



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

ROADMAP FOR IWRMP OPERATIONALIZATION

Component II

Appendix C: Core Scenario: Concept Notes





August 2024 FINAL REPORT

Report number: ORASECOM 012C/2019

The Preparation of a Climate Resilient Water Resources Investment Strategy & Plan and the Lesotho-Botswana Water Transfer Multipurpose Transboundary project was commissioned by the Secretariat of the Orange-Sengu River Basin Commission (ORASECOM) with technical and financial support from the African Development Bank, NEDPAD-IPPF (Infrastructure Project Preparation Facility), the Stockholm International Water Institute (SIWI), the Climate Resilient Infrastructure Development Facility – UK Aid, and the Global Water Partnership-Southern Africa.













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

······COMPONENT I=

ROADMAP SUPPORTING REPORT

APPENDIX C

CORE SCENARIO: CONCEPT NOTES



Orange-Senqu River Commission (ORASECOM)

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Prepared by











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

COMPONENT II ROADMAP SUPPORTING REPORT APPENDIX C

CORE SCENARIO: CONCEPT NOTES

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TABLE OF REPORTS

Reports submitted	ORASECOM Report No.1
Inception Report Components I and II	ORASECOM 010/2018
Inception Report Components III and IV	ORASECOM 011/2018
Preparation of climate resilient water resources investment strategy & plan Component I	
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
Core Scenario Supporting Report: Ground Water Report Component I	ORASECOM 006/2019
Climate Change Report Component I	ORASECOM 007/2019
Review and assessment of existing policies, institutional arrangements and structures Component I	ORASECOM 008/2019
Optimized IWRMP Core Scenario economic approach Report Component I	ORASECOM 009/2019
Climate Resilient Water Resources Investment Plan Report Component I	ORASECOM 010/2019
System analysis Report Component I	ORASECOM 011/2019
Preparation of climate resilient water resources investment strategy & plan Component II	
Roadmap for IWRMP Operationalization Report Component II	ORASECOM 012/2019
Roadmap for IWRMP Operationalization Executive Summary	ORASECOM 012A/2019
Roadmap for IWRMP Operationalization: Appendix B Strategic Actions Concept Notes	ORASECOM 012B/2019
Roadmap for IWRMP Operationalization: Appendix C Core Scenario Concept Notes	ORASECOM 012C/2019
Climate Resilience Investment Plan (Brochure)	ORASECOM 012D/2019
Roadmap supporting Report: Strategic actions and TORs (Appendix A to Roadmap Report)	ORASECOM 013/2019
Lesotho-Botswana water transfer multipurpose transboundary project Component III Pre-feasibility Phase	
Pre-feasibility report Phase 1 Report Component III	ORASECOM 014/2019
Pre-feasibility report Phase 2 Report Component III	ORASECOM 015/2019
Lesotho-Botswana water transfer multipurpose transboundary project Component IV - Feasibility Phase	

¹ Note: For any report not prepared and completed within 2019 revert back for revised numbering.

Reports submitted	ORASECOM Report No.1
Feasibility Study Interim Report Component IV	ORASECOM 016/2019
Feasibility Study Report Component IV	ORASECOM 017/2019

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Cluster

1

Orange River Project + Noordoewer/Vioolsdrift Dam Cluster related development Projects

Development Options Core Scenario

The Basin Wide Investment Plan and the Core Scenatio development options comprises projects that had already been identified by the basin states, and which had been subject to various levels of planning. The projects were grouped into clusters based on the larger schemes or sub-systems of which they formed one of the key components. The following Clusters were concidered:

1) Orange River Project (ORP) + Noordoewer/Vioolsdrift Dam future improvements.

- 2)Lesotho Botswana Water Transfer Scheme.
- 3)Lesotho Lowlands Water Project
- 4)Integrated Vaal River System Intervention Options.
- 5)Caledon to Greater Bloemfontein transfer.
- 6)Greater Bloemfontein internal resource improvements
- 7) Gariep to Greater Bloemfontein Transfer.
- 8)Neckartal Dam Scheme
- 9)Integrated Water management actions.

Projects forming part of the Orange River Project Cluster.

1a) Utilise the Lower Level Storage in Vanderkloof Dam:

Vanderkloof Dam is an existing dam with its current minimum operating level (m.o.l.) at about 40 m above the riverbed level, which equates to a dead storage capacity of 1 015 million m3. This high m.o.l. was fixed by the outlet into the Vanderkloof main canal for irrigation supply purposes as well as the outlets used for hydro-power generation by Eskom. This m.o.l. could be lowered to reduce the dead storage capacity to 165 million m³. By utilizing that additional live storage, the historic firm yield from Vanderkloof Dam could be increased by 137 million m³/a. For that option, it would be required to install a pumping system with 15 m³/s capacity, in order to lift the water from the dam into the Vanderkloof Main Canal. The capital cost of such a modification is estimated at R180 million and the cost of operating the dam is estimated to increase by about R10 million per annum based on 2018 prices. RSA DWS will most probably install this option once Polihali Dam started to inundate water and the ORP system is moving into a dry cycle.

1b)Real-time monitoring and modelling Orange River:

This option already forms part of one of key strategiec action 2. Thus no need to provide details here.

1c) Building of the Verbeeldingskraal Dam upstream of the Gariep Dam

The Verbeeldingskraal Dam is a proposed new dam to be built upstream of the Gariep Dam in the Orange River and just upstream of the Aliwal North Town. The initial planning is to construct a 67m high dam (FSL) with a storage of 1 363 million m³. The dam will increase the net yield of the system by 200 million m³/a. The purpose of this dam is to augment the ORP to be able to supply the final agreed EWR or ecological Reserve, increasing urban and mining demands, as well as to restore the ORP water balance impacteddue to negative yield impacts on the ORP at the time when the Polihali Dam and its transfer system to support the IVRS, is in place. The construction cost of the dam is estimated at R4.0 billion and the annual operating cost at R12 million at 2018 prices.

1d) Orange River agreed EWRs (Ecological Reserve)

This project was selected as one of the Strategic actions (Strategic Action 1) and will not be discussed here.

1e)Noordoewer-Vioolsdrift Dam

The Noordoewer/Vioolsdrift Dam is a proposed new dam that will be built in the Lower Orange River across the border of South Africa and Namibia. This dam will be a combined Namibia/RSA project to increase the ORP yield, reduce the current high system operating requirements, and control EWR releases, mainly for the Orange River mouth. A feasibility study has already been completed and at the time of writing this report the decision on confirming the dam size had yet to be taken (between 400 and 2800 mil m3). A bridging study will soon start with the main aim to determine and agree on the size of the dam, bearing in mind the EWR impacts.

1f) Development of 12 000 ha for resource-poor farmers in the RSA from the ORP

These developments are almost completed and is driven by DWS RSA.

1 g) Polihali Dam (Lesotho Highlands Water Project (LHWP) Phase II and connecting tunnel to Katse Dam; using new operating rule The construction of this scheme started in 2023

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

1a

Utilize the lower-level storage in Vanderkloof Dam

Project Description

Vanderkloof Dam is an existing dam with its current minimum operating level (m.o.l.) at about 40 m above the riverbed level, which equates to a dead storage capacity of 1 015 million m³. This high m.o.l. was fixed by the outlet into the Vanderkloof main canal for irrigation supply purposes as well as the outlets used for hydro-power generation by Eskom. This m.o.l. could be lowered to reduce the dead storage capacity to 165 million m³. The impact of sedimentation on the reduced dead storage capacity in Vanderkloof Dam is minimal as most of the sediment is captured in Gariep Dam. The estimated reduction in storage in Vanderkloof Dam by 2040 due to sedimentation is only 40 million m³ (ORASECOM,2014). That would increase the live storage from the current 2 173 million m3 to 3 023 million m³, with the gross storage of the dam being 3 188 million m³.

By utilizing that additional live storage, the historic firm yield from Vanderkloof Dam could be increased by 137 million m³/a. For that option, it would be required to install a pumping system with 15 m³/s capacity, in order to lift the water from the dam into the Vanderkloof Main Canal. The capital cost of such a modification is estimated at \$9.47 million and the cost of operating the dam is estimated to increase by about \$0.53 million per annum based on 2018 prices.

This intervention would also result in a loss of power generated specifically during severe drought periods when the water level in Vanderkloof Dam drops below the current m.o.l. The quantification of the loss of generated power was complex and depended on the volume of water released to supply downstream water requirements, as well as the water level in the dam. The water level in the dam is further highly dependent on the operating rule used.

Based on the analysis and related results carried out in the Orange River Reconciliation Strategy Study (DWS, 2015) it was stated that the economic benefits or disbenefits on the effect of hydro-power generation for the option were considered too uncertain to be estimated as part of the Reconciliation Strategy Study, but it was not expected to be significant. The Reconciliation Strategy Study, therefore, recommended that during the pre-feasibility study of this component, Eskom should be part of the evaluation and recommendations relating to this component. Eskom is fully aware of this option and participated in the Orange Reconciliation Strategy Study.

This is a quick win project in that construction can commence almost immediately. In reality, this option will most probably only be implemented once a severe drought is experienced with expected low water levels in Vanderkloof Dam. It is thus foreseen that this option will only be put in place after the inundation and construction of Polihali Dam.

