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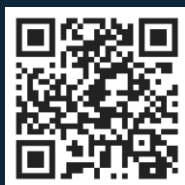
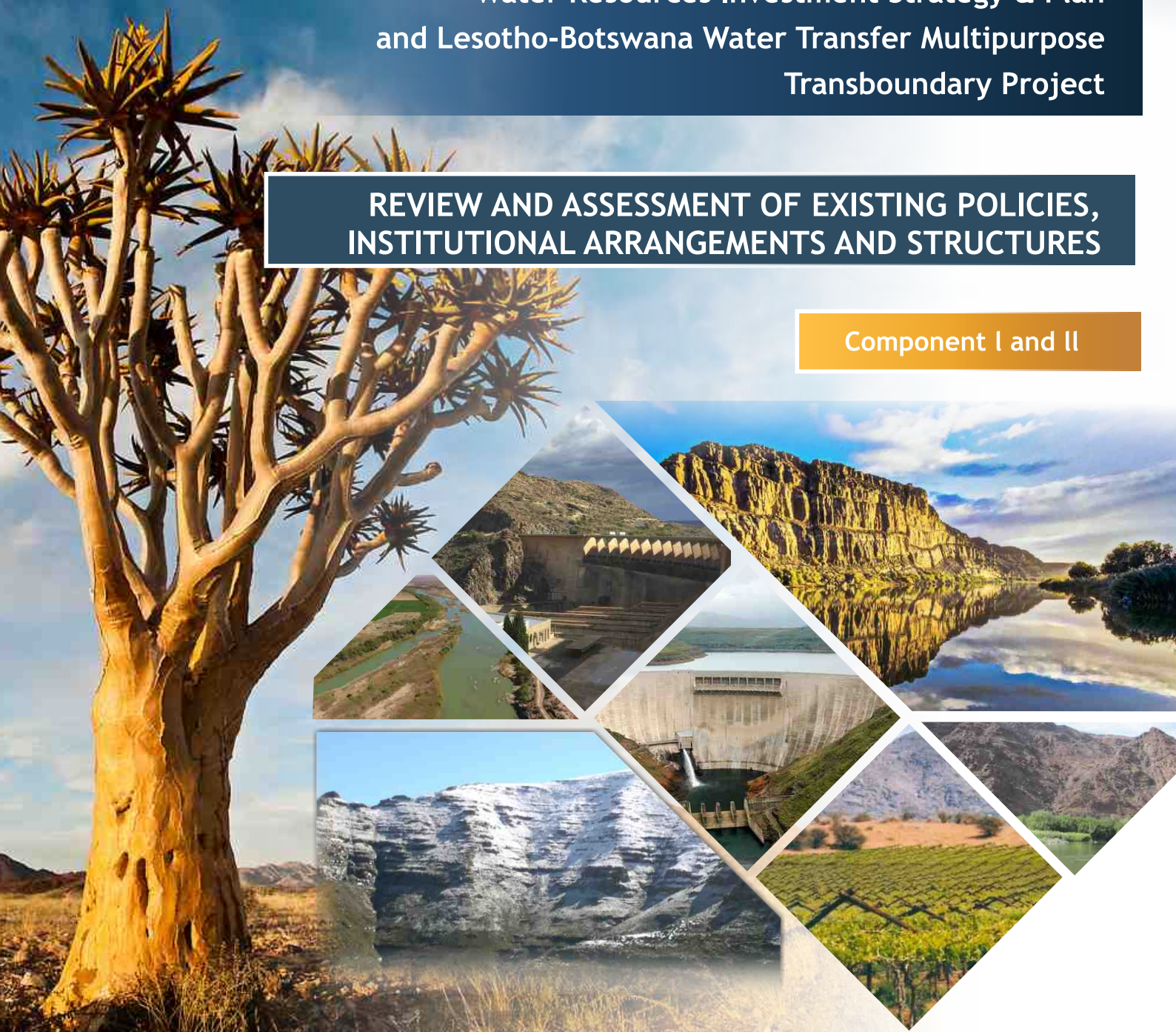
The Orange-Senqu River Commission (ORASECOM)

Sharing the Water Resources of the Orange-Senqu River Basin

Contract No.: P-Z1-EAZ-048/CS/01
**Preparation of Climate Resilient
Water Resources Investment Strategy & Plan
and Lesotho-Botswana Water Transfer Multipurpose
Transboundary Project**

**REVIEW AND ASSESSMENT OF EXISTING POLICIES,
INSTITUTIONAL ARRANGEMENTS AND STRUCTURES**

Component I and II



January 2020
FINAL REPORT

Report number: ORASECOM 008/2019

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PREPARATION OF CLIMATE RESILIENT WATER RESOURCES INVESTMENT STRATEGY & PLAN AND LESOTHO-BOTSWANA WATER TRANSFER MULTIPURPOSE TRANSBOUNDARY PROJECT

COMPONENT I AND II

REVIEW AND ASSESSMENT OF EXISTING POLICIES, INSTITUTIONAL ARRANGEMENTS AND STRUCTURES

Prepared for



Orange-Senqu River Commission (ORASECOM)

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**PREPARATION OF CLIMATE RESILIENT WATER
RESOURCES INVESTMENT STRATEGY & PLAN
AND LESOTHO-BOTSWANA WATER TRANSFER
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TABLE OF REPORTS

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Inception Report Components I and II	ORASECOM 010/2018
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Core Scenario Update Report Component I	ORASECOM 003/2019
Core Scenario Supporting Report: Water Requirements and Return flows Component I	ORASECOM 004/2019
Core Scenario Supporting Report: Water Conservation, Water Demand management and Re-use Report Component I	ORASECOM 005/2019
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Roadmap for IWRMP Operationalization: Appendix C Core Scenario Concept Notes	ORASECOM 012C/2019
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Lesotho-Botswana water transfer multipurpose transboundary project Component III Pre-feasibility Phase	
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Report B Phase2: Water Conveyance System	ORASECOM 015B/2019
Report C Phase 2: Environmental and Social Assessment	ORASECOM 015C/2019
Report D Makhaleng River Ecological Water Requirements	ORASECOM 015D/2019
Lesotho-Botswana water transfer multipurpose transboundary project Component IV - Feasibility Phase	
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EXECUTIVE SUMMARY

The Orange-Senqu River basin is one of the largest river basins south of the Zambezi with a catchment area of approximately 1 million km². It encompasses all of Lesotho, a significant portion of South Africa, Botswana and Namibia. The Orange River originates in the Lesotho Highlands and flows in a westerly direction approximately 2 200 km to the west coast of South Africa and Namibia where the river discharges into the Atlantic Ocean

The Orange-Senqu River basin is a highly complex and integrated water resource system, characterized by a high degree of regulation and major inter-basin transfers to manage the resource availability between the location of relatively abundant precipitation and the location of greatest water requirements. The infrastructure involves water storage and transmission infrastructure, transmitting water to demand centres that are in some cases located outside of the basin through intra and inter basin transfers.

The Republic of Botswana is an arid country faced with serious water constraints which will worsen with the expected effects of climate change. Botswana is predicted to experience chronic water shortages by about 2025, unless major new water source(s) is developed. Already Gaborone was critically hit by the 2015-2016 drought. As a consequence, the Governments of Botswana, Lesotho and South Africa signed a memorandum of agreement to undertake a reconnaissance study on the Lesotho to Botswana Water Transfer scheme (L-BWT) aimed at developing water in Lesotho and conveying it to Botswana and, on the way, supplying various users in Lesotho and South Africa. This reconnaissance study led to the selection of a technical option which included a new dam on the Makhalleng River in Lesotho and a piped conveyance system to Botswana. It is envisaged that eventually 150 million m³/a will be pumped to Botswana with additional supplies for consumers along the route in Lesotho and South Africa.

Water scarcity is the main challenge in the basin, and this requires a coordinated joint development, management and conservation of the water resources system.

To enhance the objectives of integrated water resources development and management in the region, the Orange–Senqu River Basin Commission (ORASECOM) was established in November 2000. This led to the development of a basin level Integrated Water Resources Management (IWRM) Plan adopted in February 2015 by the ORASECOM Member States. The IWRM Plan provides a strategic transboundary water resources management framework and action areas and serves as a guiding and planning tool for achieving the long-term development goals in the basin.

The objective of the study is to update the Integrated Water Resources Management (IWRM) Plan validated in 2015 and propose an updated core scenario which includes the L-BWT project and to assist the Orange Sengu River Commission (ORASECOM) and the riparian countries in operationalizing the updated IWRM Plan.

The study is divided into two distinct parts:

- 1) A climate resilient investment plan, based on the updated Water Resources Yield and Planning Model and the updated Core Scenario defined in the IWRM Plan of 2015 (Components I & II of the study); and
- 2) The Lesotho-Botswana Water Transfer Project (Components III & IV of the study)

This report falls under Component 1: Climate Resilient Water Resources Investment Plan. The purpose of this report is to provide a comprehensive assessment of existing policies, institutional arrangements and structures that are responsible for water resources development and management.

Analysis of treaties and policies

The following treaties, policies and institutional arrangements have a bearing on international obligations regarding the shared resources of the Orange-Senqu Watercourse. The essence of these treaties has been summarised:

- Convention on the Law of the Non-navigational Uses of International Watercourses Adopted by the General Assembly of the United Nations on 21 May 1997;
- The Law on Transboundary Aquifers (UN Resolution 11 December 2008);
- Convention on wetlands of international importance especially as waterfowl habitat (The Ramsar Convention on Wetlands), 1971 as amended 1982 and 1987;
- New Partnership for Africa's Development (NEPAD), October 2001;
- The Abuja Ministerial Declaration on Water -A Key to Sustainable Development in Africa Abuja, Nigeria 29-30 April 2002
- SADC Revised Protocol on Shared Water Courses, 7 August 2000;
- SADC Regional Water Policy 2005;
- ORASECOM Agreement 3 November 2000;

- Treaty on the Lesotho Highlands Water Project between the Government of the Republic of South Africa and the Government of the Kingdom of Lesotho, 24 October 1986;
- Agreement on Phase II of the Lesotho Highlands Water Project, 11 August 2011;
- Stockholm Convention on Persistent Organic Pollutants;
- The Agreement on the Establishment of the Vioolsdrift and Noordoewer Joint Irrigation Scheme on the lower Orange River (1992); and
- Memorandum of understanding for feasibility study to transfer water from Lesotho to Botswana;

The report identifies that the conventions and treaties are in agreement that water resources allocation must be based on the **equitable and reasonable utilisation** of the shared water sources by each watercourse state. Furthermore, any planned development must not cause significant harm to another watercourse state.

Specified factors/criteria uses must be taken into account when agreeing what is equitable and reasonable use, includes:

- social, economic and environmental needs;
- the population dependent on the shared watercourse;
- the effects of the use or uses of a shared watercourse in one Watercourse State on other Watercourse States;
- existing and potential uses of the watercourse;
- conservation, protection, development and economy of use of the water resources; and
- the availability of alternatives.

All relevant factors are to be considered together and a conclusion reached on the basis of the whole.

States must adopt a river basin or watercourse approach in the planning, development and management of the shared water resources and must follow IWRM principles.

In the context of the Basin Wide Investment Strategy then, every new upstream dam is legally obliged to make allowance through releases for downstream use, and every new downstream dam will be dependent on sufficient releases from upstream dams. In other words, any new development must not result in one state causing significant harm to another watercourse state.

Allocation of water resources

ORASECOM Council is mandated to make recommendations, or to advise the Parties, on the safe yield of the river and on the equitable and reasonable utilisation of the water sources in the River System to support sustainable development in the territory of each Party. All parties to the ORASECOM Agreement must be notified of any planned development that will adversely affect another watercourse state. The notification and response procedures are specified.

In order to make the future development of the Orange sustainable, and in order to avoid later conflicts between the basin states, it is recommended that ORASECOM convene a committee to facilitate an agreement on the allocation of the resources of the Orange River over a specified time horizon, say the next 30 years.

The suggested ToR of such an Allocation Committee would be to:

- Agree a reasonable forecast of the future water demand of each sector out of each current and proposed dam in the Orange River;
- Agree a level of assurance and curtailment percentages for each sector;
- Test the ability of the resource to meet such forecast demand using a stochastic hydrological model;
- If the resource is not sufficient, then reach agreement on curtailing the projected demand in a fair and equitable way using the principles set out in the various treaties and summarised in section 5; and
- Agree, through means of a treaty or protocol to a treaty, a fair allocation of the resource between basin states and the operating rules to ensure such a fair allocation of the resource.

The Real Time monitoring of the basin would be a necessary input to the work of this committee.

Because the of the variable or stochastic nature of the hydrology, such a quantified allocation would necessarily be in the form of operating rules that are triggered/driven through the continual monitoring of the status of the dam levels throughout the basin, and by attaching assurance of supply and curtailment percentages to the water demand of the different water use sectors out of those dams. In other words what is required is a real-time dynamic allocation of water based on rules that reflect a maximum supply and levels of curtailment depending on the status of the dams as interpreted by an agreed stochastic hydrological model.

A fundamental input to such operating rules is an agreement on the level of assurance that each water use sector should be supplied. Basic human needs and domestic and industrial use would generally receive water at a higher level of assurance than agriculture. This means that in the case of a drought, water supply to agriculture would be reduced by a certain percentage before water supply to domestic and industrial is reduced.

Another fundamental input is the amount of new development of each of the sectors that will be supplied out of the Orange River, as opposed to being supplied from other sources. And again it will be necessary to agree priorities between domestic/industrial and agriculture.

