Department of Water Affairs. Strategic Plan 2011/12 to 2013/14. Accessed at www.dwa.gov.za.

The DWA will support local government with implementing water conservation and demand management. It expects to save 12 Mm^3/a nationally.

The DWA plans to:
- Improve its licensing systems and develop a strategy to reduce unlawful use, inter alia by strengthening regulation of the water sector by establishing an independent economic water regulator.
- Implement programmes to improve stakeholder awareness and understanding of the value of water.
- Gazette a revised raw water pricing strategy in 2013/14.
- Set selected water consumption targets for key sectors.

Priority 3: Changes to the hydrological regime

The DWA plans to:
- Develop a climate-change strategy.
- Increase the number of priority basins that are optimally monitored.
- Improve or implement improved operating rules for systems to regulate water availability and manage drought risks.

Priority 4: Land degradation

See section 5.8: LandCare Programme.

5.14 ONGOING ACTIVITIES OF INTERNATIONAL COOPERATING PARTNERS ON PRIORITY AREAS

Other projects financed by international cooperating partners that have a direct link to the priority areas in the Orange–Senqu basin are:
- GEF has financed projects on community-based rangeland management and water management in the irrigation sector.
- GIZ has financed small-scale IWRM projects in Botswana and Namibia, wetlands protection and municipal water demand management.

5.15 KNOWLEDGE GAPS AND OTHER CONSTRAINTS

The NWRS II identifies a number of databases (in part uncoordinated) in which hydrological data is managed. It identifies some gaps:
- Inadequate coverage of water data and information.
- Insufficient reporting about the availability and use of water with regard to accounting for how water supply is balancing demand to meet transformational imperatives.

Hydrologists are extremely concerned that the effective collection of stream flow (DWA) and rainfall data (SA Weather Service) has been in decline following the national water resource assessment based on the 1990 data. It is noted that the number of useful streamflow gauges decreased from a peak of 450 in the late 1980s to less than 350 in 2004 (Van Vuuren, 2012; Anon., 2013).

South Africa suffers the typical difficulties of a developing country in that it is unable to prioritise committing financial and human resources to infrastructure that delivers long-term benefits of the nature derived from rainfall and river-flow gauging.

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6. THE ACTION PLAN

6.1 ACTION PLAN DEVELOPMENT PROCESS

The Action Plan in each country is structured around the four environmental priority areas of concern identified in the TDA: increasing water demand, declining water resources quality, changes to the hydrological regime and land degradation. Through the Action Plan consultation process, each country prioritised four areas of concern from its national perspective. In response to each priority area of concern, national targets were set to address these concerns over a ten-year time period. Interventions were then identified to meet the targets. In line with national policies, strategies and plans, project concepts were developed that package the proposed interventions into structured, implementable projects. These project concept notes (PCNs) form the backbone of each Action Plan.

The Action Plan development process involved intersectoral dialogue to achieve integration of water resources management and, most importantly, national endorsement of the Action Plan. The Action Plans feed into the SAP but are independent planning products and their success depends on receiving full support of both state and non-state stakeholders. In practice, this means that the political and technical guidance for the Action Plans comes from the countries, through an Action Plan Working Group as well as a broader National Stakeholder Platform, each structure specifically set up for the purpose of Action Plan (and SAP) development.

Below: A silt-laden Orange River in the eastern Free State Province

Opposite page: The halfmens, *Pachypodium namaquanum*, is endemic to the Succulent Karoo, which straddles the western-most reaches of the Lower Orange River.

While it is part of the national stakeholder forum, the Action Plan Working Group is smaller in size (between five and eight members), comprised mostly of individuals holding positions in government related to water, planning and finance. Each country's delegate to the ORASECOM Technical Task Team was appointed as the national coordinator of the Action Plan/SAP process for their country. With support from the consultant team, the Action Plan Working Group was primarily responsible for the development of the Action Plan (and the SAP, together with the Action Plan/SAP Working Groups from the respective other countries) and provided the technical and political guidance for the formulation of the Action Plan.

The National Stakeholder Platforms consist of stakeholders representing a wide range of role-players, including both state and non-state participants. While established initially for the purposes of Action Plan/SAP development, the aim is that the National Stakeholder Platforms and the Action Plan Working Groups are maintained in the long term and become permanent national partners with ORASECOM.

Two workshops of the National Stakeholder Platform were held at national level in each country, in addition to regular meetings of the (smaller) Action Plan Working Groups. Furthermore, the Action Plan Working Groups from the four basin states met collectively three times throughout the process, forming the regional Action Plan/SAP Working Group. This served to ensure synergy between the four Action Plans, as well as joint development of the SAP as the basin-wide planning document.

In addition to the National Stakeholder Platforms and Action Plan/SAP Working Groups, there were other key role-players in the Action Plan/SAP development process. The ORASECOM Secretariat and the United Nations Office for Project Services (UNOPS) provided important political and technical guidance to the process. Likewise, regular information exchange and coordination with other ongoing initiatives (notably the Orange–Senqu Basin IWRM Plan development process) took place to ensure technical coherence and harmonisation of the Action Plans (and SAP) with the Orange–Senqu Basin IWRM Plan.

6.2 MEGA AND OTHER ONGOING PROJECTS

There are three mega projects and three other ongoing projects that are noted here for completeness. It was considered that their identification and planning lay outside the scope of this Action Plan/SAP process and analysis.

Acid mine drainage

Acid mine drainage is a legacy of decades of mining. In brief, as mine workings have been closed or mostly abandoned and dewatering has stopped, the water level in the mining void has been rising. At the same time, the exposure of the rock face, particularly where pyrite is present, means that the water is very acidic and laden with heavy metals and particularly troublesome sulphates. Over the years, the levels have risen and in some areas decanting has started. The South African Government has implemented a short-term plan while more permanent solutions are sought. The cost of the short-term plan exceeds ZAR2 billion.

New dams

South Africa and Lesotho have recently concluded an agreement on the implementation of Phase II of the Lesotho Highlands Water Project.

South African water resource studies have also indicated the value of an additional storage dam in the middle to Lower Orange–Senqu River.

Orange–Senqu River mouth management

A draft River Mouth Management Plan has recently been developed with financing provided by the UNDP–GEF Benguela Current Large Marine Ecosystem Project.

Environmental flow requirements

The DWA is progressing with a long-term project to determine environmental flow requirements throughout South Africa.

Working for Water; Working for Wetlands; Working for Land

The model of the successful Working for Water Programme has been extended to other activities.