STRATEGIC ACTION					
Strategic action being supported	d		Specif	fic action	
LEAD AND SUPPORTING ORGAN	ISATIONS OR COUNT	RIES			
LEAD	RSA				
Supporting 1	Namibia				
Supporting 2					
Supporting 3					
Supporting 4					
DUDGET DECLUDENTALITS					
BUDGET REQUIREMENTS					
More than 1 billion USD	ili: LICD				
Between 50 million USD and 1 b			.,		
Between 1 million USD and 50 m	nillion USD		X		
Less than 1 million USD					
Revision Ver 1.0	Date	30 Oct 2023		Prepared by	HG Maré

INVESTMENT PLAN & L	ISFER PRO		MA WAI	EK	Project	1a
Util	lize the low	er-level stora	ge in Vand	derkloof Dam		'
1: Involvement of ORASECOM			2: Countr	ies involved		
High			Botswana			
Significant			Lesotho			
Medium			Namibia			Χ
Limited	Х		South Afri	ica		Χ
3: Priority		•	4: Impact	on Climate Resilien	ce	
High Priority	х		High			
Medium Priority			Medium			X
Low Priority			Small			
5:Type of Funding Required		•	6: Likley L	oan Period		
Normal Loan	х		1 to 5 Yea	rs		
Loan and Donor			6 to 20 Ye	ears		Χ
Donor Only			More than	n 20 Years		
7: Job Creation		•	8: Impact	on possible Conflic	cts Between Basin Sta	tes
Long term jobs	X		Positive			Х
During construction	X		Neutral			
None			Negative			
9: Socio economic influence			10: Influe	nce on local commu	ınities	
High			Positive			Х
			Nout			
Medium			Neutral			
Low	Х		Negative			
11: Yield contribution			12: Contri	ibution to alleviatin	g water scarcity	
Significant contribution			Significan	t contribution		
Moderate contribution	X		Modorat	contribution		Х
	X		iviouerate	CONTRIBUTION		^
Small contribution			Low contr	ribution		

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

1c

Building of the Verbeeldingskraal Dam upstream of the Gariep Dam

Project Description

The Verbeeldingskraal Dam is a proposed new dam to be built upstream of the Gariep Dam in the Orange River, located wholly in South Africa as recommended by the Orange Reconciliation Strategy study (DWS, 2015). There is however the possibility, if agreed with Lesotho, that the dam can be built higher which will then inundate some area in Lesotho. This will have the advantage of a larger storage capacity and increased yield available from the dam. There is a high possibility that Lesotho, Botswana and RSA will look at an intervention option to re-balance the ORP after the construction of Makhaleng Dam. Verbeeldingskraal Dam might then be a good option to conder to re-balance the ORP due to the impacts of both Polihali and Makhaleng dams.

The dam site is located in the Orange River just upstream of the Aliwal North Town. Only a low level reconaicance level study was carried out untilnow. Pre-feasibility and feasibility studies still need to take place. This should include to also look at possible other dam sites as well as the raising of Gariep Dam.

As recommended in the Orange Reconciliation Strategy study (if not inundating part of Lesotho) the dam will have a maximum wall height of 67 m at full supply level and storage of 1 363 million m³. The dam will increase the net yield of the system by 200 million m³/a. The purpose of this dam is to augment the ORP to be able to supply the final agreed EWR or ecological Reserve, increasing urban and mining demands, as well as to restore the ORP water balance impacted by some of the negative yield impacts on the ORP at the time when the Polihali Dam and its transfer system to support the IVRS, is in place. The water will be held back as long as possible before it is released to the Gariep Dam so that the high evaporation losses from the Gariep Dam can be reduced.

The construction cost of this dam is estimated at \$210.5 million and the annual operating cost at \$0.63 million/a at 2018 prices.

STRATEGIC	ACTION					
Strategic a	ction being supporte	ed		Specif	fic action	
Valuable in	put from SA3 & SA4	1				
LEAD AND	SUPPORTING ORGA	NISATIONS OR COUNT	RIES			
LEAD		RSA				
LEAD		KSA				
Supporting	1	Namibia				
Supporting		Possibly Le	esotho			
Supporting	3	Possibly B	otswana			
Supporting	4					
	EQUIREMENTS					
More than	1 billion USD					
Between 50	0 million USD and 1	billion USD		X		
Between 1	million USD and 50	million USD				
Less than 1	million USD					
Revision	Ver 1.0	Date	30 Oct 2023		Prepared by	HG Maré

Building o	f the Verbeeldingskra	al Dam upstream of the Gariep Da	am
1: Involvement of ORASECOM		2: Countries involved	
High		Botswana	X
		Lesotho	V
Significant			^
Medium	x	Namibia	Х
Limited		South Africa	Х
3: Priority		4: Impact on Climate Resilience	
High Priority	X	High	x
Medium Priority		Medium	
Low Priority		Small	
5:Type of Funding Required		6: Likley Loan Period	
	V		
Normal Loan	X	1 to 5 Years	
Loan and Donor	Х	6 to 20 Years	
Donor Only		More than 20 Years	Х
7: Job Creation		8: Impact on possible Conflicts Be	etween Basin States
Long term jobs	x	Positive	Х
During construction	Х	Neutral	
None		Negative	
9: Socio economic influence		10: Influence on local communitie	es
High		Positive	
Medium	X	Neutral	Х
Low		Negative	
11: Yield contribution		12: Contribution to alleviating wa	ter scarcity
Significant contribution	x	Significant contribution	x
Moderate contribution	X	Moderate contribution	x
			7
Small contribution		Small contribution	

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

1e

Noordoewer-Vioolsdrift Dam

Project Description

The Noordoewer/Vioolsdrift Dam is a proposed new dam that will be built in the Lower Orange River across the border of South Africa and Namibia. This dam will be a combined Namibia/RSA project to increase the ORP yield, reduce the current high system operating requirements, and control EWR releases, mainly for the Orange River mouth.

The final dam size is still to be determined and will be between 400 mil m3 and 2800mil m3.

A feasibility study was already completed. Due to EWR impacts agreement on the size of the dam could not be obtained. A bridging study will soon start with the main aim to determine and agree on the size of the dam, bearing in mind the EWR ipmacts. The dam will re-regulate water to the Orange River mouth and provide water for the EWRs, irrigators, mining and urban users downstream of the dam. This will reduce the load on the Gariep and the Vanderkloof dams.

It is expected that the Noordoewer/Vioolsdrift Dam yield may also be used to supply water to new additional irrigation developments in Namibia downstream of the dam, although it might still contribute to part of the ORP yield loss replacement. Two options for the NVD were thus considered.

- 1) One where the NVD is purely used as a yield replacement dam to restore the water balance, due to the negative impact of the Polihali Dam on the ORP yield.
- 2) Secondly when NVD is used as a new resource, using its net yield mainly to support existing and new users.

The capital cost of the dam is estimated at \$231.6 million and the annual operating cost at \$0.68 million/a although the costs will change and depend upon the final size of dam selected.

Specific a	action	
	Namibia	
	RSA	
X		
3	Prepared by	HG Maré
	X X	

	Noordoewer-	-Vioolsdrift Dam	,			
1: Involvement of ORASECOM		2: Countries involved				
High		Botswana				
Significant		Lesotho				
Medium	х	Namibia	X			
Limited		South Africa	X			
3: Priority	•	4: Impact on Climate Resilience				
High Priority	Х	High				
Medium Priority		Medium	X			
Low Priority		Small				
5:Type of Funding Required	•	6: Likley Loan Period				
Normal Loan	Х	1 to 5 Years				
Loan and Donor	Х	6 to 20 Years				
Donor Only		More than 20 Years	Х			
7: Job Creation	•	8: Impact on possible Conflicts Betwe	en Basin States			
Long term jobs	Х	Positive	X			
During construction	Х	Neutral				
None		Negative				
9: Socio economic influence	•	10: Influence on local communities	10: Influence on local communities			
High		Positive	Х			
Medium	х	Neutral	Х			
Low		Negative				
11: Yield contribution		12: Contribution to alleviating water s	carcity			
Significant contribution		Significant contribution				
Moderate contribution	х	Moderate contribution	Х			
Small contribution		Small contribution				

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Cluster

2

Lesotho Botswana Water Transfer Scheme

Development Options Core Scenario

The Basin Wide Investment Plan and the Core Scenatio development options comprises projects that had already been identified by the basin states, and which had been subject to various levels of planning. The projects were grouped into clusters based on the larger schemes or sub-systems of which they formed one of the key components. The following Clusters were conciderred:

1) Orange River Project (ORP) Scheme future improvements.

2)Lesotho Botswana Water Transfer Scheme.

- 3)Lesotho Lowlands Water Project
- 4)Integrated Vaal River System Intervention Options.
- 5)Caledon to Greater Bloemfontein transfer.
- 6)Greater Bloemfontein internal resource improvements
- 7)Gariep to Greater Bloemfontein Transfer.
- 8)Neckartal Dam Scheme
- 9)Integrated Water management actions.

Projects forming part of the Lesotho Botswana Water Transfer Scheme

2a) Future Dam on the Makhaleng River in Lesotho:

Based on the results from the Phase II Pre-feasibility Study (Feasibility study is already in process) the dam will have a wall height of about 126 m at full supply level and storage of 1 133 million m³ (3 MAR dam). The gross yield from a 3 MAR Makhaleng Dam at the N1A site was determined as 334 million m³/a. The capital cost of the dam is estimated at R4.1 billion for the Arch dam option.

2b) L-BWTS Conveyance System

The recommended pipeline route is the Central Route and was proposed to be a fully piped option that will transport raw water from a proposed weir located just downstream of the proposed dam site on the Makhaleng River in Lesotho, to a proposed outfall upstream of Nnywane Dam in Botswana over 688 km away. Following pre-feasibility level hydraulic analysis, steel pipe with diameters ranging from 2 200 mm to 1 100 mm are required. The capital cost of the pipeline is estimated at R48 billion and the annual operating and pumping cost at the full supply capacity of the transfer system at R838 million/a.