National Legislation

Those aspects of the National legislation that impact on the regulation of water use, dam safety, key institutional arrangements, and international arrangements in Lesotho; South Africa; Botswana; and Namibia have also been highlighted, namely:

- Kingdom of Lesotho (Water Act 15 of 2008)
- Republic of South Africa (National Water Act 36 of 1998)
- Botswana (Water Act date of commencement: 9th February, 1968)
- Namibia (Water Resources Management Act 11 of 2013).

Proposed institutional arrangements

Specific institutional arrangements are proposed for each of the investments proposed in the basin wide investment plan, including institutional arrangements for:

- L-BWT Project
- Orange River Projects Scheme Future Improvements

- Lesotho Lowlands
- Caledon to Greater Bloemfontein transfer, Gariep to Greater Bloemfontein Transfer, and Greater Bloemfontein internal resource improvements
- Neckartal Scheme
- Thukela Transfers
- Treated Acid Mine Drainage
- Desalination of effluent and re-use
- Integrated Water management options (Urban – Industrial and separately for agriculture)

Additional notes are also provided on how PPP projects could be structured for L-BWT and desalination and re-use projects.

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LIST OF ACRONYMS

AGRP	Average Groundwater Resource Potential
AMD	Acid mine drainage
AMCOW	African Ministerial Conference on Water
BAS	Best Attainable State
BOT	Build, Operate, Transfer
CSIR	Council for Scientific and Industrial Research
DBOM	Design, Build, Operate and Transfer
DWA	Department of Water Affairs (RSA)
DWAF	Department of Water Affairs and Forestry (RSA)
DWS	Department Water and Sanitation
EC	Electrical conductivity
EFR	Ecological flow requirements
EHI	Estuarine Health Index
EWR	Ecological Water Requirement
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GEP	Groundwater Exploitation Potential
GESI	Global Environmental Sanitation Initiative
GRA II	Groundwater Resources Assessment Phase II
GoL	Government of Lesotho
GRP	Groundwater Resource Potential
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
IAPP	International Association for Public Participation
IGRAC	International Groundwater Resources Assessment Centre
IPCC	International Panel for Climate Change
IVRS	Integrated Vaal River System
IWRM	Integrated Water Resources Management
JIA	Joint Irrigation Authority
JPTC	Joint Permanent Technical Committee
L-BWT	Lesotho Botswana Water Transfer

LHDA	Lesotho Highlands Development Authority
LHWP	Lesotho Highlands Water Project
LOR	Lower Orange River
l/s	Litre per second
MAFS	Ministry of Agriculture and Food Security (Lesotho)
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MAWF	Ministry of Agriculture, Water and Forestry (Namibia)
MCA	Multi-criteria analysis
MC	Management Centre (Botswana)
MEWR	Minerals, Energy and Water Resources (Botswana)
mm/a	Millimetres per annum
m ³ /s	Cubic Meters per second
m ³ /a	Cubic Meters per annum
MW	Megawatts
NEPAD	New Partnership for Africa's Development
NWA	National Water Act
NAP	National Action Programme
NGO	Non-governmental Organisation
ORASECOM	Orange Senqu River Commission
ORP	Orange River Project (Gariep and Vanderkloof dams and supply area)
OVTS	Orange Vaal Transfer Scheme
PES	Present Ecological State
PF	Potability Factor
PGEP	Potable Groundwater Exploitation Potential
PPP	Public Private Partnership
PSC	Public Sector Comparator
PWC	Permanent Water Commission
RO	Reverse Osmosis
RQO	Resource Quality Objectives
RSA	Republic of South Africa
SADC	Southern African Development Community

SADC-GIO	Southern African Development Community Groundwater Information Portal
SAP	Strategic Action Programme
SOE	State Owned Entities
TCTA	Trans Caledon Tunnel Authority
TDA	Transboundary Diagnostic Analysis
TDS	Total dissolved solids
TTT	Technical Task Team
TOR	Terms of Reference
UGEP	Utilisable Groundwater Exploitation Potential
UN	United Nations
UNDP	United Nations Development Programme
VRS	Vaal River System
WARMS	Water Authorisation and Registration Management System
WASCO	Water and Sanitation Company
WC	Water Conservation
WDM	Water Demand Management
WMA	Water Management Area
WQ	Water Quality
WRYM	Water Resources Yield Model
WRPM	Water Resources Planning Model
WUC	Water Utilities Company
ZAR	South African Rand

1 INTRODUCTION

1.1 Background to the study area

The Orange-Senqu River basin is one of the largest river basins south of the Zambezi with a catchment area of approximately 1 million km². It encompasses all of Lesotho, a significant portion of South Africa, Botswana and Namibia. The Orange-Senqu River originates in the Lesotho Highlands and flows in a westerly direction for approximately 2 200 km to the west coast where it discharges into the Atlantic Ocean. (See **Figure 1.1**)

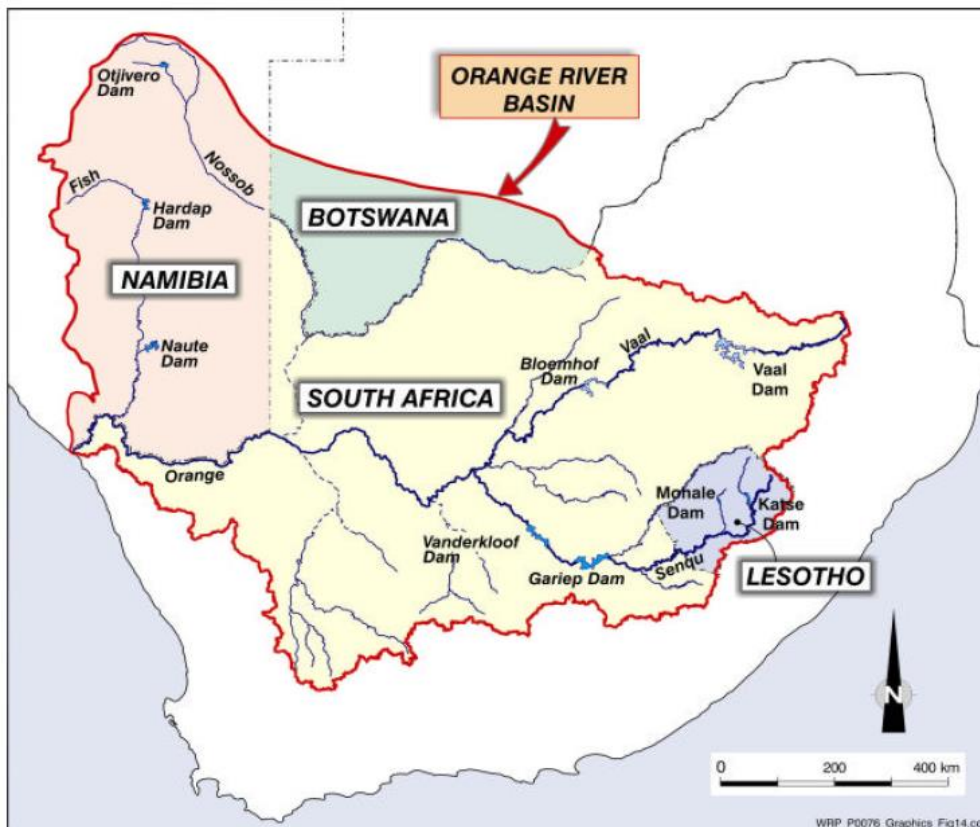


Figure 1-1: Orange River Basin

It has been estimated that the natural runoff of the Orange-Senqu River basin is in the order of 11 300 million m³/a, of which approximately 4 000 million m³/a originate in the Senqu basin in the Lesotho Highlands, 6 500 million m³/a from the Vaal and Upper Orange, with approximately 800 million m³/a from the Lower Orange and Fish River (Namibia). The basin also includes a portion in Botswana and Namibia (north of Fish River) feeding the Nossob and Molopo rivers.

Southern Africa has fifteen (15) transboundary watercourse systems of which thirteen exclusively stretch over SADC Member States. The Orange–Senqu is one of these thirteen. The Southern African Development Community (SADC) embraces the ideals of utilizing the water resources of these transboundary watercourses for the regional economic integration of

SADC and for the mutual benefit of riparian states. The region has demonstrated a great deal of goodwill and commitment towards collaboration on water issues. Thus, SADC has adopted the principle of basin-wide management of the water resources for sustainable and integrated water resources development.

To enhance the objectives of integrated water resources development and management in the region, the Orange–Senqu River Basin Commission (ORASECOM) was established in November 2000.

ORASECOM was established by the Governments of the four States for managing the transboundary water resources of the Orange-Senqu River basin and promoting its beneficial development for the socio-economic wellbeing and safeguarding the basin environment. This led to the development of a basin level Integrated Water Resources Management (IWRM) Plan adopted in February 2015 by the ORASECOM Member States. The IWRM plan provides a strategic transboundary water resources management framework and action areas, and serves as a guiding and planning tool for achieving the long-term development goals in the basin. A key aspect of the transformative approach for strengthening cooperation has been identified as the need for joint project implementation that provides a mutually inclusive transboundary benefit.

The IWRM Plan recommends strategies and measures for promoting sustainable management of the water resources of the basin and defines strategic actions that will ensure and enhance water security, considering the long term socio-economic and environmental demands on the water resources of the basin. The Lesotho to Botswana Water Transfer scheme, a major component of this study, was not included in the 2015 IWRM Plan as one of the strategic actions.

The Orange-Senqu River basin is a highly complex and integrated water resource system, characterized by a high degree of regulation and major inter-basin transfers to manage the discrepancy between the location of relatively abundant precipitation and the location of greatest water requirements. The infrastructure involves storage and transmission of water, to water demand centres that are in some cases located outside of the basin.

Figure 1.2 provides approximate values of the natural run-off in the Orange-Senqu River basin. These figures highlight the variable and uneven distribution of runoff from east to west in the basin. The figures refer to the natural runoff which would have occurred had there been no developments or impoundments in the catchment. The actual runoff reaching the river mouth is considerably less than the natural values and are estimated to be in the order of half the natural values.

The difference is due mainly to the extensive water utilisation in the Vaal River basin, most of which is for domestic and industrial purposes. Large volumes of water are also used to support extensive irrigation and some mining demands along the Orange River downstream of the Orange/Vaal confluence, as well as significant irrigation developments in the Eastern Cape, supplied through the Orange/Fish Tunnel. In addition to the water demands, evaporation losses from the Orange River and the associated riparian vegetation account for 500 to 1 000 million m³/a, depending upon the flow in the river.

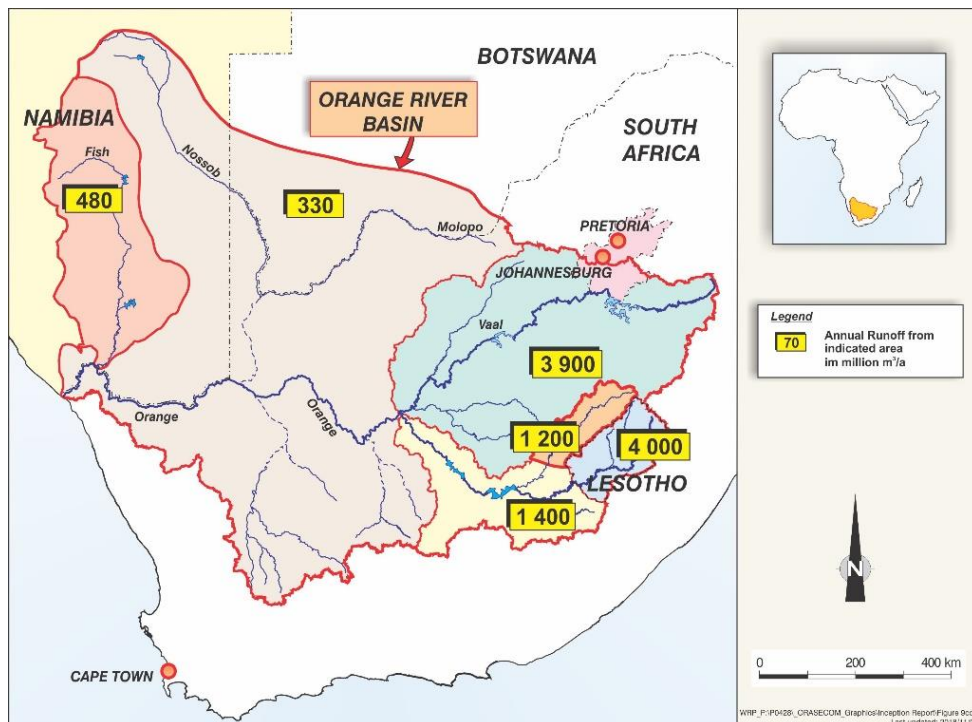


Figure 1-2: Approximate Natural Run-off in the Basin

Water scarcity is the main challenge in the basin and this requires a coordinated joint development, management and conservation of the water resources system. The climate in the basin varies from relatively temperate in the eastern source areas, to hyper-arid in the west. As shown in **Figure 1.3**, average annual precipitation decreases from more than 1000 mm/a in the source areas of the basin to less than 50 mm at the mouth. This varies considerably from year to year. Much of the rainfall occurs as intense storms, which can be highly localised. The temporal and spatial distribution of precipitation within any particular year can be considerable.

In **Figure 1.4** it is evident that evaporation increases from south-east to north-west reaching a maximum of more than 1 650 mm in the west. Even in the cooler and wetter parts of the basin, evapotranspiration exceeds precipitation. Temperature and evapotranspiration follow a similar distribution with coolest temperatures in the Lesotho Highlands and the hottest in the western Kalahari.