© UNOPS/Christoph Mor

Sampling water near Parys, Free State, during a basin-wide, water-quality survey.

6.3 DRIVING DEPARTMENTS

Section 6.4 sets out the Action Plan implementation plan through the national government system.

However, the department that will be the driver of a particular programme, project or sub-project will be determined primarily by the functions assigned to the three spheres of government as set out in Section 2.1 of this document.

The Department of Water Affairs, being assigned the water resource management function and being 'water sector leader', will drive most of the projects proposed. However, where projects involve irrigated agriculture and soil and land conservation, the national Department of Agriculture, Forestry and Fisheries (DAFF) or the provincial departments may drive the project. A local government may take advantage of the broader programme and drive projects related to wastewater in its management area.

Table 9: The South Africa Action Plan

Targets	Proposed interventions	Project concept note	Ongoing initiatives	Policies/strategies/plans/programmes
PRIORITY AREA 1: DECLINING WATER RESOURCES QUALITY				
Objective: Water resources quality within the basin is improved				
Basin-wide receiving water resources quality objectives are set and a monitoring system is operational	• Design and implement monitoring system • Capacity building of field staff and laboratories • Update situational assessment (catchment) quality and quantity • Prioritise river lengths to manageable size • Stakeholder participation • Research strategy	PCN 1: Monitoring priority chemical pollutants Lower priority in this programme	• Part of the sub-programmes on water ecosystems and water information management in the DWA strategic plan	• Finalise specific interim receiving water quality objectives according to the approved system • Implement a monitoring system

Targets	Proposed interventions	Project concept note	Ongoing initiatives	Policies/strategies/plans/ programmes
The impact of the agricultural sector on water resources quality is mitigated	• Identify homogeneous areas in respect of water quality • Identify hotspots (e.g. Vaal Harts, Buchuberg and downstream) • Determine the role of infrastructure and the impact of deficiencies (e.g. leaking canals) • Correlate pollution occurrence with irrigation farming • Characterise contributing farming practices: irrigation and drainage, fertilisation, pest control, tillage • Compile best practice guide • Stakeholders	PCN 2: Mitigation of impact of agricultural sector on water quality	• Part of the sub-programmes on water ecosystems and water information management in the DWA Strategic Plan	• Research water quality issues in the agricultural sector

A basin-wide water quality research and monitoring programme is implemented on POPs, radionuclides, heavy metals and other exotic substances	• Catchment situational assessment
	• Prioritise the substances of importance and their thresholds where possible
	• Assess the possible impact (using precautionary principle) of prioritised exotic substances on:
	  • ecosystems
	  • humans
	  • agricultural productivity
	• Develop management guidelines incorporating a monitoring system
		Lower priority in this programme but linked to PCN 1: Monitoring priority chemical pollutants	• Part of the sub-programmes on water ecosystems and water information management in the DWA Strategic Plan	• Research exotic substances and their management

All wastewater treatment plants achieve Green Drop status as a step towards compliance with discharge water quality standards	• Identify core needs of municipalities • Design capacity-building programmes • Appoint mentors and troubleshooters • Establish easily accessible scientific advisory service • Assist with upgrading of reporting systems • Sponsor technical training • Sponsor increased incentives in Green Drop programmes	PCN 3: Support for wastewater treatment upgrade	• DWA Green Drop and Blue Drop initiatives	
PRIORITY AREA 2: INCREASING WATER DEMANDS				
Objective: Sustainable water resource utilisation is achieved				
All abstractions are accurately monitored	• Review measurement and recording system • Review regulatory system • Develop reporting and communication strategies • Develop geographic information system tools • Investigate introduction of remote sensing recording • Develop regulations to place onus of reporting abstraction on the user • Benchmarking	Lower priority in this programme Will form part of the ORASECOM IWRM Plan	• Strategy in NWRS II	• Extension of abstraction measurement system
The hydrometeorological and geohydrological monitoring and modelling system is improved	• Review monitoring strategy (river flow, groundwater and rainfall) • Climate-change modelling including how this will guide the monitoring strategy • Optimise existing systems including updating technology and facilities • Technical training in new technologies • Study to demonstrate the value of monitoring and promote advocacy • Add monitoring stations to the system	Lower priority in this programme Will form part of the ORASECOM IWRM Plan	• Strategy in NWRS II	• Hydrometeorological and geohydrological monitoring and modelling system

Targets	Proposed interventions	Project concept note	Ongoing initiatives	Policies/strategies/plans/ programmes
A water conservation and demand management programme is implemented in all sectors	• Irrigation efficiency and system losses	PCN 4: Water conservation and demand management in the irrigation sector	• NWRS II submits that water conservation and water demand management should be one of the top priorities • National water conservation and demand management strategy	• Water conservation and demand management programme
	• Leakage detection • Bulk and zone measurement within local government • Water accounting and reporting • Support system for local authorities capacity • Awareness/advocacy campaigns/ political support	Mostly in DWA strategic plans Will form part of the ORASECOM IWRM Plan		
Unlawful use is curtailed	• Regulatory control • Increase inspectorate and enforcement	Mostly in DWA strategic plans	• Strategy in NWRS II	• Permit enforcement
The proposed Vaal River integrated water quality management strategy is implemented	• Reduced need for dilution releases/ freeing-up yield in Vaal Dam for other uses • Review potential users of this water in relation to cost and quality	Mostly in DWA strategic plans	• Strategy in NWRS II	• Acid mine drainage project component. NB: The technology and processes to deal with acid mine drainage are being formulated – cannot at present be scoped within the Action Plan process.
Appropriate water infrastructure to meet developmental needs is implemented	• Planning • Financial plan (Lesotho Highlands Water Project Phase II is already being addressed by the Trans-Caledon Tunnel Authority)		• National planning	• Completion of planning of proposed infrastructure
The management and use of groundwater and surface-water resources are integrated	• Site specific/local level investigations of the interactions between prioritised aquifers and the adjacent fluvial system • Socio-economic community level work to advocate the benefits of conjunctive use	SAP PCN 2: Groundwater management and use	• Strategy in NWRS II	• Surface/Groundwater integration study
Water-use efficiency is improved	• Devise incentives for increased efficiency in all sectors • Promotion of efficient methods in the irrigation sector • Review the regulatory system to increase potential incentives to efficiency	Mostly in DWA strategic plans	• Strategy in NWRS II	• Promotion of water use efficiency
PRIORITY AREA 3: CHANGES TO THE HYDROLOGICAL REGIME				
Objective: The adverse effects of the changed hydrological regime are mitigated				
The hydrometeorological and geohydrological monitoring and modelling system is improved		SAP PCN 1: ORASECOM information and knowledge management Will also form part of the ORASECOM IWRM Plan	• Strategy in NWRS II	• See priority area 3 information
Environmental flows (the Reserve) are established and managed as part of agreed basin-wide environmental flows regime	• Increased resources into the ongoing process • Prioritise the estuary	SAP PCN 3: Basin-wide environmental flows regime	• Ongoing long-term project in DWA	• Environmental flows (the Reserve) determination