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

2a

	Proposed Full	ure Dam on t	he Makh	aleng Ri	ver			
Project Description								
Based on the results from the Pha	ase II Pre-feasibility Stud	dv (Feasibility stu	udv is alrea	dy in proce	ss) the dar	n will have	a wall heig	tht of
Based on the results from the Pha about 126 m at full supply level ar site was determined as 334 millio decrease in the downstream syste recommended that a separate Re Senqu catchments due to all the f gross yield from Makhaleng Dam developments within the RSA. T for the Arch dam option.	nd storage of 1 133 mill n m3/a. Utilizing this gr em yield by approximat concilliation Strategy ty uture developmenst su will be available for the	ion m3 (3 MAR of oss yield in full for telly 200 million response of study mustich as Makhalen, a L-BWT Scheme	dam). The g for the Lesc m³/a which st be initiate g, Polihali, l including c	gross yield on otho-Botsw would need ed to look a Lesotho Loo developme	from a 3 M ana transfe d to be cor at the inbal wland dam nts within L	AR Makha er system v mpensated lance in th s etc. It wa esotho an	leng Dam a would resul I for. It was e Upper Or as assumed d also poss	It the N1A It in a range and that the sible other
			Specific	ction				
Strategic action being supported	: inputs		Specific a	ction				
	: inputs		Specific a	ction				
Strategic action being supported	inputs		Specific a	ction				
			Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important		5	Specific a	ction				
Strategic action being supported		5	Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important LEAD AND SUPPORTING ORGANIS	SATIONS OR COUNTRIES	5	Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1	Lesotho Botswana	5	Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2	SATIONS OR COUNTRIES		Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3	Lesotho Botswana		Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3	Lesotho Botswana		Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3	Lesotho Botswana	5	Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4	Lesotho Botswana		Specific a	ction				
Strategic action being supported SA3 & SA 4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3	Lesotho Botswana	5	Specific a	ction				

INVESTMENT PLAN & TRAI	NSFER PROJECT	SWANA WATER	Project	2 a
	Proposed Future Da	m on the Makhaleng River		
1: Involvement of ORASECOM		2: Countries involved		
High		Botswana		Х
Significant		Lesotho		Х
Medium	Х	Namibia		Х
Limited		South Africa		X
3: Priority		4: Impact on Climate Resil	ience	
			lence	
High Priority	X	High		
Medium Priority		Medium		Х
Low Priority		Small		
		C. Lilday Laur Davie d		
5: Funding Required		6: Likley Loan Period		
Normal Loan	Х	1 to 5 Years		
Loan and Donor	Х	6 to 20 Years		
Donor Only		More than 20 Years		Х
7: Type of Job Creation		8: Impact on possible Cor	nflicts Between Basin State	s
Long term jobs	х	Positive		
During construction	Х	Neutral		
None		Negative		Х
None		Negative		^
9: Socio economic influence		10: Influence on local com	munities	
High		Positive		
Medium	x	Neutral		X
Low		Negative		
11: Yield contribution		12: Contribution to allevia	ting water scarcity	
Significant contribution		Significant contribution		
Moderate contribution	x	Moderate contribution		Х
	^			^
Small contribution		Small contribution		

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

2b

LBWT Conveyance System

Project Description

The recommended pipeline route is the Central Route and was proposed to be a fully piped option that will transport raw water from a proposed weir located just downstream of the proposed dam site on the Makhaleng River in Lesotho, to a proposed outfall upstream of Nnywane Dam in Botswana over 688 km away. Following pre-feasibility level hydraulic analysis, steel pipe with diameters ranging from 2 200 mm to 1 100 mm are required to deliver the required design flows ranging from 8 731 l/s to 2 735 l/s resulting in pipe velocities between 1.3 m/s and 2.9 m/s. As a result of the total dynamic head requirement at the discharge in Botswana, a combination of high lift pump stations, booster pump stations and break-pressure tanks will be required. The capital cost of the pipeline is estimated at \$2.53 billion and the annual operating and pumping cost at the full supply capacity of the transfer system at \$44.1 million/a. While dependent on the final agreed water allocations, it is currently foreseen that the dam and the pipeline will supply users in the different countries as follows:

- •Directly from dam: Lesotho for irrigation purposes 0 to 78 million m³/a, still depending on the final agreed water allocations and can be higher for specific options.
- •Dam via main transfer Pipeline: Lesotho urban ±22 million m³/a. Lesotho urban ±22 million m³/a Botswana urban 156 million m³/a.

STRATEGIC ACTION							
Strategic ac	tion being suppo	orted			Speci	fic action	
SA3 & SA 4	will provide impo	ortant inputs					
LEAD AND S	SUPPORTING OR	GANISATIONS	OR COUNT	RIES			
LEAD			Lesotho				
Supporting 1 Botswana							
Supporting	2		RSA				
Supporting	3						
Supporting	4						
RUDGET RE	QUIREMENTS						
	1 billion USD				Х		
	million USD and	l 1 billion USD					
Between 1	million USD and	50 million USE)				
Less than 1	million USD						
Revision	Ver 1.0		Date	30-Oct-23		Prepared by	HG Maré

INVESTMENT PLAN & I	LEGOTTIO	10 00	15007410	AVVAI	LN		
	L	BWT Co	nveyanc	e System	1	1	
1: Involvement of ORASECOM				2: Countri	es involved		
High				Botswana			Х
Significant				Lesotho			Х
Medium		х		Namibia			
Limited				South Afri	са		Х
3: Priority		•		4: Impact	on Climate Resilien	ce	
High Priority		X		High			X
Medium Priority				Medium			Х
Low Priority				Small			
5:Type of Funding Required		•		6: Likley Lo	oan Period		
Normal Loan		X		1 to 5 Year	rs		
Loan and Donor		X		6 to 20 Ye	ars		
Donor Only				More thar	a 20 Years		Х
7: Job Creation				8: Impact	on possible Conflic	ts Between Basin Stat	es
Long term jobs		X		Positive			
During construction		X		Neutral			Х
None				Negative			Х
9: Socio economic influence					nce on local commu	nities	
High		X		Positive			
Medium		X		Neutral			Х
Low				Negative			
11: Yield contribution					bution to alleviating	g water scarcity	l.
Significant contribution			1		contribution		X
Moderate contribution		X]		contribution		Х
Small contribution				Small cont	ribution		

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Cluster

3

Lesotho Lowlands Water Project

Development Options Core Scenario

The Basin Wide Investment Plan and the Core Scenatio development options comprises projects that had already been identified by the basin states, and which had been subject to various levels of planning. The projects were grouped into clusters based on the larger schemes or sub-systems of which they formed one of the key components. The following Clusters were conciderred:

1) Orange River Project (ORP) Scheme future improvements.

2)Lesotho Botswana Water Transfer Scheme.

3)Lesotho Lowlands Water Project

4)Integrated Vaal River System Intervention Options.

5)Caledon to Greater Bloemfontein transfer.

6)Greater Bloemfontein internal resource improvements

7)Gariep to Greater Bloemfontein Transfer.

8)Neckartal Dam Scheme

9)Integrated Water management actions.

Projects forming part of the Lesotho Lowlands Water Supply Schemes

3a) Future Hlotse Dam in Lesotho :

The Hlotse Dam is located in the Hlotse River, a tributary of the Mohokare/Caledon River with an expected total demand of 66.3 million m³/a. This demand includes the urban/rural (about 30%) and irrigation developments (about 70%).

3b) Future Ngoajane Dam in Lesotho

The Ngoajane Dam is located just north of Hlotse Dam in the Hololo River a tributary of the larger Mohokare/Caledon River. The dam will be used to mainly supply urban/rural water requirements (80%) and some irrigation with a total combined water requirement estimated at 29 million m³/a.

ORASECOM:CLIMATE RESILIENT WATER RESOURCES

	Propose	ed Future Da	m on the I	Hlotse Rive	r			
Project Description								
The Hlotse Dam is located in the l	Hlotse River, a tribu	utary of the Mo	hokare/Caled	don River with	an expect	ed total dem	and of 66	3.3 million
m ³ /a to be imposed on the dam In the Hlotse Dam has a gross stora and the Hlotse Dam has a gross stora and the Hlotse Dam has a gross stora and the Hlotse Dam has a gross yield 85 missing downstream us the eds to be released to mitigate a storage of the construction cost is estimated. The construction cost is estimated.	ige of 105 million million million m³/a). The lar sers when the Hlot the loss of the exist	n ³ and a wall he ge difference b se Dam is introc ting system yield	ight of about etween the n duced. This m d for the exis	51 m at full s let and gross y leans that sor ting downstre	upply level yield is due ne of the yi am users.	with an esting to the signiful generate	mated ne icant redu ed by the	t yield of uction in dam
STRATEGIC ACTION								
			Specif	ic action				
strategic action being supported			Specif	ic action				
Strategic action being supported			Specif	ic action				
Strategic action being supported SA3 & SA4 will provide important	input		Specif	ic action				
Strategic action being supported SA3 & SA4 will provide important	input	TRIES	Specif	ic action				
Strategic action being supported A3 & SA4 will provide important EAD AND SUPPORTING ORGANIS	input	TRIES	Specif	ic action				
Strategic action being supported SA3 & SA4 will provide important SA4 & SA4	SATIONS OR COUN	TRIES	Specif	ic action				
Strategic action being supported SA3 & SA4 will provide important	SATIONS OR COUN	TRIES	Specif	ic action				
STRATEGIC ACTION Strategic action being supported SA3 & SA4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3	SATIONS OR COUN	TRIES	Specif	ic action				
EAD Supporting 1 Supporting 2 Supporting 3	SATIONS OR COUN	TRIES	Specif	ic action				
Strategic action being supported SA3 & SA4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4	SATIONS OR COUN	TRIES	Specif	ic action				
EAD AND SUPPORTING ORGANIS LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4 SUPPORTING AND SUPPORTING ORGANIS SUPPORTING AND SUPPORTING ORGANIS SUPPORTING AND SUPPORTING ORGANIS	SATIONS OR COUN	TRIES	Specif	ic action				
Strategic action being supported SA3 & SA4 will provide important LEAD AND SUPPORTING ORGANIS LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4	SATIONS OR COUN Lesotho	TRIES	Specif	ic action				