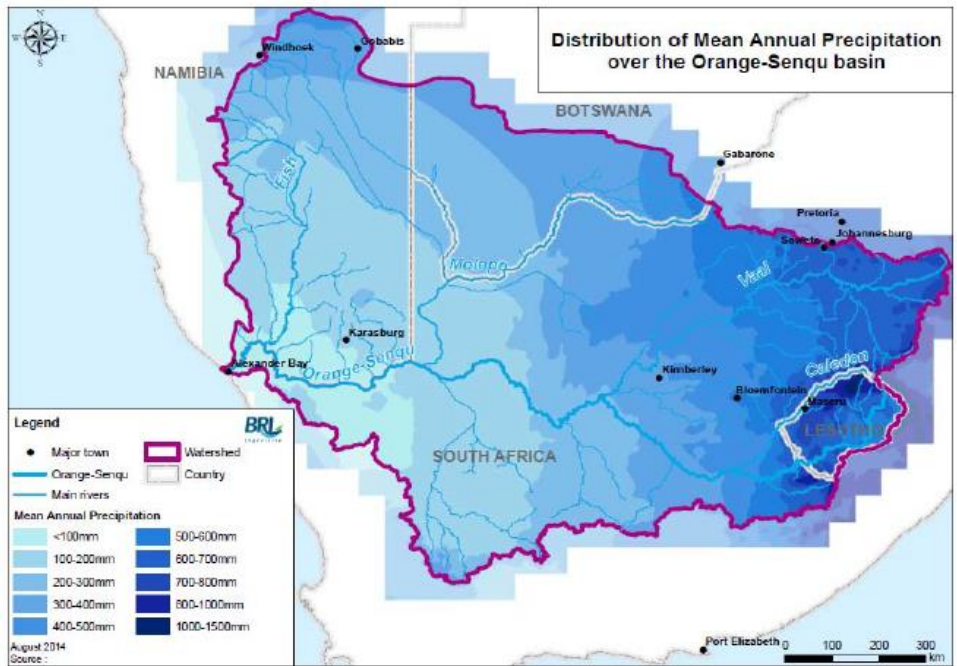


Figure 1-3: Distribution of Mean Annual Precipitation

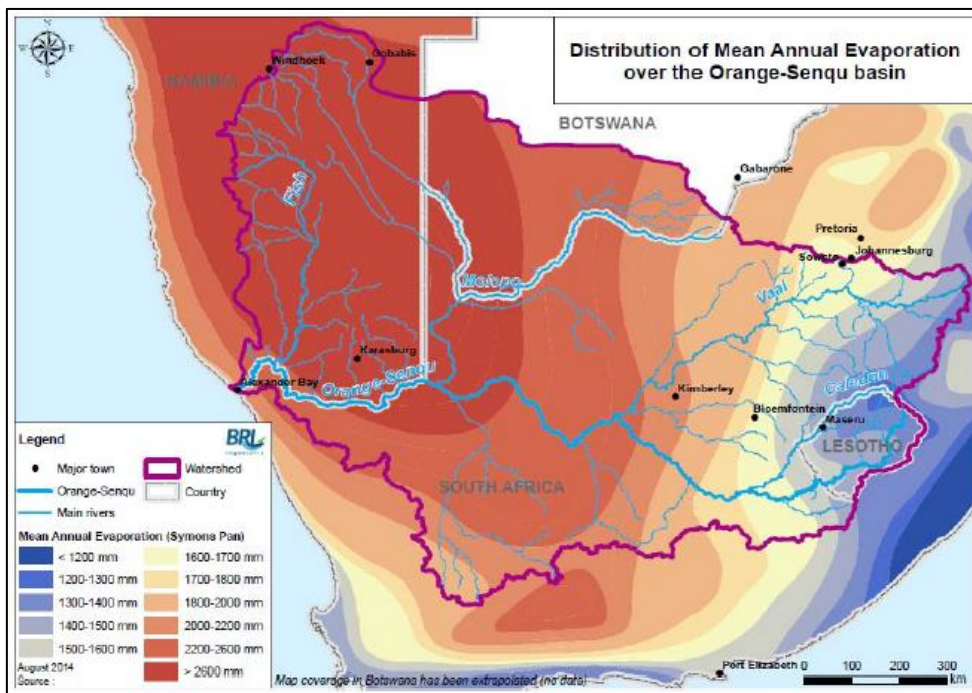


Figure 1-4: Distribution of mean annual Evaporation over the Orange-Senqu basin

It is generally accepted that southern Africa will be highly impacted by climate change. Consequently, there are concerns around the changes in precipitation and temperature due to climate variability and climate change. This study therefore aims to enhance investment in transboundary water security and to build resilience to climate change into the implementation of the strategic projects and actions described in the IWRM Plan.

The Republic of Botswana is an arid country faced with serious water constraints which will worsen with the expected effects of climate change. Botswana will experience chronic water shortages by about 2025, unless a major new water source is developed. Already Gaborone was critically hit by the 2015-2016 drought.

As a consequence, the Governments of Botswana, Lesotho and South Africa signed a memorandum of agreement to undertake a reconnaissance study on the Lesotho to Botswana Water Transfer scheme (L-BWT) aimed at mobilizing water in Lesotho and conveying it to Botswana and, on the way, supplying various users in Lesotho and South Africa. This reconnaissance study led to the selection of a technical option which included a new dam on the Makhaleng River in Lesotho and a piped conveyance system to Botswana. It is envisaged that eventually 150 million m³/a will be pumped to Botswana with additional supplies for consumers along the route in Lesotho and South Africa.

1.2 Objective of the Assignment

The objective of the study is to update the IWRM Plan validated in 2015 and propose an updated core scenario which includes the L-BWT project and to assist ORASECOM and the riparian countries in operationalizing the updated IWRM Plan. This will be met through three outputs:

- Preparing a climate resilient investment plan for the Orange-Senqu River Basin based on the updated core scenario;
- operationalizing ten priority actions selected from the updated IWRM Plan; and
- studying at pre-feasibility level the L-BWT, and at feasibility level the dam included in this study.

The study was therefore divided into two distinct parts:

- A climate resilient investment plan, based on the updated Water Resources Yield and Planning Model and the updated Core Scenario defined in the IWRM Plan of 2015 (Components I & II of the study); and
- The Lesotho-Botswana Water Transfer Project (Components III & IV of the study)

The four components referred to above are:

- Component I: Climate Resilient Water Resources Investment Plan;
- Component II: Operationalisation of the Integrated Water Resources Management Plan;
- Component III: Pre-feasibility study of the Lesotho to Botswana Water Transfer Project;
- Component IV: Feasibility Study of the Dam on Makhaleng River in Lesotho.

1.2.1 Climate Resilient Investment Plan (Components I and II)

The high level of variability in precipitation due to climate variability and change, defines the need to optimize and implement efficient water resources development and management in the basin. The development of new infrastructure to meet increasing water demands, even if technically and environmentally feasible, is both expensive and complex. Economic considerations of water use have been identified as a key part in the planning and optimum use of what will become an increasingly scarce and expensive resource. Projections of future water demand and associated infrastructure development must be based on balanced considerations of economic, social, and environmental factors. The integration of water resources yield analysis, water resources development planning and economic optimization will ensure the development of short, medium- and long-term solutions to address basin water resources development challenges.

The assignment will include water resource studies in the Botswana, Lesotho and Namibian parts of the basin and the updating of inputs from the RSA Reconciliation Strategy Studies with more recent results from the Reconciliation Strategy Maintenance Studies as well as other recent water resource related studies conducted for the South African part of the basin. This will establish comprehensive basin wide analyses which will be integrated with economic analyses to determine the optimized and most efficient development options, as part of setting the long-term development investment strategy and plan for the basin.

Components I & II will thus address the water resources investment plan and the operationalization of the updated IWRM Plan with the following outputs:

- Update the Core Scenario of the IWRM Plan to include the Lesotho-Botswana Water Transfer Scheme and any other new projects that are identified;
- Estimate the Climate Change Effects on the updated Core Scenario;
- Optimise the IWRM Plan Core Scenario through an economic approach;
- Develop a Financial Strategy for the Core Scenario;
- Update the basin wide investment plan approved by ORASECOM by including new projects considering climate change effects;
- Undertake a comprehensive assessment of existing policies, institutional arrangements and structures;
- Select 10 strategic actions and develop Terms of Reference and cost estimates for each; and
- Prepare a road map for operationalization of ten strategic actions contained in the Integrated Water Resource Management Plan.

1.2.2 Lesotho-Botswana Water Transfer (L-BWT) Project (Components III & IV)

The south eastern urban complex of Botswana centred around the capital city, Gaborone, has experienced rapidly increasing growth over the last few decades, and is expected to continue doing so. Its water demands have long outstripped local bulk water resources, which have already been supplemented from sources in the north-east of the country. The country has experienced several severe drought spells that have, in the recent past, led to water restrictions. Despite several concerted efforts to alleviate the water shortage challenges, indications are that the water sources will not be adequate to meet the growing demand as early as 2025.

The solution for addressing the water security challenges lies in the need for increasing the efficient use of existing infrastructure, developing additional water resources and improving the management systems, based on water resources availability and use.

A Reconnaissance Study to identify possible water resources was completed in October 2015, which outlined various options of water sources and conveyance routes to supply water from Lesotho to Botswana. The various sources covered by the study include the Lesotho Highlands Water Project, the Makhaleng River and the Senqu/Orange in the south of Lesotho. The preferred supply scheme recommended in the Reconnaissance Study is a dam on the Makhaleng River, and a conveyance system to bring the water from Lesotho, across South Africa to Botswana.

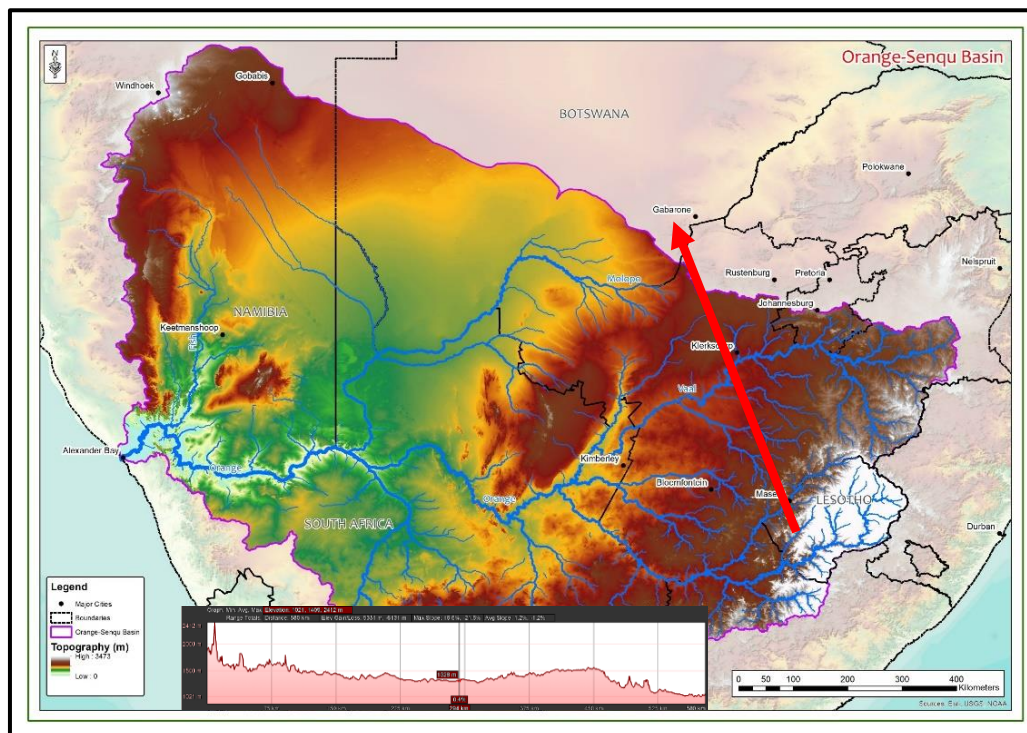
A Pre-feasibility Study is required to determine water demands for up to 2050 for specified areas in Botswana, Lesotho and South Africa, from available relevant information in all countries, and to investigate suitable dam site(s) by analysing the Makhaleng catchment hydrology, determining the size of dam(s) on the basis of topography, geology, yield, sedimentation, hydropower generation and water demands for specific areas in Botswana, Lesotho and South Africa. For the conveyance system, the study is only required to investigate pipeline options along the shortest route, to either Gaborone or Lobatse in Botswana, preferably along existing road servitudes. Depending on the results and recommendations from the Pre-feasibility Study, a Feasibility Study for the dam on the Makhaleng River will follow, but this depends on a final decision by the client.

In **Figure 1.5** the topographic map of the catchment is shown with the Lesotho to Botswana water transfer project overlain.

Components III & IV of this study will thus focus on the Lesotho-Botswana Water Transfer Multipurpose Trans-boundary Project (L-BWT) and will address:

Component III - Phase 1

- Undertake a validation of the water requirements for irrigation in Lesotho, the demand in South Africa along the pipeline route, and the demand in Botswana;
- Undertake an assessment of the water resource being the Makhalleng catchment;
- Do the dam site selection; and
- Do the conveyance route selection.



- **Figure 1-5: Lesotho to Botswana Water Transfer Project**

Component III - Phase II

- Conduct a pre-feasibility study of a dam on the Makhalleng River;
- Conduct a prefeasibility study of the conveyance pipeline from Makhalleng to Gaborone/Lobatse;
- Evaluate environmental and social impacts;
- Undertake an economic assessment of the dam and the Lesotho-Botswana conveyance pipeline; and
- Undertake a multi-criteria analysis (MCA) of the options.

Component IV - Feasibility of the Makhalleng Dam (Depending on results from the Pre-Feasibility Study)

- A hydrological analysis including climate change effects;
- A Feasibility Study of the Makhalleng Dam:

- An Economic analysis update; and
- A project implementation plan.