Targets	Proposed interventions	Project concept note	Ongoing initiatives	Policies/strategies/plans/ programmes
A management plan for the Orange–Senqu River estuary is implemented	• Finalise the draft plan (Orange–Senqu Mouth Interim Committee) • Implement the plan	SAP PCN 4: Orange–Senqu River mouth management	• Management plan in preparation	• Management plan for the Orange–Senqu River estuary
The CMA and WUAs are established and fully functional (everywhere or cross-cutting but not only here)	• Ongoing process that is unlikely to be part of this project	Lower priority in this programme	• Strategy in NWRS II	• CMA and WUA establishment
PRIORITY AREA 4: LAND DEGRADATION				
Objective: Land degradation is reversed and sustainable land use promoted				
Environmentally sound land management practices directed at soil retention and wetland conservation are promoted	• Identify candidate sites in the basin based on land condition and the potential for poverty alleviation • Define specific interventions that are needed in the Orange–Senqu basin (e.g. buffer zone) • Increase resources available to the programme • Reinforce inter-departmental cooperation on the issue (create a platform, including stakeholders) • Review/research existing floodplain usage and relocation outside the floodplain	PCN 5: Complementary support for LandCare Programme	• Existing LandCare Programme	• Extension of the LandCare Programme
The programmes for monitoring and applied research on land degradation are extended	• Additional resources for the existing programmes • Mobilise remote sensing technology • Survey the extent of the problem in the basin	Lower priority in this programme	• Existing LandCare Programme	• Land Degradation Research Programme
A programme for community-based land conservation and recovery is established	• Initial phase to review merit of reintroduction of earlier soil conservation scheme • Target sensitive areas and high levels of poverty	Lower priority in this programme, but partly linked to PCN 5: Complementary support for LandCare Programme	• Existing LandCare Programme	• Community-based land conservation and recovery project
The Working for Water, Working for Wetlands, Working for Land, Working on Fires and similar programmes are extended	• More resources to the programmes • Mobilise agricultural extension services • Intensify multi-departmental law enforcement in priority areas	Lower priority in this programme	• All programmes are ongoing	• Extension project(s)

6.4 ACTION PLAN IMPLEMENTATION, COORDINATION AND MONITORING

The Action Plan has been designed as a portfolio of project concepts. Funding is sought for each project, either individually or for a combination of projects. Potential funding sources are primarily national governments, international cooperation partners and, to some degree, the private sector.

In line with the project approach to the Action Plan, implementation is not through a central implementation agency responsible for the entire Action Plan. Instead, implementation is project-specific and the implementation mechanism is dependent on the requirements of the lead implementing agent for each respective project. A proposed implementation mechanism at project level is described in each project concept note.

Overall coordination and monitoring of the Action Plan is through the relevant government line ministry(ies) using their established structures and systems. Therefore, close collaboration with ORASECOM is necessary to ensure synergy in coordination and monitoring of the implementation of Action Plan (and SAP) activities in the four basin states.

Knellpoort Dam on the Rietspruit in the Free State Province augments water supply to Bloemfontein via the Caledon–Bloemfontein pipeline.

Below: A flock of Cape turtle doves (*Streptopelia capicola*) at a waterhole in the Kgalagadi Transfrontier Park, Northern Cape

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7. REFERENCES

Anon, 2013. Water resources study successfully completes first year. *Water Wheel* 12(4) July/August 2013.

Department of Agriculture, Forestry and Fisheries (DAFF), 2012. Integrated Growth and Development Plan.

DAFF (Department of Agriculture, Forestry and Fisheries), 2013. Annual Strategic Plan: 2013/14 to 2017/18.

DEAT (Department of Environmental Affairs and Tourism), 2005a. National Programme Combating Land Degradation to Alleviate Rural Poverty. Government Gazette 27952, 26 August 2005. Accessed at www.info.gov.za

DEAT (Department of Environmental Affairs and Tourism), 2005b. South Africa's National Biodiversity Strategy and Action Plan. Accessed at http://www.envirionment.gov

DEA (Department of Environmental Affairs), 2011. National Strategy for Sustainable Development and Action Plan (NSSD 1): 2011–2014.

Department of Water Affairs and Water Research Commission, 2010. Wastewater Risk Abatement Plan. Guideline to plan and manage towards safe and compliant wastewater collection and treatment in South Africa. Draft 01.

Department of Water Affairs, c. 2011. Enhanced Local Government Support Approach: Concept Paper. Accessed at http://www.cer.org.za

Department of Water Affairs, 2001. Strategic Plan (Annual Performance Plan): 2011/12 to 2013/14.

DWA (Department of Water Affairs), 2009. Water for Growth and Development Framework. Pretoria, Department of Water Affairs.

Department of Water Affairs, 2010. Green Drop Report.

Department of Water Affairs, 2011. Green Drop Handbook.

Department of Water Affairs, 2011. Green Drop Report p. 1.

Department of Water Affairs, 2013. National Water Resource Strategy (2nd edition).

DWA (Department of Water Affairs), 2013. Strategic Plan for the fiscal years 2013/14 to 2017/18.

Driver A, Sink, KJ, Nel, JN, Holness, S, Van Niekerk, L, Daniels, F, Jonas, Z, Majiedt, PA, Harris, L and Maze, K, 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.

IUCN (International Union for the Conservation of Nature and Natural Resources), 2013. Kalahari–Namib Project: Enhancing decision-making through interactive environmental learning and action in Molopo-Nossob River basin in Botswana, Namibia and South Africa. Accessed at http://www.iucn.org

National Water Act, 1998. Government of South Africa. National Water Act, No. 36 of 1998.

NPC (National Planning Commission), 2011. National Development Plan. Report RP270/2011.