05 August 2024

INVESTMENT PLAN & L	ISFER PR		ISWAN	AWAI	EK	Project	3a
	Propose	d Future	Dam on	the Hlo	tse River		1
1: Involvement of ORASECOM				2: Countri	es involved		
High				Botswana			
Significant				Lesotho			X
				Nama ila in			V
Medium				Namibia			Х
Limited		Х		South Afri	ca		X
3: Priority		`		4: Impact	on Climate Resilia	nce	
High Priority		Х		High			
Medium Priority			1	Medium			Х
Low Priority				Small			
5:Type of Funding Required				6: Likley Lo	oan Period		
Normal Loan		Х		1 to 5 Year	rs		
Loan and Donor		Х		6 to 20 Ye	ars		Χ
Donor Only				More than	n 20 Years		
7: Job Creation				Q: Impact	on nossible Confl	icts Between Basin St	tates
					on possible conn	icts between basin st	lates
Long term jobs		Х		Positive			
During construction		Х		Neutral			Х
None				Negative			Х
9: Socio economic influence				10: Influer	nce on local comm	nunities	
High				Positive			
		V					v
Medium		Х		Neutral			Х
Low				Negative			
11: Yield contribution		•		12: Contri	bution to alleviati	ng water scarcity	
Significant contribution				Significant	contribution		
Moderate contribution		X		Moderate	contribution		Х
Little or no contribution				Little or no	contribution		

	TRANSFER PROJEC	<u>T</u>				
	Proposed Future Ng	goajane Dam o	n the Hololo F	River		
Project Description						
The Ngoajane Dam is located just will be used to mainly supply urbestimated at 29 million m³/a, by 2 level. The net yield of the system Dam, the large difference in the glownstream users. The construction cost is estimate.	an/rural water requiremen 2050. The gross storage of t is estimated as 10.6 millior gross and net yield is a resu	its (80%) and some the dam is 36 million m ³ /a, with a gros It of the significant	e irrigation with a on m ³ /a with a wa s yield of 30.8 mil reduction of exis	total combined Il height of 47.5 ion m ³ /a. As in ting system yield	water requirer m at the full s the case of the	ment upply
STRATEGIC ACTION						
Strategic action being supported		Spec	ific action			
Strategic action being supported		Spec	ific action			
Strategic action being supported		Spec	ific action			
Strategic action being supported		Spec	ific action			
Strategic action being supported SA3 & SA4 will provide important	input	Spec	ific action			
Strategic action being supported SA3 & SA4 will provide important	SATIONS OR COUNTRIES	Spec	ific action			
Strategic action being supported SA3 & SA4 will provide important	input	Spec	ific action			
Strategic action being supported SA3 & SA4 will provide important SA4 &	SATIONS OR COUNTRIES	Spec	ific action			
Strategic action being supported SA3 & SA4 will provide important SA4 wi	SATIONS OR COUNTRIES	Spec	ific action			
Strategic action being supported SA3 & SA4 will provide important SA4 & SA4	SATIONS OR COUNTRIES	Spec	ific action			
EAD Supporting 1 Supporting 2 Supporting 3	SATIONS OR COUNTRIES	Spec	ific action			
EAD Supporting 1 Supporting 2 Supporting 3	SATIONS OR COUNTRIES	Spec	ific action			
STRATEGIC ACTION Strategic action being supported SA3 & SA4 will provide important LEAD AND SUPPORTING ORGANI EAD Supporting 1 Supporting 2 Supporting 3 Supporting 4	SATIONS OR COUNTRIES	Spec	ific action			
Extrategic action being supported SA3 & SA4 will provide important SA4 will provide important SA4 SA4 will provide important SA4 will p	SATIONS OR COUNTRIES		ific action			
EAD AND SUPPORTING ORGANI: LEAD AND SUPPORTING ORGANI: LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4 SUPPORTING ORGANI: SUPPORTI	SATIONS OR COUNTRIES Lesotho	Spec	ific action			
EAD AND SUPPORTING ORGANI: EAD Supporting 1 Eupporting 2 Eupporting 3 Eupporting 4 EUDGET REQUIREMENTS	SATIONS OR COUNTRIES Lesotho		ific action			

INVESTIVIENT PLAN 6	LESOTHO TO BOT	SWANA WATER	Project 3b
Pı	roposed Future Ngoaj	ane Dam on the Hololo River	1 1
1: Involvement of ORASECOM		2: Countries involved	
High		Botswana	
Significant		Lesotho	х
Medium		Namibia	X
Limited	X	South Africa	X
3: Priority		4: Inpact on Climate Resiliar	nce
High Priority		High	
Medium Priority	Х	Medium	
Low Priority		Smal	X
5:Type of Funding Required		6: Likley Loan Period	
Normal Loan	x	1 to 5 Years	
Loan and Donor	X	6 to 20 Years	Х
Donor Only		More than 20 Years	
7: Type of Job Creation		8: Impact on possible Confl	icts Between Basin States
Long term jobs	Х	Positive	
During construction	Х	Neutral	Х
None		Negative	Х
9: Socio economic influence		10: Influence on local comm	unities
High		Positive	
Medium	Х	Neutral	Х
Low		Negative	
11: Yield contribution		12: Contribution to alleviati	ng water scarcity
Significant contribution		Significant contribution	
Moderate contribution		Moderate contribution	
Small contribition	X	Small	X

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Cluster

4

Integrated Vaal River System Intervention Options

Development Options Core Scenario

The Basin Wide Investment Plan and the Core Scenatio development options comprises projects that had already been identified by the basin states, and which had been subject to various levels of planning. The projects were grouped into clusters based on the larger schemes or sub-systems of which they formed one of the key components. The following Clusters were conciderred:

- 1) Orange River Project (ORP) Scheme future improvements.
- 2)Lesotho Botswana Water Transfer Scheme.
- 3)Lesotho Lowlands Water Project

4)Integrated Vaal River System Intervention Options.

- 5)Caledon to Greater Bloemfontein transfer.
- 6) Greater Bloemfontein internal resource improvements
- 7)Gariep to Greater Bloemfontein Transfer.
- 8)Neckartal Dam Scheme
- 9)Integrated Water management actions.

Projects forming part of the Integrated Vaal River System Intervention Options.

4a) Utilise Crocoldile River Return flows: The Vaal River System Reconciliation Strategy (DWAF, 2009) identified the re-use of return flows in the Upper Crocodile (West) River as one of the important intervention options for the IVRS. By re-using these return flows, the demand of the Northern Gauteng area, of which most is supplied from the IVRS, will be reduced.

4b)The proposed further phases of the Thukela River Water Transfer: The proposed further phases of the Thukela River Water
Transfer comprise two new dams at Jana on the main stem of the Thukela River and the Mielietuin Dam on the Bushmans River (a
tributary of the Thukela River) with new pipelines and pump stations linking these dams to the existing Thukela Water Transfer Scheme.

4c) The desalination and re-use of acid mine drainage

The

desalination and re-use of acid mine drainage (AMD) were listed as one of the most important intervention options from the Vaal River System Reconciliation Strategy (DWAF, 2009) as it significantly improves both water quality and water quantity. The implementation of this intervention option is forming part of the continuation of the IVRS Reconciliation Strategy Phase 2. In the IVRS, the desalination of AMD will ensure a reduction in the release of water from the Vaal Dam for dilution purposes; it will also reduce demand through reclamation and direct re-use, as well as improve the salinity levels in the Vaal River system, and the Orange-Senqu River Basin, by eliminating or substantially reducing the discharge of saline AMD.

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

4a

Utilise Crocoldile River Return flows

Project Description

The Vaal River System Reconciliation Strategy (DWAF, 2009) identified the re-use of return flows in the Upper Crocodile (West) River as one of the important intervention options for the IVRS. These return flows are generated from the Vaal River water, transferred over the water shed from the Vaal River Catchment into the Upper Crocodile River Catchment by Rand Water, to supply water to urban and industrial areas within the Northern Gauteng Province. By re-using these return flows, the demand of the Northern Gauteng area, of which most is supplied from the IVRS, will be reduced.