1.3 Purpose and Structure of this report

This report provides a comprehensive assessment of existing policies, institutional arrangements and structures that are responsible for water resources development and management.

The report is structured in three parts:

Firstly, a synopsis is provided of the each of the various multi-lateral and bi-lateral treaties guiding water resource management in the basin.

This synopsis also covers treaties that have established institutional structures in the basin, such as the Lesotho Highlands Water Project between Lesotho and South Africa, the Vioolsdrift Irrigation Project between South Africa and Namibia, and the ORASECOM between all four basin states.

Secondly, a synopsis is provided of the national water resource management legislation of each of the basin states, that is Lesotho's Water Act 15 of 2008, South Africa's National Water Act 36 of 1998, Botswana's Water Act of 1968, and Namibia's Water Resources Management Act 11 of 2013.

These pieces of legislation prescribe how water resources will be managed in each of the sovereign countries and establish national and catchment water resource management institutions.

Although not required as part of the Component I assessment, this report also provides a very brief introduction to possible institutional arrangements that could be established to support the Lesotho-Botswana Water Transfer (L-BWT) Project. These arrangements will be fully developed as party of Component II. Two alternative institutional arrangements are provided, firstly a commission similar to the Lesotho Highlands Commission, with implementing agents that include TCTA and LHDA as well as a third institution to develop the Botswana component; and an alternative arrangement which is essentially a PPP or BOT arrangement is also provided.

2 INTERNATIONAL NATURE OF THE ORANGE RIVER

The Orange River is shared by four independent watercourse states, from east/source to west/mouth being Lesotho, South Africa, Botswana and Namibia.

A major tributary of the Orange is the Vaal River, which itself is supplemented with Orange River water from the Lesotho Highlands transfers.

The entire Orange River Basin, and Vaal River Catchment is shown in **Figure 2-1**.



Figure 2-1: The Orange-Senqu river basin.

Because the Orange is a shared watercourse, any Climate Resilient Water Resources Investment Strategy and Plan must be implemented within a framework of international law, comprising international agreements or treaties and policy documents that are recognized by each state.

3 INTERNATIONAL POLICIES, INSTITUTIONAL ARRANGEMENTS AND STRUCTURES

The following treaties, policies and institutional arrangements have a bearing on international obligations regarding the shared resources of the Orange-Senqu Watercourse.

- Convention on the Law of the Non-navigational Uses of International Watercourses Adopted by the General Assembly of the United Nations on 21 May 1997;
- The Law on Transboundary Aquifers (UN Resolution 11 December 2008);
- Convention on wetlands of international importance especially as waterfowl habitat (The Ramsar Convention on Wetlands), 1971 as amended 1982 and 1987;
- New Partnership for Africa's Development (NEPAD), October 2001;
- The Abuja Ministerial Declaration on Water -A Key to Sustainable Development in Africa Abuja, Nigeria 29-30 April 2002
- SADC Revised Protocol on Shared Water Courses, 7 August 2000;
- SADC Regional Water Policy 2005;
- ORASECOM Agreement 3 November 2000;
- Treaty on the Lesotho Highlands Water Project between the Government of the Republic of South Africa and the Government of the Kingdom of Lesotho, 24 October 1986;
- Agreement on Phase II of the Lesotho Highlands Water Project, 11 August 2011;
- Stockholm Convention on Persistent Organic Pollutants;
- The Agreement on the Establishment of the Vioolsdrift and Noordoewer Joint Irrigation Scheme on the lower Orange River (1992); and
- Memorandum of understanding for feasibility study to transfer water from Lesotho to Botswana;

3.1 Convention on the Law of Non-navigational uses of International Watercourses adopted by the General Assembly of the United Nations on 21 May 1997

The Convention is generally accepted as reflecting the customary law regarding the non-navigational uses of international water courses.

Article 3(3) provides that Watercourse States may enter into one or more agreements, hereinafter referred to as “watercourse agreements”, which apply and adjust the provisions of the present Convention to the characteristics and uses of a particular international watercourse or part thereof.

Article 5(1) provides that Watercourse States shall in their respective territories utilize an international watercourse in an **equitable and reasonable manner**. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse.

Article 5(2) provides that Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present Convention.

Article 6 lists the factors that must be taken into account when determining **equitable and reasonable utilization**, namely:

- (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
- (b) The social and economic needs of the watercourse States concerned;
- (c) The population dependent on the watercourse in each watercourse State;
- (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
- (e) Existing and potential uses of the watercourse;
- (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
- (g) The availability of alternatives, of comparable value, to a particular planned or existing use.

Article 7(1) provides that Watercourse States shall, in utilizing an international watercourse in their territories, take all appropriate measures to **prevent the causing of significant harm** to other watercourse States.

Article 8 provides for a general duty to cooperate and in determining the manner of such cooperation, watercourse States may consider the establishment of joint mechanisms or commissions, as deemed necessary by them,

Part III (Articles 11 to 19) provides for information concerning planned measures and notification of planned measures.

Part IV (articles 20 to 26) provides for the protection, preservation and management of a resource.

Article 21 specifically deals with the prevention, reduction and control of pollution.

Watercourse States shall, individually and, where appropriate, jointly, prevent, reduce and control the pollution of an international watercourse that may cause significant harm to other Watercourse States or to their environment, including harm to human health or safety, to the

use of the waters for any beneficial purpose or to the living resources of the watercourse. Watercourse States shall take steps to harmonize their policies in this connection.

Watercourse States shall, at the request of any of them, consult with a view to arriving at mutually agreeable measures and methods to prevent, reduce and control pollution of an international watercourse, such as:

- (a) Setting joint water quality objectives and criteria;
- (b) Establishing techniques and practices to address pollution from point and non-point sources;
- (c) Establishing lists of substances the introduction of which into the waters of an international watercourse is to be prohibited, limited, investigated or monitored.

3.2 The Law on Transboundary Aquifers (UN Resolution 11 December 2008)

The Law on Transboundary Aquifers closely resembles the Law on Non-navigational Uses of International Watercourses on which it was based.

The Law of Transboundary Aquifers also provides for equitable and reasonable utilization; for the obligation not to cause significant harm, for the obligation to cooperate; and for the protection, preservation and management of the ecosystem.

3.3 Convention on Wetlands of International Importance Especially as Waterfowl Habitat (The Ramsar Convention on Wetlands), 1971 as amended 1982 and 1987

Article 2 of the Ramsar Convention provides inter alia that each Contracting Party shall designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance, referred to as "the List"; and that Wetlands should be selected for the List on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology.

In the first instance wetlands of international importance to waterfowl at any season should be included.

The Orange River Mouth was placed on the list on 28 June 1991.

Article 5 provides that the Contracting Parties shall consult with each other about implementing obligations arising from the Convention especially in the case of a wetland extending over the territories of more than one Contracting Party or where a water system is shared by Contracting Parties. They shall at the same time endeavour to coordinate and support present and future policies and regulations concerning the conservation of wetlands and their flora and fauna.

3.3.1 Towards a Management Plan for Orange River Estuary Ramsar Site Situation Assessment (May 2011)

The CSIR prepared a situation assessment of the Orange River Estuary Ramsar Site in May 2011.

The situation assessment records that the maximum number of water birds recorded during the 1980s was 21,512 individuals in January 1980 and between 20,563 and 26,653 individuals in December 1985.

Since then there has been a significant decline in water bird numbers. A situation primarily accounted for by the decline in Cape Cormorant and Common Tern *S. Hirundo* populations. Without the large numbers of Cape Cormorants and Common Terns, ***the important number of 20,000 water birds, one of the criteria used for the original designation of the ORM as a Ramsar site, cannot be attained.***

The maximum number of water birds recorded at the ORM since being listed on the Montreux Record were 9,240 in July 2000 and the maximum number of species recorded in December 1995 were 64.

Yet despite a change in fortunes the water bird population still comprise of close to 60 species of which 14 regularly occurring and an additional seven occasionally occurring species are Red Data listed. A recent analysis of the summer and winter 1997 water bird survey data also found that significant proportions of the regional populations of South African Shelduck *Tadorna Cana* and Cape Shoveller *A. Smithii* and globally significant populations of Kelp Gull *L. Dominicanus* and Hartlaub's Gull were present during the winter months.

A re-evaluation of the Orange River estuary in terms of the new Ramsar criteria, concluded that the Ramsar site still meets several of the criteria for which it was originally established and at least one new criterion (Anderson in Van Niekerk et al 2008).

The Estuarine Health Index (EHI) score for the Orange River Estuary of 56 translated into a Present Ecological Status of D+, indicative of a largely modified estuary.

With major dam developments in the catchment it was considered unlikely to realistically restore the estuary to a Category A through river flow adjustments only. Further, anthropogenic developments along the banks of the estuary (i.e. non-flow related modifications), such as the road across the salt marsh area, seepage of saline water from mining developments and human disturbance of birds contribute largely to the its highly modified present state.

The Best Attainable State (BAS) for the estuary was accordingly recommended as an Ecological Category C (equating to moderately modified), which could largely be achieved by mitigating modification related to the non-flow related activities.

The Situation Assessment makes a **number of recommendations** for future consideration:

- Recommendation 1: Establish institutional structures to oversee the development of the management plan;
- Recommendation 2: Provide statutory protection to the Orange River Estuary;
- Recommendation 3: Remove the causeway;
- Recommendation 4: Rehabilitating the saltmarsh;
- Recommendation 5: Restrict windblown dust and sand;
- Recommendation 6: Control exploitation of fish;
- Recommendation 7: Incorporating municipal planning in the management planning process;
- Recommendation 8: Improved flow gauging and recalibration of 1993 – 1996;
- Recommendation 9: Setting of Resource Quality Objectives (RQO's);
- Recommendation 10: Comprehensive Ecological Water Requirement Study;
- Recommendation 11: Operating rules of dams;
- Recommendation 12: Water bird research and monitoring;
- Recommendation 13: Ecological Water Requirement of the Marine Environment;
- Recommendation 14: Agree on objectives and actions required to remove the Orange River Estuary from the Montreux record.

3.4 Stockholm Convention on Persistent Organic Pollutants

The objective of this Convention is to protect human health and the environment from persistent organic pollutants.

Persistent organic pollutants possess toxic properties, resist degradation, bio accumulate and are transported, through air, water and migratory species, across international boundaries and deposited far from their place of release, where they accumulate in terrestrial and aquatic ecosystems.

3.4.1 Measures to Reduce or Eliminate Releases from Intentional Production and Use

Article 3 sets out the measures that parties to the Treaty shall take to reduce or eliminate intentional releases of persistent organic pollutants.

The production or use of chemicals listed in Annexure A must be eliminated.

The production or use of chemicals listed in Annexure B must be restricted to the acceptable purposes or specific exemptions that are listed in the table.

Imports or exports of the chemicals listed in Annexure A or Annexure B must also be eliminated or restricted.

Article 6 provides for measures to reduce or eliminate releases from stockpiles and wastes containing the chemicals listed in Annexure A and Annexure B.

3.5 New Partnership for Africa's Development (NEPAD), October 2001

This New Partnership for Africa's Development is a pledge by African leaders, based on a common vision and a firm and shared conviction, that they have a pressing duty to eradicate poverty and to place their countries, both individually and collectively, on a path of sustainable growth and development, and at the same time to participate actively in the world economy and body politic.

The Partnership includes an Action Programme of top priorities that covers what needs to be done in the short term. The following objectives and actions are listed under the water and sanitation sector:

Objectives

- To ensure sustainable access to safe and adequate clean water supply and sanitation, especially for the poor;
- To plan and manage water resources to become a basis for national and regional co-operation and development;
- To systematically address and sustain ecosystems, bio-diversity and wildlife;
- To co-operate on shared rivers among member states;
- To effectively address the threat of climate change;
- To ensure enhanced irrigation and rain-fed agriculture to improve agricultural production and food security.

Actions

- Accelerate work on multipurpose water resource projects; for example, the SADC Water Secretariat's investigation of the utilisation of the Congo River, and the Nile Basin Initiative;
- Establish a task team to make plans for mitigating the negative impact of climate change in Africa;

- Collaborate with the Global Environmental Sanitation Initiative (GESI) in promoting sanitary waste disposal methods and projects;
- Support the UN Habitat programme on Water Conservation in African Cities.

3.6 The Abuja Ministerial Declaration on Water -A Key to Sustainable Development in Africa Abuja, Nigeria 29-30 April 2002

The African Ministers responsible for water meeting in Abuja, Nigeria, from 29 - 30 April 2002, adopt the "Abuja Ministerial Declaration on Water - a key to Sustainable Development in Africa".

The Ministers decided:

to establish the African Ministerial Conference on Water (AMCOW).

that AMCOW's mission will be based on the vision outlined in the instruments establishing the African Union.

Further decide, that AMCOW shall strive to:

- (a) Strengthen intergovernmental co-operation in order to halt and reverse the water crisis and sanitation problems in Africa;
- (b) monitor progress in the implementation of major regional and global water resources and water supply and sanitation initiatives
- (c) review progress in the implementation of the commitments set forth in key international arrangements for the provision of financial resources and technology transfer in support of water sector reforms in Africa. Our review will take into account progress made globally, in the achievement of the water-related goals in both the Millennium and the Malmö Ministerial Declarations,
- (d) receive and analyse, on a regular basis, reports or information, on the adequacy of financial and technological investments in the water and sanitation sector in Africa;
- (e) consider information provided by African Ministers responsible for Water, for example during the regular sessions of AMCOW, regarding best practices in policy reforms in the water and sanitation sector at the country level;
- (f) enhance and solidify intergovernmental and regional co-operation in the management of shared waters, including surface and ground water;

(g) consider, where appropriate, information regarding progress made or needed in the implementation of intergovernmental agreements on surface and ground water resources;

(h) assess and where appropriate adopt best practices in global and regional programmes dealing with water and sanitation

(i) engage in dialogue and consultations with regional economic groupings and with regional and global financial institutions on issues relevant to the water and sanitation sector in Africa.