Orange–Senqu River Commission Secretariat, 2011. Surface and groundwater resources. Contribution to the final transboundary diagnostic analysis and built structures database for the Orange–Senqu Basin. Technical Report 20. 7 December 2011.

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Above: A sewage treatment works near Lenasia, Gauteng

Opposite page: The Orange River at the Augrabies Falls National Park is about 120 km west of Upington, Northern Cape.

ORASECOM (Orange–Senqu River Commission), 2007. Orange River Integrated Water Resources Management Plan: Demographic and economic activity in the four Orange Basin States. Report 008/2007, prepared by WRP Consulting Engineers, Jefares and Green, Sechaba Consulting, WCE & Water Surveys Botswana for ORASECOM.

ORASECOM, 2011. Surface and groundwater resources. Contribution to the final transboundary diagnostic analysis and built structures database for the Orange–Senqu Basin. Technical Report 20. 07 December 2011.

ORASECOM, 2013. POPs, PAHs and elemental levels in sediment, fish and wild bird eggs in the Orange–Senqu basin. Report 002/2013. Prepared by Bouwman, H, Pieters, R, Genthe, B and Chamier, J.

Perry, C, 2007. Efficient irrigation, inefficient communication, flawed recommendations, irrigation and drainage, *Wiley InterScience* 56:4.

Reinders, FB et al, 2010. Standards and guidelines for improved efficiency of irrigation water use from dam wall release to root zone application: Main report. Water Research Commission Report No. TT 465/10.

Reinders, FB, 2012 Technical Aspects and cost estimating procedures of surface and subsurface drip irrigation systems. Volume 1: Main report. Water Research Commission Report No. TT 524/12.

Roberts, C and Montgomery, S (eds), 2013. Orange–Senqu River Basin Transboundary Diagnostic Analysis. Produced by the UNDP–GEF Orange–Senqu Strategic Action Programme (Atlas Project ID 71598). ORASECOM Report 2013/004.

South African Government Information Service, 2010. Framework of the New Economic Growth Path. Accessed at http://www.info.gov.za/aboutgovt/programmes/new-growth-path/

Statistics South Africa (STATSSA), 2006. Natural resource accounts. Updated Water Accounts for South Africa: 2000. Discussion Document D0405. Accessed at http://www.statssa.gov.za

Stevens, JB, 2012. Training material for extension advisors in irrigation water management. Volume 1: Main report. Water Research Commission. Report No. TT 539/12.

Swartz, CD, 2012. The establishment and piloting of the technical assistance centre for small water and wastewater treatment plants. Water Research Commission. Report No. TT 510/11.

UNDP (United Nations Development Programme), 2002. The GEF IW TDA/SAP Process: Notes on a proposed best practice approach.

UNEP (United Nations Development Programme, 2010. Kalahari–Namib Project: Enhancing decision-making through Interactive environmental learning and action in the Molopo-Nossob River basin in Botswana, Namibia and South Africa. Project document. IMIS: GFL/2328-2770-4B81. PMS: GF/3010-10-32.

Van Vuuren, LJ, 2012. Taking on the water resource assessment challenge. *Water Wheel* 11(3) May/June 2012.

Vast tracts of wheat are harvested in the Free State. The grain industry is one of the largest in South Africa, making up between 25% and 33% of the country's total gross agricultural production. The largest area of farmland is planted with maize, followed by wheat and, to a lesser extent, sunflowers.

The cool waters of the Orange River provide welcome reprieve from the heat for families at Keimoes, Northern Cape.

8. ANNEXURE: PROJECT CONCEPT NOTES

PROJECT CONCEPT NOTE 1

CORE DATA	
Project number	South Africa PCN 1
Project title	Monitoring priority chemical pollutants
Action Plan priority area	Declining water resources quality
Short description	Monitoring of the wide range of chemical pollutants that could impact on either human or ecosystem health is challenging in a resource-limited environment. This project aims to develop a focused monitoring system to monitor selected chemical pollutants in the basin (e.g. persistent organic pollutants, radionuclides, pharmaceuticals and personal health care products, etc). The intention is to achieve this in close alignment with the objectives of the South African Department of Water Affairs (DWA) and in close collaboration with them.
PROJECT RATIONALE	
Background	The South African Department of Water Affairs (DWA) and its regional offices implement a variety of national, regional and local water quality monitoring programmes. The NWRS II lists the National Microbial Water Quality Monitoring Programme, the National Eutrophication Monitoring Programme and the National Toxicity Monitoring Programme. However, monitoring of the very wide range of potential chemical pollutants remains somewhat limited. This is partly because of the technical difficulties and costs associated with such monitoring on a large scale. A project that specifically targets these problems has the potential to add significantly to the information that can inform appropriate management of these chemicals so that their impact on ecosystems and humans can be mitigated or even avoided. The project will further be informed by a preliminary joint basin survey. (ORASECOM, 2013. POPs, PAHs and elemental levels in sediment, fish and wild bird eggs in the Orange–Senqu basin. Report 002/2013, prepared by Bouwman, H, Pieters, R, Genthe, B and Chamier, J.)

The densely populated suburb of Kliptown, Soweto, is situated on the Klip River which empties into the Vaal River.