This strategy was further taken up in the City of Tshwane Water Resource Masterplan (Tshwane, 2014). The City of Tshwane Metropolitan Municipality (MM) is planning a re-use plant at Rietvlei Dam with a capacity of 100 Ml/d. Water transferred from the Olifants WWTW will also be treated at the Rietvlei Plant. The second re-use plant of 50 Ml/d is planned at the Roodeplaat Dam, utilizing water from the Zeekoegat WWTW extension, which is flowing into the Roodeplaat Dam. These two treatment plants will further treat the Tshwane return flows to a potable standard to re-use that water in the Tshwane Municipality. Key information on the re-use schemes includes the following:

- •The potential savings in Tshwane's demand supplied from the Vaal River System is estimated to be in the order of 56 million m³/a, as a result of the re-use;
- •The capital cost to implement this further treatment capacity is estimated at \$77.6 million, at the 2018 price level;
- •The annual operation costs are estimated to be \$6.68 million/a (2018); and
- •This intervention option is expected to be in place by 2025

STRATEGI	C ACTION								
Strategic a	action bein	g supporte	ed				Specif	ic action	
SA2 Can p	rovide use	full input							
LEAD AND	SUPPORT	ING ORGAI	VISATIONS	OR COUN	TRIES				
LEAD				RSA					
Supportin	g 1								
Supportin	g 2								
Supportin	g 3								
Supportin	ıg 4								
BUDGET F	REQUIREMI	NTS							
More tha	n 1 billion l	JSD							
Between !	50 million l	JSD and 1	oillion USD				Χ		
Between :	1 million U	SD and 50	million USD)					
Less than	1 million U	SD							
Revision	Ver	1.0		Date	30 Oc	t 2023		Prepared by	HG Maré

INVESTMENT PLAN & L TRAN	SFER PROJECT		Project 4a
	Utilise Crocoldi	e River Return flows	, ,
1: Involvement of ORASECOM		2: Countries involved	
High		Botswana	
		Lesotho	
Significant		Lesotho	
Medium		Namibia	
Limited	Х	South Africa	Х
3: Priority		4: Impact on Climate Resilience	
High Priority	Х	High	
Medium Priority		Medium	Х
Low Priority		Low	
5:Type of Funding Required		6: Likley Loan Period	
		o. Likiey Loan Period	
Normal Loan	Х	1 to 5 Years	
Loan and Donor	Х	6 to 20 Years	
Donor Only		More than 20 Years	
7: Job Creation		8: Impact on possible Conflicts Be	tween Basin States
Long term jobs	Х	Positive	Х
During construction	Х	Neutral	
None		Negative	
9: Socio economic influence		10: Influence on local communitie	S
High		Positive	Х
Medium		Neutral	
low	Х	Negativo	
Low	^	Negative	
11: Yield contribution		12: Contribution to alleviating wat	ter scarcity
Significant contribution		Significant contribution	
Moderate contribution	x	Moderate contribution	X
			,
Low contribution		Low contribution	

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

4b

The proposed further phases of the Thukela River Water Transfer.

Project Description

The proposed further phases of the Thukela River Water Transfer comprise two new dams at Jana on the main stem of the Thukela River and the Mielietuin Dam on the Bushmans River (a tributary of the Thukela River) with new pipelines and pump stations linking these dams to the existing Thukela Water Transfer Scheme.

The proposed further phases will increase the yield of the Vaal River system, by approximately 522 million m3/a. This represents the net yield from the two dams after provisions were made for required yield loss mitigation releases for existing downstream users.

Key information on this water transfer scheme includes:

- •The Jana Dam with the net yield of 396 million m3/a and the Mielietuin Dam with the net yield of 126 million m³/a
- •The Jana Dam with a gross storage of 2 652 million m³ and the Mielietuin Dam with a gross storage of 467 million m³;
- •The dam wall height at full supply level for the Jana Dam is 186 m and for the Mielietuin Dam is 95 m;
- •The total pumping head is high at about 580 m, requiring substantial electrical energy;
- •The construction cost for the total scheme is estimated at \$1 184 million and the annual operations cost at \$9.1 million/a, at the 2018 development level; and
- Construction of the further phases is scheduled to commence in 2032 and it is estimated to be completed by 2036

STRATEGI	C ACTION					
Strategic a	action being support	ted		Specif	ic action	
LEAD AND	SUPPORTING ORGA	ANISATIONS OR COUNT	TRIES			
LEAD		RSA				
Supportin	-					
Supportin	-					
Supportin	-					
Supportin	g 4					
	REQUIREMENTS					
	n 1 billion USD	Lully 1100		.,		
	50 million USD and 1			X		
	1 million USD and 50	million USD				
Less than	1 million USD					
Revision	Ver 1.0	Date	30 Oct 2023		Prepared by	HG Maré

INVESTMENT PLAN &	LESOTHO TO I	BOTSWAN	A WATER	Project	4b
The propo	sed further pha	ses of the T	hukela River Water	Transfer.	
1: Involvement of ORASECOM			2: Countries involved		
High			Botswana		
Significant			Lesotho		
Medium			Namibia		
Limited	Х		South Africa		Х
3: Priority			4: Impact on Climate Res	silience	
High Priority			High		X
Medium Priority	Х		Medium		
Low Priority			Low		
5:Type of Funding Required			6: Likley Loan Period		
Normal Loan	X		1 to 5 Years		
Loan and Donor	X		6 to 20 Years		
Donor Only			More than 20 Years		
7: Job Creation			8: Impact on possible Co	onflicts Between Basin Stat	es
Long term jobs	Х		Positive		
During construction	Х		Neutral		Х
None			Negative		
9: Socio economic influence			10: Influence on local co	mmunities	
High			Positive		
Medium	Х		Neutral		Х
Low			Negative		
11: Yield contribution			12: Contribution to allev	iating water scarcity	
Significant contribution	Х		Significant contribution		Х
Moderate contribution			Moderate contribution		
Low contribution			Low contribution		

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

4c

The desalination and re-use of acid mine drainage

Project Description

The desalination and re-use of acid mine drainage (AMD) were listed as one of the most important intervention options from the Vaal River System Reconciliation Strategy (DWAF, 2009) as it significantly improves both water quality and water quantity. The implementation of this intervention option is forming part of the continuation of the IVRS Reconciliation Strategy Phase 2 (DWS, 2018). In the IVRS, the desalination of AMD will ensure a reduction in the release of water from the Vaal Dam for dilution purposes; it will also reduce demand through reclamation and direct re-use, as well as improve the salinity levels in the Vaal River system, and the Orange-Senqu River Basin, by eliminating or substantially reducing the discharge of saline AMD.

The AMD mainly occurs in the Middle Vaal catchment downstream of the Vaal Dam. The Short-Term Intervention (STI) of the project is currently maintained. The STI consists of pumping and treatment infrastructure which reduces the concentration of metals and neutralizes the acidity before releasing the water into the natural water courses.

Initial estimations indicated a positive quantity contribution to the IVRS of 500 million m3/a. Current indications are that this might be less. RSA DWS is in the process to carry out further detailed studies in this regard, and a final updated quantity contribution is thus not yet available.

The pumping and treatment processes introduced through the immediate and short-term solution only neutralize AMD's high acidity and address the metals (notably iron) carried in the water. In the medium, to long term, the option of neutralizing will not be sustainable, as it could result in excessive salt loads in the surface water of the receiving catchments. For the long-term, the desalination and selling the pumped mine water to users should be investigated. During 2014/15 the proposed long-term solution for AMD was put on hold due to further requested investigations. In April 2019 a detailed dilution assessment was undertaken as part of the investigation for the pre-feasibility study on the long-term solutions for the AMD problem. The results from the investigation recommended a full recalibration of the Vaal Barrage catchment hydrology and water quality modules before proceeding with the implementation of the Long-term Solution. The water quality recalibration study has not yet been initiated and details on what the Long-term solution would entail is thus not yet available.

The long-term solution work was estimated to start in 2021 with full implementation by 2025. These dates will change depending on the findings from the proposed recalibration study which has not yet started.

Initial estimations indicated a positive quantity contribution to the IVRS of 500 million m³/a. Current indications are that this might be less. RSA DWS is in the process to carry out further detailed studies in this regard, and a final updated quantity contribution is thus not yet available. This is an expensive intervention option with total capital expenditure at 2018 price levels estimated at \$0.463 billion and operational costs at \$68 million/a

STRATEGI	IC ACTION					
Strategic	action being supported			Specif	fic action	
SA 2 will p	provide usefull input					
LEAD AND	SUPPORTING ORGANISATION	IS OR COUN	TRIES			
					204	
LEAD					RSA	
Supportin	ng 1					
Supportin	=					
Supportin	_					
Supportin	-					
BUDGET F	REQUIREMENTS					
More tha	n 1 billion USD					
Between	50 million USD and 1 billion US	SD		Х		
Between	1 million USD and 50 million U	SD				
Less than	1 million USD					
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Revision	Ver 1.0	Date	30 Oct 2023	1	Prepared by	HG Maré

05 August 2024

ORASECOM:CLIMA INVESTMENT PLAN 8					Project	4c
<u> </u>	The desalir	nation and re	e-use of acid m	nine drainage		
1: Involvement of ORASECOM			2: Countri	ies involved		
High			Botswana			
Significant			Lesotho			
Medium			Namibia			
Limited		X	South Afri			Х
3: Priority			4: Impact	on Climate Resilie	ence	
High Priority		Х	High			
Medium Priority			Medium			Х
Low Priority			Low			
5:Type of Funding Required			6: Likley L	oan Period		
Normal Loan		Х	1 to 5 Yea	rs		
Loan and Donor		Х	6 to 20 Ye	ars		
Donor Only			More than	n 20 Years		
7: Job Creation			8: Impact	on possible Conf	licts Between Basin Stat	es
Long term jobs		Х	Positive			Х
During construction		Х	Neutral			
None			Negative			
9: Socio economic influence			10: Influe	nce on local comm	nunities	
High			Positive			Х
Medium			Neutral			Х
Low		х	Negative			
11: Yield contribution				ibution to alleviati	ing water scarcity	
		V			States scarcity	V
Significant contribution		X		t contribution		Х
Moderate contribution			Moderate	contribution		
Low contribution			Low contr	ibution		
						1,5
Revision Ver 1.0	Date	30 C	ct 2023	Prepared by		HG Mar

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Cluster

5

Caledon to Greater Bloemfontein transfer Cluster

Development Options Core Scenario

The Basin Wide Investment Plan and the Core Scenatio development options comprises projects that had already been identified by the basin states, and which had been subject to various levels of planning. The projects were grouped into clusters based on the larger schemes or sub-systems of which they formed one of the key components. The following Clusters were conciderred:

- 1) Orange River Project (ORP) Scheme future improvements.
- 2)Lesotho Botswana Water Transfer Scheme.
- 3)Lesotho Lowlands Water Project
- 4)Integrated Vaal River System Intervention Options.