4. Also decide that AMCOW shall support measures which:

(a) encourage stronger and better performing institutional arrangements for the water sector;

(b) strengthen the monitoring and assessment of available water resources.

(c) ensure sustainable water and sanitation infrastructure development and services delivery and the transfer of water to drought-prone areas for the poor majority in our region;

(d) promote policies for the appropriate allocation of water for domestic use and food security and other competing demands;

(e) support regional intergovernmental dialogue on the implementation of Chapter 18 (Freshwater) of Agenda 21 for the purpose of recommending measures needed to strengthen implementation.

3.7 SADC Revised Protocol on Shared Water Courses, 7 August 2000

The SADC Revised Protocol defines "**Significant Harm**" as meaning non-trivial harm capable of being established by objective evidence without necessarily rising to the level of being substantial.

Article 3 sets out the general principles including:

Sub-article 3.2 which provides that the utilisation of shared watercourses within the SADC Region shall be open to each Watercourse State, in respect of the watercourses within its territory and without prejudice to its sovereign rights, in accordance with the principles contained in this Protocol. The utilisation of the resources of the watercourses shall include agricultural, domestic, industrial, navigational and environmental uses.

Sub-article 3.7.(a) Watercourse States shall in their respective territories utilise a shared watercourse in an equitable and reasonable manner;

Sub-article 3.8 **Utilisation** of a shared watercourse **in an equitable and reasonable manner** requires taking into account all relevant factors and circumstances including:

- i. geographical, hydrographical, hydrological, climatical, ecological and other

- factors of a natural character;
- ii. the social, economic and environmental needs of the Watercourse States concerned;
- iii. the population dependent on the shared watercourse in each Watercourse State;
- iv. the effects of the use or uses of a shared watercourse in one Watercourse State on other Watercourse States;
- v. existing and potential uses of the watercourse;
- vi. conservation, protection, development and economy of use of the water resources of the shared watercourse and the costs of measures taken to that effect; and
- vii. the availability of alternatives, of comparable value, to a particular planned or existing use.

The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is an equitable and reasonable use, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.

Article 3.10(a) provides that State Parties shall, in utilising a shared watercourse in their territories, take all appropriate measures to **prevent the causing of significant harm** to other Watercourse States.

Article 4. provides for planned measures, information concerning planned measures and the notification concerning planned measures with possible adverse effects.

Article 5 provides institutional mechanisms for implementing this Protocol including Shared Watercourse Institutions.

Article 6 provides for shared water course agreements.

3.8 SADC Regional Water Policy 2005

While probably not generally classified as a binding treaty, the SADC Regional Water Policy does provide a number of useful policy statements that have been agreed by the SADC members subsequent in time to the Revised Protocol which it reflects.

The policy statement for Water Resources Development and Management is particularly relevant to Climate Resilient Investment in the basin and provides:

River Basin Approach:

- i. Member States will adopt a river basin or watercourse approach in the planning, development and management of water resources. This applies in particular to shared watercourses.
- ii. Watercourse States will prepare and implement river basin development plans in a holistic and integrated manner, with the involvement of stakeholders to achieve equitable and efficient utilisation.
- iii. The planning, development and management of watercourses, particularly in shared watercourses will consider the integrated use of surface and ground water resources, the reuse of water, proper pollution management and the provision of environmental requirements.
- iv. **Water resources allocation and utilisation will be based on equitable and reasonable mechanisms through negotiations** between watercourse States.
- v. Member States will ensure that major water uses in watercourses, particularly in shared watercourses will be regulated through authorisations such as a system of permits.

Integrated Planning:

- i. Planning, development and management of water resources in the region should be based on the principles of IWRM and shall take full cognisance of the cross-cutting nature of water.
- ii. Watercourse States shall promote joint planning and implementation of water resources developments within their shared watercourse and transparently notify and/ or engage other Watercourse States in a dialogue, where such States are not proponents of the project.

Water Demand Management:

- i. When planning the development of water infrastructure and services, Member States or river basin organisations shall aim to utilise existing capacities more efficiently as part of the process of augmenting water supply.
- ii. Water Demand Management (WDM) will be pursued by Member States as a fundamental requirement for integrated planning and management of water resources, particularly in shared watercourses.

Alternative Sources of Water

- i. Member States will promote rainwater harvesting and alternative sources of water such as desalination, reuse of water, recycling and reclamation. Relevant research in this regard should be promoted as and where appropriate.

Dam Development and Management

- i. Integrated planning, development and management of dams will be promoted so as to optimise the use of the water resources, maximise derived benefits (such as hydropower, tourism, flood control, irrigation, water supply) and take both positive and negative externalities into account.
- ii. SADC shall encourage the participation of all stakeholders in decision-making processes for dam development and, where appropriate, with adequate facilitation and empowerment of vulnerable groups to ensure their effective involvement in decision-making.
- iii. Watercourse States will negotiate on operating rules for dams on shared watercourses so as to optimise the socio-economic and environmental benefits in an equitable manner.

Affected Communities

- i. Watercourse States shall promote the development and implementation of water infrastructure projects through a participatory process, especially of affected communities.
- ii. Member States will put in place proper legislation to ensure/provide for compensation and resettlement of affected communities, so that they will not be worse off as a result of the project.

3.9 ORASECOM Agreement of 3 November 2000 (repealed)

This agreement was repealed and replaced with a revised agreement in 2018, as discussed below.

In terms of this agreement, the Governments of the Republic of Botswana, the Kingdom of Lesotho, the Republic of Namibia and the Republic of South Africa established the Orange-Senqu River Commission as an international organisation with international legal personality and capacity to enter into international agreements.

Article 5 provides for the functions of the ORASECOM Council are to take all measures required to make recommendations, or to advise the Parties, on the following matters:

- Measures and arrangements to determine the long-term safe yield of the water sources in the River System;
- the equitable and reasonable utilisation of the water sources in the River System to support sustainable development in the territory of each Party;

- the investigations and studies conducted separately or jointly by the Parties, with regard to the development of the River System, including any project or the construction, operation and maintenance of any water works;
- the extent to which the inhabitants in the territory of each Party concerned shall participate in respect of the planning, development, utilisation, protection and conservation of the River System, as well as the harmonisation of policies in that regard and the possible impact on the social, cultural, economic and natural environment;
- the standardised form of collecting, processing and disseminating data or information with regard to all aspects of the River System;
- the prevention of the pollution of water resources and the control over aquatic weeds in the River System;
- contingency plans and measures for responding to emergency situations or harmful conditions resulting from natural causes such as droughts and floods, or from human conduct such as industrial accidents,
- the regular exchange of information and consultation on the possible effects of planned measures;
- measures with a view to arriving at a settlement of a dispute between two or more of the Parties; and
- such other matters as may be determined by the Parties.

Article 7 provides for the obligations of the parties which include:

- The Parties shall give their full co-operation and support to the implementation of this Agreement as well as the recommendations of the Council.
- The Parties shall, in their respective territories, utilise the resources of the River System in an equitable and reasonable manner with a view to attaining optimal and sustainable utilisation thereof, and benefits therefrom, consistent with adequate protection of the River System. The term "equitable and reasonable" shall be interpreted in line with the Revised Protocol on Shared Watercourses in the Southern African Development Community (SADC) Region.
- The Parties shall, in utilising the resources of the River System in their territories, **take all appropriate measures to prevent the causing of significant harm** to any other Party. The term "significant harm" shall be

interpreted in line with the Revised Protocol on Shared Watercourses in the Southern African Development Community (SADC) Region.

- The Parties shall exchange available information and data regarding the hydrological, hydrogeological, water quality, meteorological and environmental condition of the River System.
- A Party planning any project, programme or activity with regard to the River System which may have a significant adverse effect upon any one or more of the other Parties, or which may adversely affect such River System, shall forthwith notify the Council and provide all available data and information with regard thereto. [Sub-articles 7.5 to 7.16 prescribe in detail the process of notifying and responding to a notification of a planned project, programme or activity.]

3.10 Revised Agreements between the Governments of the Republic of Botswana, the Kingdom of Lesotho, the Republic of Namibia and the Republic of South Africa on the Establishment of the Orange-Senqu Watercourse Commission

The objective of this Agreement is to ensure the long-term conservation and sustainable use of the water resources in the Orange-Senqu Watercourse through effective implementation of this Agreement.

This agreement repeals the ORASECOM Agreement of 2000.

However, the Commission established in terms of the 2000 Agreement shall continue to exist as if established under this Agreement.

Article 4 of the Agreement sets out the General Principles as follows (summarised):

- (a) Ensure that the utilisation of the watercourse is open to each Party within its territory and without prejudice to its sovereign rights;
- (b) Respect for existing rules of general or customary international law relating to the utilisation and management of the resources of the watercourse, and abide by principles of community interests in the equitable utilisation of the watercourse;
- (c) Maintain balance between resource development for a higher standard of living for their people and conservation of the environment;

- (d) Close cooperation with regard to the study and execution of projects likely to have an effect on the watercourse;
- (e) Exchange information and data regarding hydrology, water quality and meteorological and ecological conditions;
- (f) Utilise and develop the watercourse in an equitable manner to attain optimum utilisation thereof and adequate protection of the watercourse;
- (g) Measures to prevent causing significant harm to the water course;
- (h) Notify affected parties of emergencies;
- (i) Provides for declaration of emergencies and implementation of emergency actions to save lives;
- (j) Prevent alien aquatic species from being introduced to watercourse;
- (k) Prevent pollution or environmental degradation;
- (l) Watercourse and installations only to be used for peaceful purposes.

Utilisation of the watercourse in an equitable manner requires taking into account all relevant factors and circumstances including:

- (a) Geographical, hydrological, climatical, ecological and other factors of a natural character;
- (b) The social and economic needs of the Parties;
- (c) The effects of the use of the watercourse by one Party on the other Parties;
- (d) Existing and potential uses of the watercourse; and
- (e) Guidelines and agreed standards to be adopted.

The above criteria were not included in the 2000 ORASECOM Agreement.

Article 14 of the 2018 Agreement, read with Article 9, also provides for the establishment of Task Teams, as follows:

- (a) The Communications Task Team;
- (b) The Finance Task Team;
- (c) The Legal Task Team;
- (d) The Socio-Economic Task Team; and
- (e) The Technical Task Team.

The 2000 ORASECOM Agreement did not provide for Task Teams.

3.11 Treaty on the Lesotho Highlands Water Project between The Government of the Republic of South Africa and the Government of the Kingdom of Lesotho, 24 October 1986

The Treaty provides for the establishment, implementation, operation and maintenance of the Lesotho Highlands Water Project. The project stores water in the upper reaches of the Senqu River in Lesotho, generates electricity in Lesotho, and the Treaty provides for a number of project phases with the eventual delivery of 70 m³/s (2 208 million m³/a in 2020) to a designated outlet point in the Vaal River basin.

3.11.1 Institutions

The Treaty provides for the establishment of the Trans Caledon Tunnel Authority with responsibility for the implementation, operation and maintenance of the Project situated in South Africa; the Lesotho Highlands Development Authority with responsibility for the implementation, operation and maintenance of the Project situated in the Kingdom of Lesotho and a JPTC which is now the Lesotho Highlands Water Commission, composed of two delegations, one from each Party (South Africa and Lesotho), with monitoring powers over both LHDA and TCTA.

3.11.2 Royalties in terms of the LHWP Treaty

The Treaty also provides for Royalty payments from South Africa to Lesotho as well as the approach to royalty calculations and payments are set out in the following documents:

- Treaty on the Lesotho Highlands Water Project between the Government of the Republic of South Africa and the Government of the Kingdom of Lesotho (the Treaty);
- Royalty Manual Volume 1 - Methodology;
- Royalty Manual Volume 2 - List of Figures, Tables and Appendices;
- Royalty Manual Volume 3 - Examples;
- SACU Study - Protocol II to the Treaty on the Lesotho Highlands Water Project.

3.11.3 Royalties based on net benefit

Royalty payments are based on fifty-six per cent of the net benefit, where the net benefit is the difference of the cost, at its Present Value, between two schemes with a water delivery capacity of seventy cubic metres per second²:

- (a) the first scheme, identified as the "Optimal Scheme" in the Royalty Manual, comprises either:
- i. a least cost combination of the "Lesotho Highlands Water Project Initial Development" with a "Follow-on Orange Vaal Transfer Scheme",¹ Treaty, Article 12(1)
 - ii. the least cost "Lesotho Highlands Water Project Initial Development" only,
- (b) whichever provides the lowest cost³.
- (c) the second scheme comprises the "Least Cost Orange Vaal Transfer Scheme" (OVTS).

3.11.4 Adjustments to water demand

The annual minimum quantities of water to be delivered by LHDA are specified in Annexure II and shown in **Table 3-1**.