Project objectives	To provide South African authorities and neighbouring states with information on selected priority chemical pollutants that informs appropriate and effective management.
Integration with relevant ongoing projects/ initiatives	The Department of Water Affairs (DWA) has various water quality monitoring programmes in place. This project will liaise with the appropriate directorate of DWA (e.g. Resource Quality Services) and regional offices to establish how the monitoring done in this project will most effectively augment the existing monitoring so that the most effective information for pollution management is provided. Of specific relevance would be future monitoring in the Lower Orange River area, where South Africa has a direct interest in POPs as a result of the agricultural activities associated with the Orange–Senqu River irrigation schemes.
Project outcomes	1 Monitoring system operational. 2 A better understanding of the potential impact of these chemicals on both humans and ecosystems. 3 More informed management of the sources and occurrence of these chemicals.
Technical approach	**OUTCOME 1: MONITORING SYSTEM OPERATIONAL** The project will design and implement the technical monitoring system. It will necessarily avoid duplication of any existing monitoring systems. At its core this project will be 'risk-based'. It will also distinguish between hazard-based data and information and risk-based data and information. The difference will relate fundamentally to the fact that risk requires knowledge of actual exposure to the problem pollutants in specific areas, while hazard refers to the nature of the chemical itself and its hypothetical impact. **Output 1.1 Needs assessment** A detailed needs assessment which will establish what classes of chemical pollutants should be prioritised. **Output 1.2 Design of the monitoring system** Consideration of such factors as sampling methods, sample preparation methods, the availability of sufficient analytical capacity in appropriately located laboratories, and the collection, reporting and interpretation of the data. The identification of institutional factors, such as regulatory and reporting systems. Given the potential spatial scale of monitoring such a large basin, at all times cognisance will be given to the practicalities and costs of long-term monitoring. For example, the analytical capacity of laboratories will be established. If there is currently limited analytical capacity for ongoing monitoring, then a strategy will be developed to establish the necessary capacity. This should provide a sound business model and include considerations such as the necessity for sufficient numbers of samples on an ongoing basis for the purchase of expensive equipment for a laboratory to be financially feasible. **Output 1.3 Implementation of the monitoring system** Case study sites will be selected on the basis of the potential severity of problems associated with these chemicals as well as the likelihood of achieving initial successes in implementation. These early successes are important for creating momentum for further uptake and implementation in areas where there are greater difficulties. **OUTCOME 2: A BETTER UNDERSTANDING OF THE POTENTIAL IMPACT OF THESE CHEMICALS ON BOTH HUMANS AND ECOSYSTEMS** The project will improve understanding of the chemicals both within the scientific community and the public. Further research into the impact of these chemicals will be carried out. One aspect of the problem with many pollutants is that guidelines that quantify levels, e.g. below which their associated risks are 'acceptable', are not available. This project will therefore also give attention to obtaining, either from the literature or from focused experimental work, data which can be used to establish preliminary guidelines. This is critical to ensuring that the data collected by this monitoring system provide for informed decision-making. **Output 2.1 Availability of risk-based information on the priority chemical pollutants in the basin** **Output 2.2 Information for stakeholders of potential impact and emerging issues of which they may not yet be aware** **Output 2.3 Public outreach programmes specifically designed for information dissemination to the general public** **OUTCOME 3: MORE INFORMED MANAGEMENT OF THE SOURCES AND OCCURRENCE OF THESE CHEMICALS** The project will generate information that will enable improved water resource management and regulation. **Output 3.1 Improved information on the origin, dispersion and concentration of the priority chemicals** **Output 3.2 Emergency response protocols**
Assumptions and risks	• The assumption is made that DWA would be: (i) sufficiently interested in monitoring such chemicals in a way that supplements monitoring that may already be occurring; and (ii) capable and willing to provide the necessary contact people and time to ensure any new monitoring contributes to their monitoring objectives.
IMPLEMENTATION	
Project duration	Four years
Project cost	ZAR50 million (USD5 million)
Proposed funding sources	To be secured
Implementation mechanism	To be determined

PROJECT CONCEPT NOTE 2

CORE DATA	
Project number	South Africa PCN 2
Project title	Mitigation of impact of agricultural sector on water quality
Action Plan priority area	Declining water resources quality
Short description	The agricultural sector can significantly impact on both water quantity and quality. This project will focus on water quality impact and identify priority agricultural land uses and priority water quality impact in the basin. Giving appropriate consideration to existing best practice guidelines, improved guidelines will be developed which give appropriate consideration to the degree to which the new guidelines will be socially acceptable and economically sustainable.
PROJECT RATIONALE	
Background	The agricultural sector is not only a significant user of water – it can also impact heavily on the quality of surface-water resources and groundwater resources. This can happen particularly via return flows from agricultural land which can cause increases in salinity, nutrients and other chemicals, such as pesticides, herbicides, etc. Furthermore, intensive livestock farming can result in deteriorating microbial quality. Indeed, decreasing microbial water quality can impact adversely on downstream agricultural land when water from a polluted surface-water resource is used for irrigation of crops that are eaten raw. Although a great deal of research has been done worldwide on agricultural impact on water quality, a focused research project in the basin is warranted as, while the generalities are understood, effective management requires site-specific knowledge.
Project objectives	To characterise the relationships between agricultural practices in the basin and the associated water quality in surface-water resources and to develop best practice guidelines to mitigate water quality impact sustainably.
Integration with relevant ongoing projects/ initiatives	The link between agriculture and water resources quality has been considered in several DWA and WRC-funded projects. In part, this project will collate outcomes and fill any gaps to create a more comprehensive and credible body of knowledge.
Project outcomes	1 Improved understanding of priority agricultural land-use practices and priority water quality issues in the basin. 2 Better understanding of the optimum way forward to mitigate potential agricultural impact on surface-water resources.
Technical approach	**OUTCOME 1: IMPROVED UNDERSTANDING OF PRIORITY AGRICULTURAL LAND-USE PRACTICES AND PRIORITY WATER QUALITY ISSUES IN THE BASIN** **Output 1.1 Basin-specific aims** While the generic impact of specific land uses on water quality is known, it will be necessary to characterise the actual land uses in the basin, the current water quality issues, and the nature and extent of current initiatives (especially within DWA and DAFF). This will help identify problems that are specific to the basin so that aims can be defined that will properly focus (and prioritise) the subsequent work. **Output 1.2 Correlation of current agricultural land uses in the basin with existing water quality** With a detailed situation assessment in the basin, attempts will be made to link (correlate) actual agricultural land use with observed water quality. This will help identify the specific agricultural practices most in need of improvement. **OUTCOME 2: BETTER UNDERSTANDING OF THE OPTIMUM WAY FORWARD TO MITIGATE POTENTIAL AGRICULTURAL IMPACT ON SURFACE-WATER RESOURCES** In close collaboration with the specific priority land users, actual current practices need to be well understood. Any existing best practice guidelines should be identified and reviewed. The degree to which these are actually practised should be established. The exact way in which water quality is impacted should also be understood. On this basis, improved land-use practices can be developed that have as their ultimate aim the mitigation of water quality impact while being practical, socially acceptable and economically sustainable. Whenever possible, case study sites should be identified where the new practices can be implemented and the effects on water quality monitored. On the basis of such practical investigations, refined land-use guidelines can be developed. **Output 2.1 Research report** **Output 2.2 Best practice guidelines**
Assumptions and risks	• The proposed project does assume that local land users will be amenable to: (i) their practices being examined and (ii) new practices being proposed. This need for uptake of the new ideas generated in this project will inevitably bring a social component into the research work which should be catered for from the start in an appropriately sensitive and empathetic manner.
IMPLEMENTATION	
Project duration	Five years
Project cost	ZAR10 million (USD1 million)
Proposed funding sources	To be secured
Implementation mechanism	To be determined