5)Caledon to Greater Bloemfontein transfer.

- 6)Greater Bloemfontein internal resource improvements
- 7)Gariep to Greater Bloemfontein Transfer.
- 8)Neckartal Dam Scheme
- 9)Integrated Water management actions.

Projects forming part of the Caledon to Bloemfontein transfers

5a) Increase Tienfontein Pumping capacity to 3.87 m³/s :

This was already completed .

5b) Tienfontein pump station capacity increase to 7 m³/s

This phased project is primarily a regional project augmenting the water supply to the City of Mangaung (Bloemfontein) but may have on-route offtakes. The Tienfontein infrastructure belongs to DWS RSA. There is some possibility of future links with Lesotho via compensation releases from Lesotho Lowland dams and or support from the LHWP.

		TRANS	SFER P	ROJECT						ject	5b
		Tienfo	ontein p	oump stat	ion cap	acity inc	rease to	7 m³/s			
	escription ed project is prim						uh - C'h - C N	1	/DI	1 - 1 - 1 - 1 - 1 - 1	
compensa oThis opti oThe capi	offtakes. The Tie ation releases fro ion is expected to ital cost for this o trational cost is es	om Lesotho Low o increase the sy option is estimat	land dam /stem yie ed at \$!	ns and or sup ld by 13.7 m 9.5 million (2	oport fron illion m	n the LHW		ility of futu	re links wi	th Lesotho	via
	IC ACTION										
Strategic	action being supp	ported				Specific a	action				
Strategic		ported				Specific a	action				
Strategic	action being supp	ported				Specific a	action				
Strategic a SA3 possi	action being suppible inputs					Specific a	action				
Strategic a SA3 possi	action being supp		OR COUN	NTRIES		Specific a	action				
Strategic a SA3 possi	action being suppible inputs	RGANISATIONS		NTRIES		Specific a	action				
Strategic : SA3 possi	action being suppible inputs	RGANISATIONS	OR COUN	NTRIES		Specific a	action				
Strategic (SA3 possi LEAD AND	action being supplible inputs D SUPPORTING O	RGANISATIONS		NTRIES		Specific a	action				
Strategic of SA3 possi LEAD AND LEAD LEAD	action being supplible inputs D SUPPORTING OF	RGANISATIONS		NTRIES		Specific a	action				
Strategic : SA3 possi LEAD ANE LEAD Supportin Supportin Supportin Supportin	oction being supplible inputs D SUPPORTING OF SUPPORTING SUPPORTIN	RGANISATIONS		NTRIES		Specific a	action				
Strategic : SA3 possi EAD ANE EAD Supportin Supportin Supportin	oction being supplible inputs D SUPPORTING OF SUPPORTING SUPPORTIN	RGANISATIONS		NTRIES		Specific a	action				
Strategic : SA3 possi LEAD ANE LEAD Supportin Supportin Supportin Supportin	oction being supplible inputs D SUPPORTING OF SUPPORTING SUPPORTIN	RGANISATIONS		NTRIES		Specific a	action				
Strategic : SA3 possi LEAD ANE LEAD Supportin Supportin Supportin	D SUPPORTING OF	RGANISATIONS		NTRIES		Specific a	action				
ELEAD ANE LEAD Supportin Supportin Supportin Supportin	D SUPPORTING OF	RGANISATIONS		VTRIES		Specific a	action				
EAD ANE LEAD ANE LEAD Supportin Supportin Supportin Supportin More than	D SUPPORTING OF SUPPORT	RGANISATIONS		NTRIES		Specific a	action				
EAD AND EAD Supporting	D SUPPORTING OF	RGANISATIONS	RSA	NTRIES		Specific a	action				

05 August 2024

INVESTMENT PLAN & I TRAN	NSFER PROJECT		Project 5b			
Tien	fontein pump statio	on capacity increase to 7 m ³ /s				
1: Involvement of ORASECOM	L: Involvement of ORASECOM		2: Countries involved			
High		Botswana				
Significant		Lesotho	X			
Medium		Namibia				
Limited	Х	South Africa	Х			
3: Priority		4: Impact on Climate Resilience				
High Priority		High				
Medium Priority	X	Medium	X			
Low Priority		Low				
5:Type of Funding Required		6: Likley Loan Period				
Normal Loan	X	1 to 5 Years				
Loan and Donor	Х	6 to 20 Years				
Donor Only		More than 20 Years				
7: Job Creation		8: Impact on possible Conflicts Be	tween Basin States			
Long term jobs		Positive				
During construction	X	Neutral	X			
None		Negative				
: Socio economic influence		10: Influence on local communities	10: Influence on local communities			
High		Positive				
Medium	X	Neutral	x			
ivieulum	^	Neutral	^			
Low		Negative				
11: Yield contribution	•	12: Contribution to alleviating wat	er scarcity			
Significant contribution		Significant contribution				
Moderate contribution	X	Moderate contribution	x			
INIOUELATE CONTINUITION	^	ivioderate contribution	Λ			
Low contribution		Low contribution				

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Cluster

6

Greater Bloemfontein Internal Resource Improvements

Development Options Core Scenario

The Basin Wide Investment Plan and the Core Scenatio development options comprises projects that had already been identified by the basin states, and which had been subject to various levels of planning. The projects were grouped into clusters based on the larger schemes or sub-systems of which they formed one of the key components. The following Clusters were conciderred:

- 1) Orange River Project (ORP) Scheme future improvements.
- 2)Lesotho Botswana Water Transfer Scheme.
- 3)Lesotho Lowlands Water Project
- 4)Integrated Vaal River System Intervention Options.
- 5)Caledon to Greater Bloemfontein transfer.

6)Greater Bloemfontein internal resource improvements

- 7) Gariep to Greater Bloemfontein Transfer.
- 8)Neckartal Dam Scheme
- 9)Integrated Water management actions.

Projects forming part of the Greater Bloemfontein Internal Resource Improvements

6a)Raise Mockes Dam:

This component is included mainly to capture and store return flows for indirect re-use purposes, and to minimise spills from the dam. The yield benefit from the raising of the Mockes Dam on its own is very small.

6b)Increase the Maselspoort WTW capacity:

Maselspoort WTW capacity increase to 130 MI/d to be able to accommodate the increased volumes due to indirect re-use. This will include the upgrading of the plant to treat the lower water quality from the re-use return flows, to potable standards.

6c)Indirect re-use of 16 million m³/a from the Bloemspruit WWTW to be captured in Mockes Dam.

6d) Direct re-use of 11 million m³/a to be fed directly into the water supply system at the Maselspoort WTW downstream of the Mockes Dam

Comined System:

The total system yield is increased by 30 million m³/a due to the combination of all improvements

The total capital cost for all components combined is \$86.2 million

The combined operational cost for all components was estimated at \$ 9.2 million/a

	VESTMI	ENT PLA	N & LESOTH	O TO BOTSWA	NA WATER	Proj	ect	6a
				Raise Mock	es Dam			
Project De		-ldd:		store return flows fo		 	:11= f====	Ala alama
		g supported	1		Specific action			
		z supportec	1		Specific action			
		g supported	1		Specific action			
Strategic a	ction being				Specific action			
Strategic a	ction being		ISATIONS OR COUN	ITRIES	Specific action			
Strategic a	ction being		ISATIONS OR COUN	ITRIES	Specific action			
Strategic a	ction being			ITRIES	Specific action			
LEAD AND LEAD Supporting	SUPPORTI		ISATIONS OR COUN	ITRIES	Specific action			
LEAD AND LEAD Supporting	SUPPORTI		ISATIONS OR COUN	ITRIES	Specific action			
LEAD AND LEAD Supporting Supporting Supporting	SUPPORTI		ISATIONS OR COUN	ITRIES	Specific action			
LEAD AND LEAD Supporting Supporting Supporting	SUPPORTI		ISATIONS OR COUN	ITRIES	Specific action			
LEAD AND LEAD Supporting	SUPPORTI		ISATIONS OR COUN	ITRIES	Specific action			
LEAD AND LEAD Supporting Supporting Supporting	SUPPORTII	NG ORGAN	ISATIONS OR COUN	ITRIES	Specific action			
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LEAD AND LEAD Supporting Supporting Supporting Supporting More than Between 5	SUPPORTII 3 1 3 2 3 3 4 EQUIREME 1 billion U 0 million U	NG ORGAN NTS SD SD and 1 bi	RSA RISATIONS OR COUN	ITRIES	Specific action			
LEAD AND LEAD Supporting Supporting Supporting Supporting More than Between 5 Between 1	SUPPORTII 3 1 3 2 3 3 4 EQUIREME 1 billion U 0 million U million US	NG ORGAN NTS SD SD and 1 bi D and 50 m	RSA RISATIONS OR COUN	ITRIES	Specific action			
LEAD AND LEAD Supporting Supporting Supporting Supporting More than Between 5	SUPPORTII 3 1 3 2 3 3 4 EQUIREME 1 billion U 0 million U	NG ORGAN NTS SD SD and 1 bi D and 50 m	RSA RISATIONS OR COUN	ITRIES	Specific action			