Table 3-1: Minimum quantities of water to be delivered by LHDA

Year	Annexure II Million Cubic Meters
1995	57
1996	123
1997	190
1998	258
1999	327
2000	398
2001	470
2002	543

² Treaty, Article 12(1)

³ Treaty Article 12(2)

2003	618
2004	695
2005	772
2006	852
2007	932
2008	1 014
2009	1 098
2010	1183
2011	1 271
2012	1 361
2013	1 452
2014	1 545
2015	1 640
2016	1 736
2017	1 835
2018	1 934
2019	2036
2020	2139
After 2020	2208

The annual quantities of water specified in Annexure II shall be adjusted in accordance with changes as projected by South Africa in the water use requirements in the Republic of South Africa, provided:

- (a) adjustments shall be made to only those annual quantities of water specified in Annexure II which exceed the Nominal Annual Yield (98% assurance)⁴ for Sub-phase IB or;
- (b) the total of the Nominal Annual Yield for any phase of the Project which is being implemented at the time of such adjustment.⁵

⁴ Treaty Article 7(5)

⁵ Treaty Article 7(2)

3.11.5 Instream flow requirements

LHDA shall at all times maintain rates of flow in the natural river channels immediately:

- (a) downstream of the Katse dam of not less than five hundred litres per second;
and
- (b) downstream of the Mohale dam of not less than three hundred litres per second;

Provided that 'subsequent to the implementation of Phase II of the Project, such rates of flow may be adjusted by agreement between the Parties'.

Provided further that in the event of either reservoir being at its minimum operating level, the quantities of water released shall be equal to the flow rate into such reservoir not in excess of the specified rate of release.⁶

3.12 Agreement on Phase II of the Lesotho Highlands Water Project

Phase I consisting of Phase IA and Phase IB of the Lesotho Highlands Water Project (LHWP) has already been completed.

Lesotho and South Africa have on 11 August 2011 entered into an agreement to implement Phase II of the LHWP. This agreement provides a legal basis for the implementation of Phase II as well as for the operation and maintenance of Phases I and II of the LHWP.

Phase II consists of a new water delivery system comprising Polihali Reservoir on the Senqu River and a water conveyance tunnel connecting Polihali Reservoir with Katse Reservoir. The existing infrastructure is used from Katse Reservoir to the Ash River outlet in RSA.

Phase II can also include a pump storage scheme as discussed in paragraph 3.11.4. below.

3.12.1 Hydropower arrangements

Article 8 provides for hydropower arrangements.

The Phase II hydropower generation system shall comprise the Kobong pump storage scheme consisting of a hydropower station, the existing Katse Reservoir as the lower reservoir, a new upper reservoir in the Kobong valley, or any other similar scheme, and an interconnecting tunnel as well as transmission lines and appurtenant works between the scheme and the designated connection point at the border with South Africa.

⁶ Treaty Article 7(9)

The implementation of the Kobong pump storage scheme is subject to agreement on the outcome of a joint feasibility study.

[The hydropower system is an integral part of Phase II.

“Phase II” means the second phase of the Project to be implemented in terms of this Agreement in two distinct systems, namely a water delivery system to augment the delivery of water to South Africa and a hydropower generation system.]

South Africa shall facilitate the sale of peak electricity from the Kobong pump storage scheme and the purchase of electricity for the pumping requirements of the scheme.

3.13 Memorandum of understanding between The Government of the Republic of Botswana, The Government of the Kingdom of Lesotho and The Government of the Republic of South Africa establishing a framework for a study on the provision of water to the Republic of Botswana from the Lesotho Highlands, 1 March 2013

Lesotho, South Africa and Botswana have entered into an agreement on 1 March 2013 to undertake a three phased study for transferring water from the Lesotho Highlands to Botswana.

Phase 1 will identify configurations at reconnaissance level to augment Botswana’s bulk water supplies from the Lesotho Highlands;

Phase 2 will be a pre-feasibility study of the preferred options;

Phase 3 will be a feasibility study of the preferred options.

At the end of each phase the Parties will decide whether to proceed to the next phase.

The Parties will establish a Joint Study Management Committee to coordinate the implementation of the Project.

3.14 The Agreement on the Establishment of the Violsdrift and Noordoewer Joint Irrigation Scheme on the Lower Orange River (1992)

3.14.1 History

Violsdrift and Noordoewer are small towns on opposite banks of the Lower Orange River (LOR), some 350 km from the river mouth. Violsdrift is in South Africa and Noordoewer in Namibia. The South African Government constructed a canal system serving the two

settlements in 1933. The canal is fed from a weir upstream of the river crossing. The canal infrastructure has supported agriculture on the southern and northern banks of the LOR for some 70 years.

Between 1933 and the independence of Namibia in 1990, the Vioolsdrift/Noordoewer Irrigation Scheme was under South African jurisdiction. An Irrigation Board was responsible for the local management of the scheme, with support from the South African Department of Water Affairs. At Namibian independence, an international boundary was established along the LOR, and a border post was constructed between the two towns. This development required new management arrangements for the irrigation scheme. A Joint Irrigation Authority (JIA) was established at the end of 1993, based on an agreement between the Governments of Namibia and South Africa.

The South African Department of Water and Sanitation had embarked on a renovation and upgrading programme just prior to the establishment of the JIA, but this work was stopped when the JIA was formed.

3.14.2 Supply and allocation of water according to the Treaty

Article 3 of the Treaty deals with “Supply of Water to the Scheme”.

Article 3, para 2 provides that subject to certain provisions being that there is no guarantee of water quality and that the supply is subject to such restrictions as may from time to time be imposed by the PWC due to a water shortage occurring in the Orange River -

“...the Parties shall allow a maximum volume of 20 million cubic metres of water to be diverted annually from the Orange River into the distribution system of the Scheme at Vioolsdrift Weir or to be abstracted directly from the Orange River in the Irrigation District by means of abstraction works in private possession, for use for domestic and stockdrinking purposes and for the irrigation of land within the said District.”

Article 4 of the Treaty deals with “Allocation of Water by the Parties for use on Land situated in the Irrigation District.”

Article 4, para 1 provides:

“The water referred to in Article 3 shall in terms of appropriate legislation in force in their respective territories, be allocated by the Parties for use for domestic, stockdrinking or irrigation purposes on land within the Irrigation District on the basis of the following apportionment of the volume of water in question:-

South Africa:	11 million cubic meters per annum,
Namibia:	9 million cubic metres per annum.

3.14.3 Scheduled irrigation – Actual situation according to the October 2004 assessment of the “Violsdrift and Noordoewer Joint Irrigation Scheme (JIA)”.

A total of 883.7 ha in **Table 3-2** is scheduled for irrigation of which 283.2 ha are at Noordoewer and 600.5 ha at Violsdrif.

The combined area currently under irrigation is 728 ha of the possible 883.7 ha.

Table 3-2: Summarizes the enlisted – and irrigated areas.

Description	Violsdrift	Noordoewer	TOTAL
Enlisted area (ha)	600.5	283.2	883.7
Area served by canal (ha)	524	283	807
Present area irrigated (ha)	475	253	728

4 NATIONAL LEGISLATION

Each of the basin states, as sovereign entities, have their own National Legislation.

What follows is a brief highlight of those aspects of the National legislation that impact on the regulation of water use, dam safety, key institutional arrangements, and international arrangements for:

- Lesotho;
- South Africa;
- Botswana; and
- Namibia.

4.1 Kingdom of Lesotho (Water Act 15 of 2008)

The **Water Act 15 of 2008** provides for the management, protection, conservation, development, and sustainable utilisation of water resources.

“Controlled activities” is defined as activities which have a potential to cause adverse effect on the quality and quantity of water.

The following general principles are applicable to the effective management, conservation and protection of water resources (s3):

- (a) Sustainable utilisation of water resources;
- (b) Intergenerational equity;
- (c) Integrated water resources management;
- (d) Equitable distribution of water and sanitation services;
- (e) Public participatory approach;
- (f) Precautionary principle;
- (g) Polluter pays principle;
- (h) Integration of environmental and social issues into water resources management, among them, HIV/AIDS and gender mainstreaming; and
- (i) Sector wide approach to water resources management.

Ownership of water resources in Lesotho is vested in the Basotho Nation and held in trust by the King on behalf of the Basotho Nation (s4).

There are 10 defined water activities, including inter alia taking of water from a water course, storing water, discharging of water or water containing waste into a water resource through a pipeline, canal, sewer, sea outfall or other conduit (s5). Lesotho is landlocked so “sea outfall” is a little peculiar.

Provision is made for a Commissioner of Water who is inter alia responsible for providing policy, implementing policy, developing strategies, and coordinating all water management activities including activities relating to international waters, carrying out regulatory activities. (s8).

No person shall engage in an activity of using or abstracting water without a water use permit. Such permit shall be valid for 5 years (s20).

No person shall engage in waterworks activities without a construction permit (s 21).

The Minister may declare certain activities as controlled activities (s25).

A person who wishes to discharge effluent into water courses shall obtain a permit (s27).

The Minister shall have power to acquire, establish, control, manage and operate Government waterworks (s32).

The Minister may declare a dam to be a dam with a safety risk (s33)

4.2 Republic of South Africa (National Water Act 36 of 1998)

The National Water Act 36 of 1998 provides as follows:

The National Government, acting through the Minister, has the power to regulate the use, flow and control of all water in the Republic (s3).

Entitlement to water use (s4)

(a) a person may use water in or from a water resource for purposes such as reasonable domestic use, domestic gardening, animal watering, fire fighting and recreational use, as set out in Schedule 1.

(b) a person may continue with an existing lawful water use in accordance with

section 34.

- (c) a person may use water in terms of a general authorisation or licence under this Act.
- (d) any entitlement granted to a person by or under this Act replaces any right to use water which that person might otherwise have been able to enjoy or enforce under any other law-
 - i. to take or use water;
 - ii. to obstruct or divert a flow of water;
 - iii. to affect the quality of any water;
 - iv. to receive any particular flow of water;
 - v. to receive a flow of water of any particular quality; or
 - vi. to construct, operate or maintain any waterwork.

The Minister must establish a national water resource strategy (s5).

A catchment management agency must establish a catchment management strategy (s8).

The Minister must prescribe a system for classifying water resource and establish procedures for determining the Reserves (s12).

The Minister must determine for all or part of every significant water resource-

- (a) a class in accordance with the prescribed classification system; and
- (b) resource quality objectives based on the class (s13).

The Minister must determine the Reserve for all or part of that water resource (s16).

Water use includes (s21)-

- (a) taking water from a water resource;
- (b) storing water;
- (c) impeding or diverting the flow of water in a watercourse;
- (d) engaging in a stream flow reduction activity;
- (e) engaging in a controlled activity;
- (f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- (g) disposing of waste in a manner which may detrimentally impact on a water resource;

- (h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- (i) altering the bed, banks, course or characteristics of a watercourse;
- (j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- (k) using water for recreational purposes.

Permissible use of water: A person may only use water (s22)-

- (a) without a licence-
 - i. if that water use is permissible under Schedule 1;
 - ii. if that water use is permissible as a continuation of an existing lawful use; or
 - iii. if that water use is permissible in terms of a general authorisation issued under section 39;
- (b) if the water use is authorised by a licence under this Act; or
- (c) if the responsible authority has dispensed with a licence requirement

The Minister may, with the concurrence of the Ministry of Finance, establish a pricing strategy for charges for any water use (s 56).

A catchment management agency may be established for a specific water management area (s77 to s90).

The Act provides for the establishment, powers and disestablishment of water user associations. Existing irrigation boards, subterranean water control boards and water boards established for stock watering purposes will continue in operation until they are restructured as water user associations. (s91 to s98).

Chapter 10 (sections 102 to 108) of the National Water Act deals with International Water Management.

Under this Chapter the Minister may establish bodies to implement international agreements in respect of the management and development of water resources shared with neighbouring countries, and on regional co-operation over water resources. The governance, powers and

duties of these bodies are determined by the Minister in accordance with the relevant international agreement, but they may also be given additional functions, and they may perform their functions outside the Republic.

Certain existing international bodies are deemed to be bodies established under this Act, namely:

- The **Trans-Caledon Tunnel Authority** (TCTA) established by Government Notice 2631 of 12 December 1986,
- The Komati Basin Water Authority established by an agreement dated 13 March 1992 with the Kingdom of Swaziland; and
- The **Vioolsdrift Noordoewer Joint Irrigation Authority** established by an agreement dated 14 September 1992 with the Government of Namibia.

The Minister may acquire, construct, alter, repair, operate or control government waterworks in order to protect, use, develop, conserve, manage and control the nation's water resources in the public interest (s109).

The Act contains measures aimed at improving the safety of new and existing dams with a safety risk so as to reduce the potential for harm to the public, damage to property or to resource quality (s117 to s123).

4.3 Botswana (Water Act date of commencement: 9th February, 1968)

The Botswana Water Act of 1968 provides that the Minister shall appoint a Board, to be styled the Water Apportionment Board (S3).

The Board may grant to any person the right to divert, dam, store, abstract, use, or discharge any effluent into, public water from such source, in such quantity, for such period, whether definite or indefinite, and for such purpose as may be specified in the water right (s15)

There shall be no right of property in public water (S4).

Provision is made for use of water by owners and occupiers of land (s6), and mines (s7), and forestry (s8), and for the retention of existing rights (s10).

Other than the above, no person shall divert, dam, store, abstract, use, or discharge any effluent into, public water or for any such purpose construct any works, except in accordance

with a water right (s9).

4.4 Namibia (Water Resources Management Act 11 of 2013)

The Water Resource Management Act 11 of 2013 sets out a number of fundamental principles (s3):

- (a) equitable access for all people to safe drinking water is an essential basic human right to support a healthy productive life;
- (b) access by all people to a sufficient quantity of safe water within a reasonable distance from their place of abode to maintain life and productive activities;
- (c) harmonisation of human water needs with the water requirements of environmental ecosystems and the species that depend on them, while recognizing that the water resource quality for those ecosystems must be maintained;
- (d) promotion of the sustainable development of water resources based on an integrated water resources management plan which incorporates social, technical, economic, and environmental issues;
- (e) availability of open and transparent information about water resources to the public;
- (f) recognition of the economic value of water in the allocation of water;
- (g) development of the most cost-effective solutions, including conservation measures, to infrastructure for the provision of water;
- (h) supporting integrated water resources management through human resources development and capacity building;
- (i) promotion of water awareness and the participation of persons having interest in the decision-making process should form an integral part of any water resource development initiative;
- (j) consistency of water resource management decisions within the specific mandate from the Government regarding the separation of policy, regulatory and operational functions;
- (k) prevention of water pollution and implementation of the principle that a person disposing of effluent or waste has a duty of care to prevent pollution;
- (l) a polluter is liable to pay all costs to clean up any intentional or accidental spill of pollutants;
- (m) cognisance of Namibia's international rights and obligations in the utilisation of internationally shared water resources and the disposal of waste or effluent; and

- (n) cognisance of the regional diversity in water resources development and the decentralisation of responsibilities to the lowest level of Government where adequate and appropriate competency exists to manage water resources effectively.