PROJECT CONCEPT NOTE 3

CORE DATA	
Project number	South Africa PCN 3
Project title	Support for wastewater treatment upgrade
Action Plan priority area	Declining water resources quality
Short description	The project supports the upgrading of the performance of municipal wastewater treatment plants.
PROJECT RATIONALE	
Background	Poorly treated municipal wastewater is a significant contributor to poor river water quality. Poor performance is due to a number of factors, including skills deficiencies, inadequate funding and aging infrastructure. The position is further complicated by the emergence of new polluting substances from current lifestyles that are not removed by traditional treatment methods. In many instances, the overflow of raw sewage from wastewater treatment works (WWTWs) can in part be attributed to the ingress of flood water to the reticulation system and excessive leakage from domestic water systems directly to the sewers. The DWA runs the Green Drop programme as part of incentive-based regulation for water services authorities to improve their wastewater management performance. The balance between 'incentive' and 'sanction' driven regulation is important. The Green Drop outcomes for 2011 are only available on a provincial basis. However, the North West, Free State and Northern Cape provinces that make up most of the South African portion of the Orange–Senqu basin are respectively sixth, seventh and ninth on the Green Drop national performance log. None of the municipalities in these provinces received Green Drop certification. The average score in the Northern Cape is below the 'critical state'. Gauteng, the other basin province, is third on the log. *Numerous studies and assessments have been conducted on various elements of the value chain over the recent past, mostly with a particular focus on challenges encountered by municipalities in discharging of their legislative mandate of providing water services. Recent examples of such studies include the State of Local Government Report (2009) and the assessments conducted as part of the Local Government Turn Around Strategy, as well as water sector-specific instruments such as the Municipal Strategic Self-Assessments, the Regulatory Performance Measurement System, the Blue Drop and Green Drop assessments, the Risk-Based Assessments for Municipal Waste Water Treatment, and the Refurbishment Grant Business Case. The outcomes of these studies and assessments have amongst other issues indicated that the current mode of water services operation is in significant decline. It has also become evident that the largest challenge faced by the water sector within the country is that of the sustainable operation of the water business and not the ability to lay new capital infrastructure.* (Department of Water Affairs undated but circa 2011).
Project objectives	Upgrade wastewater infrastructure, technology and human capacity
Integration with relevant ongoing projects/ initiatives	The DWA already has a national programme for supporting municipalities that do not meet Green Drop and regulatory standards. The Department of Cooperative Governance and Traditional Affairs has initiated a Municipal Infrastructure Support Agency (MISA). The purpose is to support municipalities with planning, management and other technical expertise to roll out infrastructure more efficiently and effectively. MISA will also be supportive of the LGTAS (Local Government Turnaround Strategy). DWA has a Rapid Response Unit (RRU) that is positioned to respond to water-related crises and emergencies within a short period of time. This includes wastewater treatment failures. The Water Research Commission (WRC) funded a project: The Establishment and Piloting of the Technical Assistance Centre (TAC) for Small Water and Wastewater Treatment Plants (Swartz, 2012). The TAC was piloted in 2009 but was unable to gain sufficient support to migrate to full operation. The DWA is in the process of rolling out a Wastewater Risk Abatement Planning (W_2RAP) process. A number of funds have been established by National Treasury for financing specific aspects of infrastructure, water and wastewater and human capacity. Included are: • Accelerated Community Infrastructure Programme • Municipal Water Infrastructure Grant • Municipal Infrastructure Grant • Regional Bulk Infrastructure Grant • National Water Resources
Project outcomes	1 Existing infrastructure and human capacity are upgraded. 2 The discharge of effluent from municipal wastewater systems complies with regulations.

Spring flowers in Namaqualand, Northern Cape

Technical approach	South Africa already has an established framework within which municipal wastewater management can be assessed and improved. As a first element, for the entire business (i.e. value chain) of municipal wastewater management: *The Green Drop process measures and compares the results of the performance of Water Service Authorities and their Providers, and subsequently rewards (or penalises) the municipality upon evidence of their excellence (or failures) according to the minimum standards or requirements that have been defined. Awareness of this performance is obtained by pressure through the customers, the media, political classes and NGOs. The strategy revolves around the identification of mediocre performing municipalities who consequently correct the identified shortcomings, as well as the introduction of competitiveness amongst the municipalities and using benchmarking in a market where competition is difficult to implement.* (DWA, 2011) The DWA has proposed a 'water investment framework'. At its core, this suggests that water services should be addressed holistically from resources through supply and collection and treatment of effluent to return to the watercourse. All the necessary elements within the water cycle must be addressed and these include: • governance • management • institutional skills • infrastructure • financial. Any further initiative of whatever form will have to fit in with existing processes. **OUTCOME 1: EXISTING INFRASTRUCTURE AND HUMAN CAPACITY ARE UPGRADED** The approach is that all the elements listed above, but focusing on human capacity and infrastructure, are necessary if the objective is to be achieved. **Output 1.1 The priorities are confirmed** The Green Drop data, augmented by further detailed research, will confirm the greatest needs and distinguish in a report between needs in human capacity and infrastructure needs. **Output 1.2 Action plan** The action plan will be based on wastewater risk abatement planning (W_2RAP) (DWA and WRC, 2010). The W_2RAP approach has been developed to organise and systematise management practices applied to wastewater treatment and to ensure the applicability of these practices to the management of treated effluent water quality. The approach draws from the risk management principles which are at the core of the water safety plans of WHO. The standout principle is that the component posing the greatest risk is prioritised for correction. The process assesses both the likelihood of an event occurring and the consequences when it does happen. The product of these two assessments is the Risk Rating. **Output 1.3 Corrective action both in terms of human capacity and investment is implemented** **OUTCOME 2: THE DISCHARGE OF EFFLUENT FROM MUNICIPAL WASTEWATER SYSTEMS COMPLIES WITH REGULATIONS** **Output 2.1 Discharges from WWTW comply with regulations** **Output 2.2 The Green Drop rating of all WWTW in the basin improves**
Assumptions and risks	• A framework for improving wastewater management already exists but there are inadequate resources in all forms to implement it effectively. • Priorities which will contribute to international cooperation in environmentally sound water sector development will have to be determined.
IMPLEMENTATION	
Project duration	Ten years
Project cost	ZAR1 billion (USD100 million) for selected environmentally focused priority interventions
Proposed funding sources	To be secured
Implementation mechanism	To be determined

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The Eye of Kuruman, a natural spring in the Northern Cape, feeds the Kuruman River, which is a tributary of the Orange.