INVESTMENT PLAN & I	<u>ESOTHO TO BOT</u>	SWANA WATER P	roject 6a					
Raise Mockes Dam								
Involvement of ORASECOM		2: Countries involved						
High		Botswana						
Significant		Lesotho						
Medium		Namibia						
Limited	Х	South Africa	X					
3: Priority		4: Impact on Climate Resilience						
High Priority	Х	High						
Medium Priority		Medium	X					
Low Priority		Low						
5:Type of Funding Required		6: Likley Loan Period						
Normal Loan	Х	1 to 5 Years						
Loan and Donor	Х	6 to 20 Years						
Donor Only		More than 20 Years						
7: Job Creation		8: Impact on possible Conflicts Between	en Basin States					
Long term jobs		Positive						
During construction	X	Neutral	X					
None		Negative						
9: Socio economic influence		10: Influence on local communities						
High		Positive						
Medium	Х	Neutral	X					
LOW		Negative						
11: Yield contribution		12: Contribution to alleviating water	scarcity					
Significant contribution		Significant contribution						
Moderate contribution	Х	Moderate contribution						
ow contribution		Low contribution	Х					

Roadmap: Appendix C 05 August 2024

ORASECOM:CLIMATE RESILIENT WATER RESOURCES **Project** 6b **INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER** TRANSFER PROJECT Increase the Maselspoort WTW capacity: **Project Description** Maselspoort WTW capacity increase to 130 MI/d to be able to accommodate the increased volumes due to indirect re-use. This will include the upgrading of the plant to treat the lower water quality from the re-use return flows, to potable standards . STRATEGIC ACTION Specific action Strategic action being supported LEAD AND SUPPORTING ORGANISATIONS OR COUNTRIES RSA LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4 BUDGET REQUIREMENTS More than 1 billion USD Between 50 million USD and 1 billion USD Between 1 million USD and 50 million USD

Prepared by

HG Maré

30 Oct 2023

Less than 1 million USD

Ver 1.0

Date

Revision

TRAN	SFER PROJE	СТ					
	Increase the	Maselspoort WTW	capacity :				
1: Involvement of ORASECOM		2: Count	tries involved				
High		Botswan	na				
Significant		Lesotho					
Medium		Namibia					
Limited	Х	South Af	frica	X			
3: Priority		4: Impac	ct on Climate Resilience				
High Priority	Х	High					
Medium Priority		Medium	1	х			
Low Priority		Low					
5:Type of Funding Required		6: Likley	Loan Period				
Normal Loan	Х	1 to 5 Ye	ears				
Loan and Donor	Х	6 to 20 Y	ears ears				
Donor Only		More the	an 20 Years				
7: Job Creation		8: Impac	ct on possible Conflicts Betw	veen Basin States			
			et on possible connects betw	See Busin States			
Long term jobs		Positive					
During construction	Х	Neutral		Х			
None		Negative					
9: Socio economic influence		10: Influ	10: Influence on local communities				
High		Positive					
Medium	Х	Neutral		X			
				,			
Low		Negative					
11: Yield contribution		12: Cont	ribution to alleviating water	scarcity			
Significant contribution		Significa	nt contribution				
Moderate contribution	Х	Moderat	te contribution	Х			
Low contribution		Low con	tribution				
		20.1. 3011					

	VESTIVIENT	PLAN & LI	ESOTHC	TO BOTS	SWANA W	/ATER	- 110	ject	6c
				Indir	ect re-use				
Project De	scription								
Indirect re	-use of 16 millio	on m³/a from th	e Bloemsp	ruit WWTW to	be captured	in Mockes Dam			
STRATEGIA	CACTION								
STRATEGIC Strategic a		ported			Speci	fic action			
	C ACTION ction being sup	ported			Speci	fic action			
		ported			Speci	fic action			
		ported			Speci	fic action			
Strategic a			OR COUN	TRIES	Speci	fic action			
Strategic a	ction being sup			TRIES	Speci	fic action			
Strategic a	ction being sup		G OR COUNT	TRIES	Speci	fic action			
LEAD AND LEAD Supporting	SUPPORTING O			TRIES	Speci	fic action			
LEAD AND LEAD Supporting Supporting	SUPPORTING O			TRIES	Speci	fic action			
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LEAD AND LEAD Supporting Supporting	SUPPORTING O			TRIES	Speci	fic action			
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LEAD AND LEAD Supporting Supporting Supporting Supporting	SUPPORTING O			TRIES	Speci	fic action			
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LEAD AND LEAD Supporting Supporting Supporting Supporting Supporting BUDGET R More than Between 5 Between 1	SUPPORTING O 3 1 3 2 3 3 4 EQUIREMENTS 1 billion USD	organisations	RSA	TRIES	Speci	fic action			

HIVESTIVIENT PLAN &	LESUTHO TO BOT	SWANA WATER	oject 6c
	Indi	rect re-use	
1: Involvement of ORASECOM		2: Countries involved	
High		Botswana	
Significant		Lesotho	
Medium		Namibia	
Limited	Х	South Africa	Х
3: Priority		4: Impact on Climate Resilience	
High Priority	Х	High	
Medium Priority		Medium	Х
Low Priority		Low	
5:Type of Funding Required		6: Likley Loan Period	
Normal Loan	X	1 to 5 Years	
Loan and Donor	X	6 to 20 Years	
Donor Only		More than 20 Years	
7: Job Creation		8: Impact on possible Conflicts Betwee	n Basin States
Long term jobs		Positive	
During construction	Х	Neutral	X
None		Negative	
9: Socio economic influence		10: Influence on local communities	
High		Positive	
Medium	X	Neutral	Х
Low		Negative	
11: Yield contribution		12: Contribution to alleviating water so	arcity
Significant contribution		Significant contribution	
Moderate contribution	Х	Moderate contribution	Х
Low contribution		Low contribution	

	INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER					Project	6d		
				Direct	re-use				
Project D	escription								
	escription use of 11 milli	on m ³ /a to be f	ed directly into	o the water supp	ly system at the	e Maselspoor	t WTW dowr	nstream of the N	Mockes
CTP									
	C ACTION action being s	upported			Specific ac	rtion			
Strategic	action semige	аррогоа			Specific de				
Strategic									
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) SUPPORTING	G ORGANISATIO	NS OR COUNT	RIES					
LEAD AND) SUPPORTING	G ORGANISATIO		RIES					
) SUPPORTING	G ORGANISATIO	NS OR COUNT	RIES					
LEAD AND	ng 1	G ORGANISATIO		RIES					
LEAD AND	ng 1	G ORGANISATIO		RIES					
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LEAD AND LEAD Supportir Supportir Supportir	ng 1 ng 2 ng 3	G ORGANISATIO		RIES					
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LEAD AND LEAD Supportir Supportir Supportir Supportir	ng 1 ng 2 ng 3 ng 4	rs		RIES					
LEAD AND LEAD Supportir Supportir Supportir Supportir More tha	ng 1 ng 2 ng 3 ng 4 REQUIREMENT n 1 billion USE	rs	RSA	RIES					
LEAD AND Supportir Supportir Supportir Supportir More tha Between Between	ng 1 ng 2 ng 3 ng 4 REQUIREMENT n 1 billion USD 50 million USD	IS)) and 1 billion U and 50 million U	RSA	RIES					

ORASECOM: CLIMATE RESILIENT WATER RESOURCES Project 6d INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER **TRANSFER PROJECT** Direct re-use 1: Involvement of ORASECOM 2: Countries involved High Botswana Lesotho Significant Medium Namibia Limited South Africa 3: Priority 4: Impact on Climate Resilience **High Priority** High **Medium Priority** Medium Low Priority Low 5:Type of Funding Required 6: Likley Loan Period Normal Loan 1 to 5 Years Loan and Donor 6 to 20 Years More than 20 Years **Donor Only** 7: Job Creation 8: Impact on possible Conflicts Between Basin States Long term jobs Positive **During construction** Neutral None Negative 9: Socio economic influence 10: Influence on local communities High **Positive** Medium Neutral Negative Low 11: Yield contribution 12: Contribution to alleviating water scarcity Significant contribution Significant contribution Moderate contribution Moderate contribution Low contribution Low contribution 30 Oct 2023 HG Maré Revision Ver 1.0 Date Prepared by

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Cluster

7

Gariep to Greater Bloemfontein Transfer

Development Options Core Scenario

The Basin Wide Investment Plan and the Core Scenatio development options comprises projects that had already been identified by the basin states, and which had been subject to various levels of planning. The projects were grouped into clusters based on the larger schemes or sub-systems of which they formed one of the key components. The following Clusters were conciderred:

- 1) Orange River Project (ORP) Scheme future improvements.
- 2)Lesotho Botswana Water Transfer Scheme.
- 3)Lesotho Lowlands Water Project
- 4)Integrated Vaal River System Intervention Options.
- 5)Caledon to Greater Bloemfontein transfer.
- 6)Greater Bloemfontein internal resource improvements

7)Gariep to Greater Bloemfontein Transfer.

- 8)Neckartal Dam Scheme
- 9)Integrated Water management actions.

Projects forming part of the Gariep to Greater Bloemfontein Transfer

7a)Gariep to Greater Bloemfontein Transfer:

Cluster 7 will focus on the future transfer from the existing Gariep Dam to the Greater Bloemfontein Water Supply system. This option was recommended from both studies, the Greater Bloemfontein Reconciliation Strategy (DWS, 2012) and the Mangaung Gariep Augmentation Project (Mangaung, 2018). However, DWS has advised that that the best option from a national perspective must still be confirmed through an independent study that is currently in process through DWS RSA.