The Act establishes a Water Regulator (s11).

The Minister may recognise a group of representatives of such institutions, stakeholders and persons who are organised or associated for the purpose of organising, planning or dealing with matters relating to the development, management, protection and enhancement of water resources in the basin or part of the basin, to be a basin committee (s20).

The functions of the Minister in relation to the joint management of internationally shared water resources are (s28):

- (a) to participate with neighbouring and other riparian states in the establishment, development and maintenance of a common database system to store and provide data and information for the protection, sustainable use and management of shared water resources;
- (b) to engage in the joint management, planning and development of projects concerning shared water resources in furtherance of the objectives of the Southern African Development Community Revised Protocol on Shared Watercourses with regard to regional integration, economic growth and poverty alleviation;
- (c) to establish and promote institutional relationships between river basin organisations within Namibia and international river basin organisations;
- (d) to encourage the participation of Namibian stakeholders in discussions concerning the identification and formulation of the interests of Namibia in the development of internationally shared water resources;
- (e) to protect the international water resource quality, including discussion with upstream states to reduce or prevent the deterioration of water quality resulting from activities in upstream states;
- (f) to develop and improve human resource capacity to participate in the management of shared water resources, including negotiations, consultations and conflict resolution; and

- (g) to establish mechanisms, or negotiate the revision of mechanisms, for the management, prevention and resolution of disputes relating to internationally shared water resources.

The Minister must prepare an Integrated Water Resources Management Plan for the development, conservation, management and control of Namibia's water resources (s31).

A person may not operate as a water services provider without holding a licence as a water services provider issued by the Minister that authorises the person (s41):

- (a) to distribute water to end-consumers; and
- (b) to operate a water treatment facility.

A person may not abstract and use water from a water resource, unless the person holds a licence issued by the Minister that authorises the abstraction and use of water from that water resource (s44).

Except under a licence issued under this Act that authorises the holder of the licence to do so, or in accordance with an exemption granted under section, a person may not (s70) -

- (a) by any act or omission, cause or allow any wastewater, effluent or waste to be discharged or deposited, directly or indirectly, into a water resource, or to be introduced into a borehole or well;
- (b) construct a wastewater treatment facility or establish a waste disposal site above an aquifer or within such distance of an aquifer where it is likely to constitute a source of pollution, directly or indirectly, of the aquifer

For the protection of water resources and the environment from pollution, the Minister may prescribe (s76):

- (a) quality standards with which effluent discharges must comply; and
- (b) requirements for the acceptance, storage, treatment and disposal of solid waste.

The Minister may declare an area to be a water protection area (s85).

The Minister may grant a combined licence to abstract and use water and to discharge effluent (s47)

The Act provides for the control and protection of groundwater (Part 12, s56 to s67).

A person may not engage in any construction work or other activity that causes, or is likely to cause, the natural flow conditions of water in, to or from a watercourse to be modified, unless the Minister has granted prior written approval for the work or activity to be carried out (s92)

The Minister may prescribe (s93)-

- (a) standards for the design, construction, maintenance, surveillance, operation and abandonment of dams; and
- (b) standards for carrying out works in constructing a dam.

The Act provides for dams with safety risk (s94) and the registration of such dams (s97).

The Minister may by regulation prohibit or regulate the use of any wetland or dam for specified purposes or the carrying on of specified activities within any wetland or dam, except under authority of a licence issued (s101).

The Minister may prescribe tariffs of fees and charges, in accordance with a determination by the Water Regulator (s104).

5 OVERALL ASSESSMENT OF THE POLICIES, TREATIES AND LEGISLATION

Not all four of the Orange River watercourse states are signatories to the Convention on International Watercourses. However it is generally accepted that the Convention reflects the customary law of international watercourses and would almost certainly be considered as highly influential by a tribunal should any dispute between the watercourse states arise.

The Revised SADC Protocol is however more immediate to the basin states and must accordingly be seen as modifying the customary law, i.e. modifying the Convention.

All of the conventions and treaties are in agreement that water resources allocation must be based on the **equitable and reasonable utilisation** of the shared water sources by each watercourse state. Furthermore, any planned development **must not cause significant harm** to another watercourse state.

The ORASECOM 2018 Agreement provides as follows:

Utilisation of the watercourse in an equitable manner requires taking into account all relevant factors and circumstances including:

- (a) Geographical, hydrological, climatical, ecological and other factors of a natural character;*
- (b) The social and economic needs of the Parties;*
- (c) The effects of the use of the watercourse by one Party on the other Parties;*
- (d) Existing and potential uses of the watercourse; and*
- (e) Guidelines and agreed standards to be adopted.*

Other Treaties provide similarly, but also include the following additional factors/criteria and uses that should be taken into account when agreeing what is **equitable and reasonable use**:

- conservation, protection, development and economy of use of the water resources; and
- the availability of alternatives.

All relevant factors are to be considered together and a conclusion reached on the basis of the whole.

States must adopt a river basin or watercourse approach in the planning, development and management of the shared water resources and must follow IWRM principles.

The Orange River mouth is a listed Ramsar wetland site and the basin states should consult on how to protect this wetland and should consider implementing some or all of the recommendations provided in the CSIR situation assessment.

Water Demand Management (WDM) and co-use of ground and surface water are fundamental requirements for integrated planning and management of the shared water resources.

Watercourse states should consult with a view to arriving at mutually agreeable measures and methods to prevent, reduce and control pollution.

ORASECOM Council is mandated to make recommendations, or to advise the Parties, on the safe yield of the river and on the equitable and reasonable utilisation of the water sources in the River System to support sustainable development in the territory of each Party. All parties to the Orasecom Agreement must be notified of any planned development that will adversely affect another watercourse state. The notification and response procedures are specified.

Besides **ORASECOM** the following institutions have been established with powers in the Orange River Basin:

- the **Trans Caledon Tunnel Authority** with responsibility for the implementation, operation and maintenance of the Lesotho Highlands Water Project situated in South Africa;
- the **Lesotho Highlands Development Authority** with responsibility for the implementation, operation and maintenance of the Project situated in the Kingdom of Lesotho;
- a JPTC which is now the **Lesotho Highlands Water Commission**, composed of two delegations, one from each Party, with monitoring powers over both LHDA and TCTA.

A **Permanent Water Commission** between Namibia and South Africa that is responsible for **overseeing the Agreement on the Establishment of the Vioolsdrift and Noordoewer Joint Irrigation Scheme** with a **Vioolsdrift and Noordoewer Joint Irrigation Authority** to manage and operate the scheme.

All four basin states have national legislation which regulates the use of water.

Most of the basin states have legislated a form of water planning, such as a national water strategy or catchment strategy.

South Africa and Namibia have international water management delegated by legislation.

6 PROPOSED INTERVENTION BY ORASECOM IN FACILITATING AGREEMENT ON THE FUTURE ALLOCATION OF ORANGE RIVER WATER

What is clearly shown in the hydrological analysis of the basin undertaken as part of this study is just how constrained the availability of water will be once the core scenario projects listed in the investment plan are developed.

Every new upstream dam will have to make allowance through releases for downstream use, and every new downstream dam will be dependent on sufficient releases from upstream dams. In other words, any development planned in the investment plan development **must not cause significant harm** to another watercourse state.

The assessment in Chapter 5 above summarises the factors and criteria that must be taken into account when agreeing what is equitable and reasonable use. However, unless the Watercourse States actually do a quantified allocation of water for use amongst themselves and the environment, including the Orange River Mouth, such factors and criteria will not be actionable.

Because of the stochastic nature of the hydrology, such an allocation would be in the form of operating rules that are triggered/driven through the continual monitoring of the status of the dam levels throughout the basin, and by the water demand of the different water use sectors out of those dams. In other words, it would be a dynamic allocation of water based on a maximum supply and levels of curtailment depending on the status of the dams.

A fundamental input to such operating rules is the level of assurance that each water use sector should be supplied. Basic human needs, domestic and industrial use would generally receive water at a higher level of assurance than agriculture. This means that in the case of a drought, water supply to agriculture would be reduced by a certain percentage before water supply to domestic and industrial is reduced.

Another fundamental input is the amount of new development of each of the sectors that will be supplied out of the Orange River, as opposed to being supplied from other sources. And again, it will be necessary to agree priorities between domestic/industrial and agriculture.

In order to make the future development of the Orange sustainable, and in order to avoid later conflicts, it is recommended that ORASECOM convene a Task Team to facilitate an agreement on the allocation of the resources of the Orange River over a specified time horizon, say the next 30 years.

The suggested ToR of such a Task Team would be to:

- Forecast the future water demand of each sector out of each current and proposed dam in the Orange River;
- Assign a level of assurance to each sector;
- Test the ability of the resource to meet such forecast demand;
- If the resource is not sufficient then to reach agreement on curtailing the demand in a fair and equitable way using the principles set out in the various treaties and summarised in section 5;
- And agree, through means of a treaty or protocol to an existing treaty, a fair allocation of the resource between basin states and the operating rules to ensure such a fair allocation of the resource.

Factors to be taken into account in determining equitable and reasonable use, should include:

- social, economic and environmental needs;
- the population dependent on the shared watercourse;
- the effects of the use or uses of a shared watercourse in one Watercourse State on other Watercourse States;
- existing and potential uses of the watercourse;
- conservation, protection, development and economy of use of the water resources; and
- the availability of alternatives.

CAVEAT

States often believe that, because they abstracted or required water prior-in-time to the rise in demand of other basin states, they have an inviolate and eternal right to the water that they have accessed. An unqualified belief in the existing lawful use or first use principle.

For example, basin states in the Nile River basin point-out old Colonial treaties between various long gone Imperial Powers as proof of an existing and eternal allocation. This

unwillingness to acknowledge current circumstances is a cause of much conflict.

The current reality in the Orange should be viewed differently.

All of the basin states would for example acknowledge the following SDG goals:

- End poverty in all its form everywhere;
- End hunger, achieve food security and improved nutrition and promote sustainable agriculture;
- Ensure healthy lives and promote well-being for all at all ages;
- Achieve gender equality and empower women and girls.

Clearly, existing upstream use, which may or may not be wasteful, or which may or may not be the most socially beneficial or economically optimal use of the water, cannot be seen as an absolute eternal allocation if downstream communities do not have access to sufficient water to elevate themselves out of poverty, achieve food security, lead healthy lives, or if women have to carry water over long distances.

At least the following specified factors/criteria uses must be taken into account when agreeing what is equitable and reasonable use, including:

- social, economic and environmental needs;
- the population dependent on the shared watercourse;
- the effects of the use or uses of a shared watercourse in one Watercourse State on other Watercourse States;
- existing and potential uses of the watercourse;
- conservation, protection, development and economy of use of the water resources; and
- the availability of alternatives.

All relevant factors are to be considered together and a conclusion reached on the basis of the whole.

When agreeing an allocation of the Orange River resource, ORASECOM cannot merely plug in existing lawful use as a given.

While existing lawful use is a very important criteria/factor, and is included in the above list, it is important that the circumstances of that use must be interrogated in terms of all of the other criteria/factors and potential beneficial uses.

7 PROPOSED ARRANGEMENTS FOR IMPLEMENTING THE LESOTHO – BOTSWANA TRANSFER PROJECT (L-BWT PROJECT)

This is merely a preliminary recommendation. The final recommendation will be agreed before finalising the Road Map; and the recommendations made in this task will be revisited, expanded on, and aligned with the vision of the Road Map at that time.

The following is noted:

- **Lesotho Highlands Development Authority (LHDA)** is already funding, planning, implementing, maintaining and operating large dams and transfers (tunnels) in Lesotho, as a parastatal organisation (SOE) wholly owned by the Lesotho Government.
- **Trans Caledon Tunnel Authority (TCTA)** is already funding planning, implementing, operating and maintaining large dams and pipelines in South Africa and supplying the Rand Water Board and others with water, as a parastatal organisation (SOE) wholly owned by the South African Government..
- **Botswana Water Utilities Corporation (WUC)** is already funding, planning, implementing, operating, maintaining, and distributing water resources in the country's urban centres and other areas mandated by the Botswana Government, as well as the supply of bulk water to the Department of Water Affairs and the various Local Authorities for distribution to villages and other small settlements in the country, as a parastatal organisation (SOE) wholly owned by the Botswana Government.

The most pragmatic, cost effective and “fastest start time” way of proceeding forward would be to utilise the above institutions to develop the various components of the proposed L-BWT Project, being dam and pipelines/tunnels in Lesotho, bulk transfer pipelines and possibly canals in South Africa, and bulk and distribution pipelines in Botswana.

Work done with TCTA shows that the more planning, construction and operating work that is delegated to TCTA, the more efficiently TCTA can apply its overheads.

In other words, a substantial portion of TCTA's overheads are relatively fixed and the more construction that TCTA does, the lower the overheads per ZAR million of construction that it undertakes.

Similarly, the more water that TCTA stores and supplies, the cheaper the cost of the overheads per kl.