PROJECT CONCEPT NOTE 4

CORE DATA	
Project number	South Africa PCN 4
Project title	Water conservation and demand management in the irrigation sector
Action Plan priority area	Increasing water demands
Short description	The use of recent research findings to increase the efficiency of irrigation water use through awareness and training programmes.
PROJECT RATIONALE	
Background	In South Africa, the irrigation sector accounts for roughly 56 per cent of all water abstractions. The sector is a high volume user, but the percentage contribution of the broader agricultural sector to the South African GDP has been in decline since the 1970s and now is around three per cent of total GDP. The sector, however, is a major employer and contributes significantly to food security and rural livelihoods, as well as supporting agro-processing industries through high economic multiplier effects. Irrigation in the middle reach of the Orange–Senqu River contributes to exports of table grapes and wine in particular. Expansion of this economic activity is now constrained by the availability of water for irrigation. The system of water allocation to agriculture has in the past not incentivised the efficient use of water and in common with most of South African irrigation it is believed that water-use efficiency can be increased. The South African Water Research Commission has recently published three major research reports on irrigation efficiency (Reinders et al., 2010; Reinders, 2012; Stevens, 2012). This project seeks to operationalise the research findings in the priority area identified in the South African Action Plan. The research area included parts of the Orange–Senqu basin. A project on the topic is being implemented at Vioolsdrift. An important aspect of the research is its adoption of the 'water balance' approach advocated by the International Commission on Irrigation and Drainage (ICID). The approach has the benefit of increasing international acceptance and is therefore proposed for this project. In this approach: • efficiency refers to the state of a water balance for a defined spatial and temporal area rather than to the value of a performance indicator; and • improved efficiency is achieved through a process of assessment and targeted actions, rather than general practices. The research also proposes a new set of system efficiency values for design purposes which are considerably more stringent than the present system design norms. The research evaluated 75 irrigation systems across the country using the standard evaluation forms and procedures as published in ARC Institute for Agricultural Engineering's Manual for the Evaluation of Irrigation Systems. As a result of the intensive use of the templates and procedures, the evaluation forms were adjusted and improved, and improved software for the capturing and analysis of the data was developed. These outcomes are available to this project.
Project objectives	Improve irrigation efficiency in the basin.
Integration with relevant ongoing projects/ initiatives	The National Development Plan (p. 156) states: *… the farming sector will have to increase the efficiency of its water use to expand production and allow transfers to other users in water-scarce areas, as well as for expansion in irrigated agriculture. The Commission proposes a dedicated national programme to provide support to local and sectoral efforts to reduce water demand and improve water-use efficiency.* The DWA has the strategic objective, i.e. *2.4. Improve water use efficiency.* The South African DWA has a policy on implementing water conservation and demand management in all water-use sectors. In urban areas this is known as Project 15%. The South African DWA is in the midst of a project to identify and curtail unlawful water use. The project will validate the above-mentioned research findings at operational level.
Project outcomes	1 The irrigation sector is aware of methods for increasing irrigation efficiency. 2 A programme for upgrading and revitalising irrigation infrastructure is established. 3 Additional water resources become available for reallocation in terms of the National Water Act and national policy.

An irrigated grape farm on the Lower Orange River

Technical approach	The research project on standards and guidelines for improved efficiency of irrigation water use from dam wall release to root zone application provides a framework for the technical approach to this project. The research project went through phases to: • standardise the terminology, definitions and formulae for distribution, surface storage, application, soil storage and return-flow efficiencies; • develop locally relevant tools and criteria to measure efficiency and practically achieve benchmarks; • apply the tools at selected locations to determine current efficiency levels, propose best management practices for improvement and develop site specific scenarios for water management; and • compile guidelines for improving water-use efficiency. The products of the research project will be applied by this project to a wider operational scale. **OUTCOME 1: THE IRRIGATION SECTOR IS AWARE OF AND PRACTICES METHODS FOR INCREASING IRRIGATION EFFICIENCY** **Output 1.1 The outputs from the research project are adapted for use as training and promotional materials** **Output 1.2 An extensive outreach, information and promotional programme is launched** **Output 1.3 A programme for training extension officers and irrigators is established, based on approaches proposed by the WRC research project. Training material for extension advisors in irrigation water management** **Output 1.4 Pilot projects in selected areas of the basin are established** **Output 1.5 Scientific and effective water abstraction and use measuring systems are established** **OUTCOME 2: AN INVESTMENT PROGRAMME FOR UPGRADING AND REVITALISING ON-FARM AND DISTRIBUTIONAL IRRIGATION INFRASTRUCTURE IS ESTABLISHED** In addition to inefficiencies in the application of irrigation water to the root zone, the research showed that much of the potential for saving water lay in the prevention of losses from the distribution systems before the water reaches the farm gate. **Output 2.1 The priority infrastructure for upgrade is identified** **Output 2.2 A special fund for irrigation infrastructure upgrade is established or the access to existing funds is facilitated** **Output 2.3 Investments are made to increase efficiency** **Output 2.4 A monitoring and evaluation system that is able to assess the economic and water-use impact of the project is established** **OUTCOME 3: ADDITIONAL WATER RESOURCES BECOME AVAILABLE FOR REALLOCATION IN TERMS OF THE NATIONAL WATER ACT AND NATIONAL POLICY** The existing rights holders will have to be incentivised to make investments that conserve water. The current national policy is unclear on this issue. (Note: A general water policy review had been initiated at the time of writing.) **Output 3.1 The policy position on how the benefits of increased irrigation efficiency are allocated is clarified** **Output 3.2 The particular problems faced by emerging farmers are understood**
Assumptions and risks	• National and provincial departments are able to coordinate their functions effectively and there is coordination in budgetary allocations. • Irrigation efficiency is low and can be improved without adverse effects on other dimensions of irrigation farming, such as salination of soil and deterioration in water quality. • Farmers and water-user associations are willing to participate. • Organised agriculture supports the initiative.
IMPLEMENTATION	
Project duration	Seven years
Project cost	ZAR80 million (USD8 million)
Possible funding	To be secured
Implementation mechanism	To be determined

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Flamingoes in the lagoon formed at the coast by overflow of the Orange River at a Ramsar site, on the South African side of the river