Roadmap: Appendix C 05 August 2024

ORASECOM:CLIMATE RESILIENT WATER RESOURCES

		Gariep	to Greate	er Bloer	nfontein	Transfer				
Project Description Cluster 7 will focus on th										
was recommended from Augmentation Project (Nonfirmed through an infere are several possible pipeline route options with the several possible pipeline route options with the several possible project of the several possible	Mangaung, 2018; adependent stud ple route options was selected, narme will be constity of 32 million reconster pump stamated at \$ 200 m t estimated at \$ 26.3 mated at \$ 26.3). However, ly that is cur if for the trainely the clear ructed in two martina increases hillion. 9 million/a million	DWS has a rrently in pr nsfer pipelii ar water pip to phases: eans of a pi sing the tra	dvised that rocess throm Good peline from ump station	at that the ough DWS Gariep Dam m Gariep D on and pip	best option RSA. For the poam to a poeline;	from a na urpose of t int near Blo	tional pers this report, pemfonteir	only one on. Based on	ust still be of the n the latter
TRATE CO. ACTION										
	upported				Specific	action				
Strategic action being su					Specific a	action				
Strategic action being su					Specific a	action				
Strategic action being su					Specific a	action				
Strategic action being so Valuable input from SA	3	S OR COUN	TRIES		Specific a	action				
Strategic action being so Valuable input from SA	3	S OR COUN	TRIES		Specific a	action				
Strategic action being so Valuable input from SA	3		TRIES		Specific a	action				
Strategic action being st Valuable input from SA LEAD AND SUPPORTING LEAD Supporting 1	3		TRIES		Specific a	action				
Strategic action being st Valuable input from SA LEAD AND SUPPORTING LEAD Supporting 1 Supporting 2	3		TRIES		Specific a	action				
Strategic action being	3		TRIES		Specific a	action				
Strategic action being	3		TRIES		Specific a	action				
Strategic action being strategic action action and supporting 1. Supporting 1. Supporting 2. Supporting 3. Supporting 4.	ORGANISATION		TRIES		Specific a	action				
Strategic action being st Valuable input from SA LEAD AND SUPPORTING LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4	ORGANISATION		TRIES		Specific a	action				
Strategic action being st Valuable input from SA LEAD AND SUPPORTING LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4 BUDGET REQUIREMENT More than 1 billion USD	ORGANISATION	RSA	TRIES			action				
STRATEGIC ACTION Strategic action being so Valuable input from SA LEAD AND SUPPORTING LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4 BUDGET REQUIREMENT More than 1 billion USD Between 50 million USD as	ORGANISATION S and 1 billion US	RSA	TRIES		Specific a	action				
Strategic action being st Valuable input from SA LEAD AND SUPPORTING LEAD Supporting 1 Supporting 2 Supporting 3 Supporting 4 BUDGET REQUIREMENT More than 1 billion USD	ORGANISATION S and 1 billion US	RSA	TRIES			action				
EAD AND SUPPORTING EAD upporting 1 upporting 2 upporting 3 upporting 4 SUDGET REQUIREMENT More than 1 billion USD setween 50 million USD setween 1 million USD as	ORGANISATION S and 1 billion US	RSA	TRIES			action				

INVESTMENT PLAN & L TRAN	ISFER PRO		ISVAN	A WAII		Project	7a	
	Gariep to	Greate	r Bloem	fontein ⁻	Transfer		'	
1: Involvement of ORASECOM				2: Countri	es involved			
High				Botswana				
							· ·	
Significant				Lesotho			X	
Medium				Namibia				
Limited	Х			South Afri	ca		X	
3: Priority		•		4· Impact	on Climate Resilien	re		
					on chinate resilien			
High Priority	X			High				
Medium Priority				Medium			Х	
Low Priority				Low				
E.T of Franchise Denotined				e. Libbar L	an Daviad			
5:Type of Funding Required				6: Likley Lo	oan Period			
Normal Loan	х			1 to 5 Year	rs			
Loan and Donor	х			6 to 20 Ye	ars			
Donor Only				More than	20 Years			
7: Job Creation				8: Impact	on possible Confli	cts Between Basin Sta	tes	
Long term jobs				Positive				
During construction	х			Neutral			X	
None				Negative				
9: Socio economic influence		1		10: Influence on local communities				
High				Positive				
Medium	x			Neutral			X	
				Negotive				
Low				Negative				
11: Yield contribution				12: Contri	bution to alleviatin	g water scarcity		
Significant contribution				Significant	contribution			
Moderate contribution	x			Moderate	contribution		Х	
Low contribution				Low contri	bution			

Roadmap: Appendix C 05 August 2024

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Cluster

8

Neckartal Water Supply Scheme

Development Options Core Scenario

The Basin Wide Investment Plan and the Core Scenatio development options comprises projects that had already been identified by the basin states, and which had been subject to various levels of planning. The projects were grouped into clusters based on the larger schemes or sub-systems of which they formed one of the key components. The following Clusters were conciderred:

- 1) Orange River Project (ORP) Scheme future improvements.
- 2)Lesotho Botswana Water Transfer Scheme.
- 3)Lesotho Lowlands Water Project
- 4)Integrated Vaal River System Intervention Options.
- 5)Caledon to Greater Bloemfontein transfer.
- 6)Greater Bloemfontein internal resource improvements
- 7)Gariep to Greater Bloemfontein Transfer.

8)Neckartal Dam Scheme

9)Integrated Water management actions.

Projects forming part of the Neckartal Water Supply Scheme

8a)Neckartal Scheme: It is important to note that the construction of the Neckartal Dam located in the lower Fish River in Namibia was recently completed and the dam started to store water already in 2018. The main purpose of this dam is to supply water to a new irrigation development.

Roadmap: Appendix C 05 August 2024

ORASECOM:CLIMATE RESILIENT WATER RESOURCES INVESTMENT PLAN & LESOTHO TO BOTSWANA WATER TRANSFER PROJECT

Project

8a

Neckartal Water Supply Scheme

Project Description

It is important to note that the construction of the Neckartal Dam located in the lower Fish River in Namibia was recently completed and the dam started to store water already in 2018. The main purpose of this dam is to supply water to a new irrigation development. Water will be released from the dam directly into the river and abstracted downstream from a diversion weir into a canal system, used to distribute the water to the irrigators. The releases from the dam into the river will take place via hydro-power turbines, which were already installed.

The planning of the irrigation scheme is currently behind schedule, and at the time of writing this report (June 2024) it was confirmed that the Namibian Government had aquired 4 farms measuring 19 137 Ha. The total irrigation requirement was estimated at 90 million m³/a. Based on the installed turbine capacities the volume that can be released through the turbines was determined as 100 million m³/a. The difference of 10 million m³/a will most probably be used to support the EWR downstream of the diversion weir. In the meantime, water is expected to be released for power generation purposes from Neckartal Dam. Depending on the amount of losses between the dam and the Orange River mouth (expected to be high) it can be considered to utilize these flows to supply the river mouth environmental requirements or part thereof and thereby reducing the demand on Gariep and Vanderkloof dams. The saved water in the ORP system can then be utilized for other purposes such as the increasing water requirements on the Lower Orange River for Namibia and the RSA. This is an option that should be further investigated.

The yield from the dam at 98% assurance is estimated at 108 million m³/a

Installed capacity of the hydro-power turbines is 2.7 MW

The planned irrigation scheme to cover approximately 5 000 ha

The capital cost for the irrigation scheme was estimated at \$ 26.3 million (2018);

The operational costs for the irrigation scheme were estimated at \$0.79/a\$ (2018)

STRATEGIC ACTION					
Strategic action being supported	ł		Specif	ic action	
SA 1 might provide usefull input	on EWRs				
LEAD AND SUPPORTING ORGAN	ISATIONS OR COUNT	RIES			
LEAD	Namibia				
Supporting 1					
Supporting 2					
Supporting 3					
Supporting 4					
BUDGET REQUIREMENTS					
More than 1 billion USD					
Between 50 million USD and 1 bi	illion USD				
Between 1 million USD and 50 m			Х		
Less than 1 million USD	IIIIIOII OSD				
Less triali I illillion OSD					
		30 Oct 2023			HG Maré

INVESTMENT PLAN & L TRAN	SFER PROJECT	SWANA WATER	Project	8a			
	Neckartal Wa	ter Supply Scheme					
1: Involvement of ORASECOM		2: Countries involved					
High		Botswana					
Cignificant		Lesotho					
Significant		Lesotiio					
Medium		Namibia		Χ			
Limited	Х	South Africa					
3: Priority		4: Impact on Climate Res	ilience				
High Priority		High					
Medium Priority	Х	Medium		Χ			
Low Priority		Low					
5:Type of Funding Required		6: Likley Loan Period					
		o. Likley Loan Period					
Normal Loan	Х	1 to 5 Years					
Loan and Donor	Х	6 to 20 Years					
Donor Only		More than 20 Years					
7: Job Creation		8: Impact on possible Co	onflicts Between Basin Stat	es			
Long term jobs		Positive					
During construction	Х	Neutral		Х			
None		Negative					
9: Socio economic influence		10: Influence on local cor	10: Influence on local communities				
High		Positive					
Medium	Х	Neutral		X			
low		Negative					
Low		Negative					
11: Yield contribution		12: Contribution to allevi	ating water scarcity				
Significant contribution		Significant contribution					
Moderate contribution	х	Moderate contribution		x			
Low contribution		Low contribution					