Another way of viewing this is that the additional costs to TCTA of supervising the South African portion of a L-BWT Project will be relatively low as most of the project management and fund-raising capacity and methodology is already established in-house.

The same benefits of scale, saving of establishment costs, and “quick start up” would apply to using LHDA for the Lesotho component of the L-BWT Project and the WUC for the Botswana component, as opposed to establishing duplicate structures.

A new Commission, similar to the LHWP Joint Commission, would be required to coordinate the activities of these three institutions.

Taking into consideration that water transferred through the transfer pipeline to Botswana would impact directly on yield of the South African Orange River Schemes of Van Der Kloof and Gariep, it is recommended that strong consideration be given to “tying” the respective planning of the LHWP Commission and the Lesotho-South Africa-Botswana Transfer Commission closely together.

Whether this means that that Commission is an expanded LHWP Commission, with Botswana as an additional member, or whether it means that the Lesotho-RSA-Botswana Commission (L-BWT Project Commission) is a new parallel Commission with a few key members shared with the LHWP, would need to be agreed by the Parties.

The **Figure 7-1** below shows such a proposed institutional arrangement:

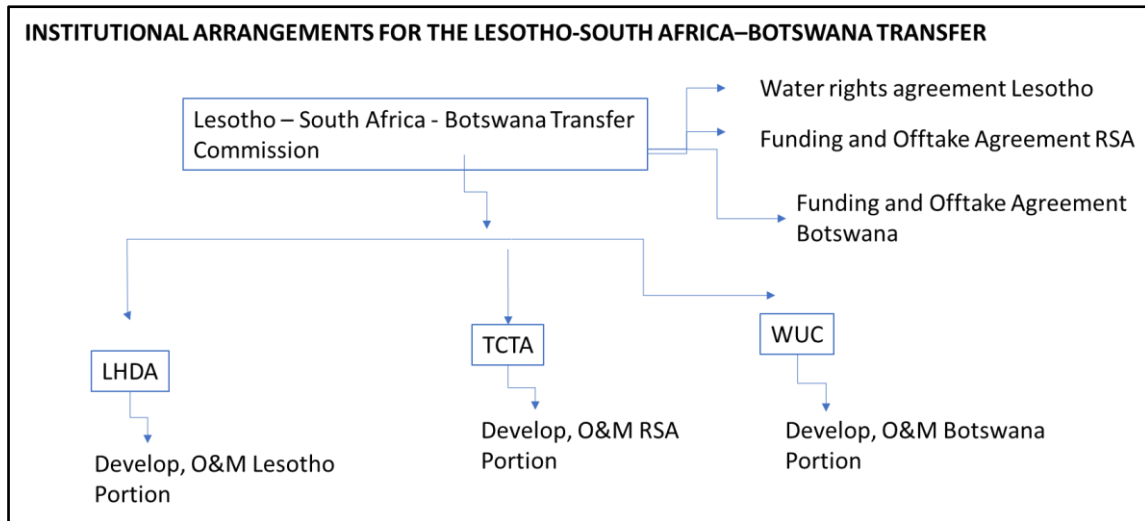


Figure 7-1: Institutional arrangements for Lesotho - Botswana Transfer (L-BWT Project).

7.1 Single corporation alternative

As an alternative to mandating LHDA, TCTA, and WUC to build and operate the L-BWT, there may be some coordination and allocation of responsibility benefits in rather appointing a single corporation in their stead.

This corporation could be an existing corporation such as Rand Water, or alternatively a special purpose vehicle or corporation established by the States specifically for that task.

The disadvantage of establishing a new institution, compared to using an existing corporation, is that all of its overheads would accrue to the project and that it takes time to establish a new corporation and to boot up through procurement of board, staff, systems, offices etc.

8 THE PPP ALTERNATIVE

Multi-lateral funding agencies generally have the express or implied objective of promoting private sector participation in projects. These funding agencies generally argue that nearly any project that a government agency can deliver, can be delivered more effectively and efficiently by the private sector because of the competitive procurement process and because the market ejects private sector participants who do not perform competitively. They argue that in comparison to a competitive private sector process government are monopolies with little competition incentive to perform effectively. For this reason, multi-lateral funding agencies are generally proponents of PPP (Public Private Partnership) or BOT (Build Operate Transfer) projects.

Governments on the other hand are generally hesitant in reaching financial closure on such projects. There are many examples in Southern Africa, where a BOT project was developed to a relatively advanced conceptual stage by Government, and then at the last minute the political will was found to be lacking and the project was given to an SOE to implement.

It is consequently important that all governments concerned fully commit to such an approach in writing (bind themselves contractually) before the large investment of management time and disbursement of consulting resources is embarked on in developing such an approach. It is in no country's interest to walk the PPP line for five years or so and then at the very end to write off that investment in management time and resources because the political appetite is not there.

A PPP or BOT project would generally comprise the following participants:

- Project Sponsor – perhaps the L-BWT Project Commission
- Funders – generally commercial banks, but perhaps Mezzanine funding from the New Development Bank to reduce the cost of commercial interest.
- Special purpose BOT vehicle – generally a private consortium/concessionaire appointed through pre-qualified competitive tender.
- Off-takers – perhaps Dept. of Water Affairs, TCTA or a Water Board in South Africa, and perhaps Government of Botswana or WUC Botswana.

The **Figure 8-1** below shows a possible PPP institutional arrangement:

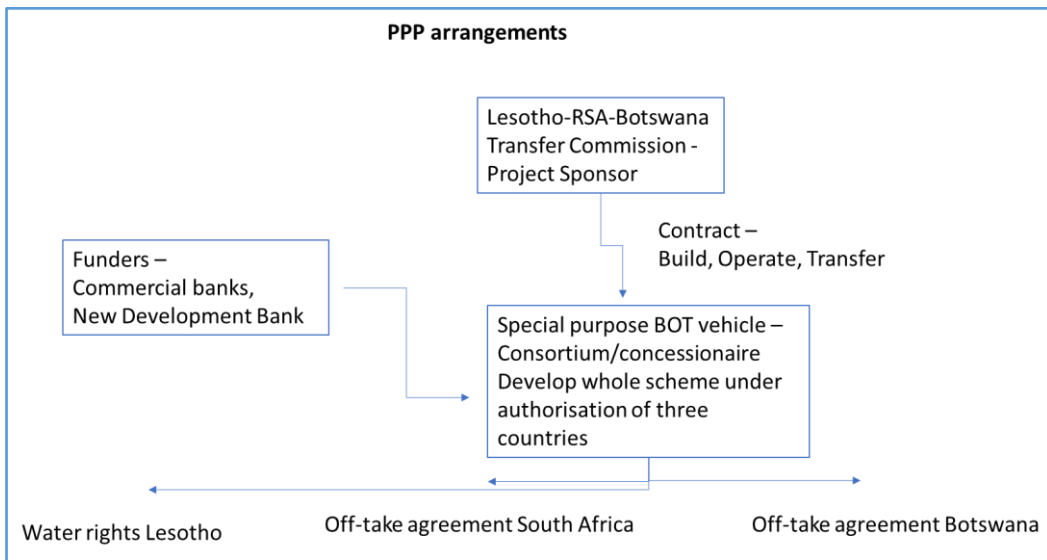


Figure 8-1: PPP arrangements.

9 PROPOSED INSTITUTIONAL ARRANGEMENTS FOR IMPLEMENTING OTHER CORE PROJECTS

Combinations of Core Projects have been identified and agreed with ORASECOM.

An economic analysis of these projects has been done and a time line for implementing these projects has been compiled. This timeline will set the foundation for the Basin Wide Investment Plan.

This section of the Policies and Institutional Arrangements and Structures Report makes proposals on institutional arrangements that are deemed appropriate for implementing, owning and operating these groupings of core projects.

Except for managing Violsdrift, the proposals that follow should not come as a surprise to the ORASECOM member states, as it to a large extent reflects current policy and thinking.

9.1.1 Orange River Projects Scheme Future Improvements

Van Der Kloof and Gariep Dams are currently owned by DWS-RSA.

In accordance with the Constitution and the National Water Act, national government (DWS) is responsible for water resource management.

Consequently, until such time as a National Water Infrastructure Agency is established these schemes and their improvements will remain with DWS-RSA.

9.1.2 Polihali to be used in combination with Violsdrift to maintain a positive water balance in the ORP

Violsdrift Dam is spanning/impacting both Namibia and South Africa, and has a multi-lateral effect on the availability of water upstream, and the preservation of the estuary.

It is proposed that a Joint Water Commission be housed within ORASECOM.

An RSA-Namibia JPTC would then be established to fund, construct and operate the Dam.

The funding and construction will be a once-off activity and it is proposed that the JPTC contract with TCTA, a SOE, for the funding and implementation phase, but then take transfer of the dam on completion and operate the dam itself, or have a national government department from either Namibia or RSA operate it under contract.

9.1.3 Polihali Dam

Polihali Dams will form part of the LHWP, together with Katse and Mohale Dams and the Matsoku Diversion.

Governance responsibility rests with the RSA-GoL LHWC, and implementation responsibility with LHDA, and funding responsibility with TCTA.

9.1.4 Lesotho Lowlands

LHDA, a GoL owned State-owned Entity, already operates Katse and Mohale Dams and the Matsoku Diversion in the Lesotho Highlands Water Project on behalf of the GoL.

As such LHDA already has the capacity and expertise to operate large dams.

It is suggested that LHDA also operate the Lesotho Lowlands dams. This will be more efficient than establishing a parallel authority/entity with similar scarce capacities.

This approach would then be similar to RSA/DWS using TCTA to implement projects outside of the scope of the LHWP.

9.1.5 Caledon to Greater Bloemfontein transfer, Gariep to Greater Bloemfontein Transfer, and Greater Bloemfontein internal resource improvements

These projects are primarily regional projects augmenting the water supply to the City of Mangaung (Bloemfontein), but may have en-route offtakes.

It is proposed that Bloemwater, a South African water board, operate the bulk pump stations and pipelines and that there be an agreed measured transfer point between Bloemwater and City of Mangaung. Such transfer point probably being at the discharge into a bulk reservoir owned by Mangaung.

9.1.6 Neckartal Scheme

Nekartal Dam will primarily supply water to irrigation within Namibia.

As such it is proposed that the dam and pipeline be constructed by DWA-Namibia in cooperation with Namibia-Dept of Agriculture.

9.1.7 Thukela Transfers

The augmentation of the transfers from the Thukela River to the Vaal will be governed and operated by RSA-DWS who operates the current transfers from the Thukela.

RSA-DWS will probably contract with TCTA to fund and implement the scheme, but not to operate it, as DWS already operates the current transfer.

9.1.8 Treated Acid Mine Drainage

The responsibility for governance of Acid Mine Drainage resides with RSA-DWS.

The following alternative procurement models for implementation have been identified and analysed to a feasibility level:

- a) a 'traditional' Government-funded and a traditionally procured Employer Design, Procure, Construct and Operate solution, which is the Public Sector Comparator model (PSC);
- b) a Design, Build, Operate and Maintain (DBOM) scenario funded by an Implementing Agent, using Private Sector or Government funding, which is also a Public Sector Comparator model (PSC); and
- c) a private sector-funded Public-Private Partnership (PPP).

A final decision will be made by DWS after consultation.

9.1.9 Desalination of effluent and re-use

The use of RO technology lends itself to PPP projects.

There are specialist firms which design, construct and implement such projects for municipalities, industrial users and mines. One such South Africa firm is successfully operating 6 multi-stage RO plants on a 24/7 basis.

Such a PPP contractor/operator could be appointed separately by each municipality or could be appointed by a Water Board for municipalities in its area of jurisdiction.

Johannesburg Water and the Cities of Tshwane and Mangaung are probably capable capacity-and-skills-wise of procuring and regulating such a contractor, but it is proposed that it would be prudent to use a water board as project sponsor – i.e. the client when it comes to a PPP serving smaller less capacitated towns.

9.1.10 Integrated Water management options (Urban - Industrial)

It is proposed that ORASECOM should have an oversight responsibility in formulating agreements between the Basin States on WCDM, WQ discharge and environmental targets.

However, the implementation would need to be done at a local level by municipalities under regulation of the respective national government departments and other regulating authorities.

9.1.11 Integrated Water management options (Agriculture)

It is proposed that ORASECOM should have an oversight responsibility in formulating agreement between the Basin States on WCDM, WQ discharge, and environmental targets.

However, the implementation would need to be done at a local level by the respective national agricultural departments.

9.1.12 Additional notes on use of PPP

PPP is probably most useful where a project is going to be established in an institutional lacuna/vacuum or where specialist technology is going to be utilised and the battery limits of the plant can be clearly delineated.

In the context of the Orange River, PPP might be an appropriate option for the pipeline portion of the L-BWT because there is currently no implementing agent or SoE operating such a multi-national cross border pipeline. This is discussed in more depth above under the institutional arrangements of the L-BWT and is part of a separate consulting study done by another PSP.

PPP might also be appropriate for the design, construction and operation of technical multi-phase reverse osmosis plants. These plants have clear battery limits (intake – output quality properties and metered physical boundaries).

PPP is unlikely to be an option for augmentations to existing projects such as LHWP, Lesotho Lowlands, Thukela Transfer, or Bloemfontein supply where there are already existing institutional and funding arrangements.

PPP is also unlikely to be an option for large dams. Most government Departments would require direct control of such expensive and strategic infrastructure that controls down-stream flow and that poses a significant dam-safety risk.

DWS-RSA did at one time seriously consider PPP for the Dam in the Berg Water Project, but after analysis realised that DWS would prefer to have a greater and more direct control over this piece of strategic infrastructure, and DWS chose instead to expand the mandate of TCTA, rather than to have a contractual arms-length approach with a PPP contractor.

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