PROJECT CONCEPT NOTE 5

CORE DATA	
Project number	South Africa PCN 5
Project title	Complementary Support for LandCare Programme
Action Plan priority area	Land degradation
Short description	The project supports additional areas for the expansion of the LandCare Programme which uses community action to combat land degradation.
PROJECT RATIONALE	
Background	The LandCare Programme was established as a community level approach to the problems of land degradation. It directly addresses poverty alleviation. LandCare is essentially a concept involving a process of participation that focuses on land resource management through the promotion of sustainable use practices. LandCare involves 'local people taking local action in their local area' to achieve sustainable land use and management. LandCare includes individual and group activities directed at on-ground action. It also provides an opportunity for local landholders to take a leading and responsible role in planning and undertaking activities to conserve their most important assets. LandCare encourages community interest and action through the formation of LandCare groups. LandCare groups assess local problems, determine priorities and undertake action. Local leadership and initiative leads to a greater understanding of the issues. In this way, the local communities become owners of the solutions. There is an existing similar international project in the basin named the Kalahari–Namib Project (IUCN, 2013). It is a joint project between South Africa, Namibia and Botswana which is funded by UNDP–GEF. The Kalahari–Namib Project is located in the marginal dryland areas of the Savannah biome. It is proposed that similar projects should be initiated in the Nama Karoo and Grassland biomes of the Northern Cape and southern Free State provinces, respectively. South Africa ratified the UN Convention to Combat Desertification in September 1997. The Action Plan, required by the Convention, was promulgated in 2004 (Department of Environment and Tourism, 2005). The Department of Environmental Affairs is the focal point for the Convention.
Project objectives	Community mobilisation for engendering sustainable land management (SLM) practices.
Integration with relevant ongoing projects/ initiatives	The Department of Agriculture, Forestry and Fisheries has a national LandCare Programme.
Project outcomes	1 Baseline assessment 2 Community-based SLM 3 Enhanced decision-making and exchange of best practices and lessons learnt 4 Income-generating activities supported through improved services 5 Project management, monitoring and evaluation

A water tank near Taung, North West Province

Technical approach	The technical approach is taken largely from the Kalahari-Namib Project (UNEP, 2010) The project will be applied in selected local areas and will deliver five major outcomes: **OUTCOME 1: BASELINE ASSESSMENT** The baseline assessment establishes the circumstances in the area and informs the particular project design for that area. **Output 1.1 A description of the physical environment (location, geology, soil, topography, climate, fauna and flora)** **Output 1.2 A description of land management and tenure systems (type of management – commercial, communal, small scale, wildlife/game management, protected areas)** **Output 1.3 A description of socio-cultural environment (population, communication and policy links and strategies, employment and livelihood patterns, public services, financial systems) and local projects and programmes** **Output 1.4 The information gathered in the above will enable the development of a communication strategy and tools (databases, websites, etc.) to communicate information and innovations** **OUTCOME 2: COMMUNITY-BASED SLM** This component, being the core of the project, should be designed to empower and support local communities across the project area to implement sustainable land management in a collaborative manner with inputs from the major service providers. The project will also be able to draw on South Africa's national LandCare Programme and the Kalahari–Namib Project. **Output 2.1 Local community-based institutions provide information on where they want to go, how to get there, what approaches are needed to assist them in getting there; they need to continue on their own once external support is discontinued** **Output 2.2 Capacity building based on identified gaps, such as mentoring, training, workshops, student training, seminars and identification and dissemination of best practices** **Output 2.3 Capacity building for participatory development and community empowerment and to institutionalise the necessary reforms for process-oriented development** **OUTCOME 3: ENHANCED DECISION-MAKING AND EXCHANGE OF BEST PRACTICES AND LESSONS LEARNT** This outcome will deal specifically with placing SLM on the local and provincial agenda, illustrating the long-term benefits thereof and mainstreaming basic principles in local and provincial institutions. This will ensure a better institutional arrangement and allow for improved support services, information flow and understanding of the importance of long-term sustainability. Placed in a better position to understand the impact of their own natural resource management based decisions, together with the appropriate market-based incentives, small-scale farmers will act with greater awareness. **Output 3.1 Enhanced understanding and decision-making on SLM scale by policy makers, communities and institutions in the basin. This output will focus firstly on analysing institutions, policies, economy (capacity/gaps) and how best to address these gaps (markets, resource rights, incentives for environmental management, etc.), and secondly on collecting best practices from this and other similar SLM projects. The results of this analysis will be used to engage with all stakeholders on the issues.** **Output 3.2 Promotion of security of tenure and provision of correct and appropriate incentives/disincentives, e.g. for marketing.** **Output 3.3 Establishment and strengthening of provincial and national project management capacity identify policy gaps, best practice/good governance in SLM.** **Output 3.4 Awareness of the economic value of ecosystems goods and services in the project area is raised.** **OUTCOME 4: INCOME-GENERATING ACTIVITIES SUPPORTED THROUGH IMPROVED SERVICES** There is a strong relationship between the level of resource degradation and income levels – the poor, for obvious reasons, tend to focus on short-term needs rather than longer term goals of sustainability. **Output 4.1 Promotion of resilient livelihoods of people through alternative income generation both inside and outside the direct realm of agriculture. These could include both on and off-land activities.** **Output 4.2 Research on available and supplementary livelihood options to ensure greater household income while maintaining and improving the resource base. The goal of this output will be to engage in activities which will increase household resilience through investigating and promoting a greater variety of livelihood options. This together with increased adaptive capacity at all levels of decision-making, especially at the household level, will facilitate greater ecosystem stability.** **OUTCOME 5: PROJECT MANAGEMENT, MONITORING AND EVALUATION** Such a project can only be effective if it is closely in touch with the participants. It will therefore be essential to conduct the project management from an office in the project area. **Output 5.1 Comprehensive project management that ensures the project is readily accessible to all the intended beneficiaries.** **Output 5.2 Comprehensive monitoring and evaluation that ensures that successful initiatives are shared with all participants.**
Assumptions and risks	• The principal assumption is that given the greater level of integration inherent to the Orange–Senqu basin analysis and with enhanced monitoring and evaluation, the merits of the programme can encourage greater replication throughout the Orange–Senqu basin and the broader South Africa. • The principal risk is buy-in by the DAFF and the officials that manage the current programme.
IMPLEMENTATION	
Project duration	Ten years
Project cost	ZAR100 million (USD10 million)
Proposed funding sources	To be secured
Implementation mechanism	To be determined