

Water Pool in the Context of Tourism and Hospitality

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- 09-10 September 2026
- Gariep Forever Resort

Our Ecosystem



Rise or Sun Set



Water Pool



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NELSON MANDELA
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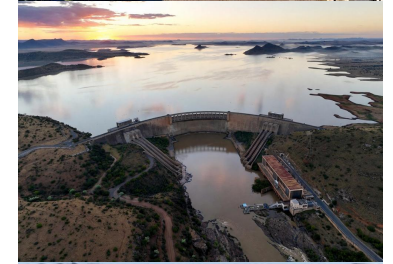
1. WATER POOL MODEL

2. TRIANGLE HELIX MODEL

3. MOTIVATION AND FUNDING MODELS

4. SMART FUTURE WATER DEMAND

5. CONCLUSION AND RECOMMENDATION



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FOR THE GOALS



PURPOSE AND OBJECTIVES

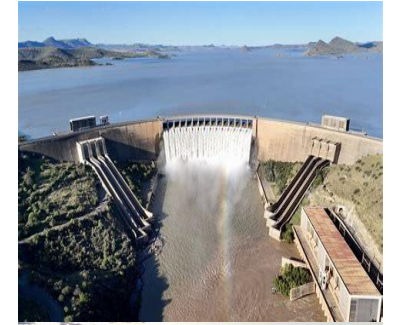
PURPOSE - Water Pool Model

Transform Gariep Dam into a tradable water asset economic

(Water = Bulk → Day-Ahead Market (SAPP model) = Powers BEAR growth)

OBJECTIVES

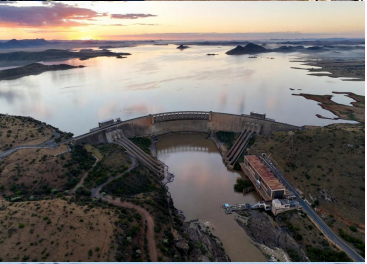
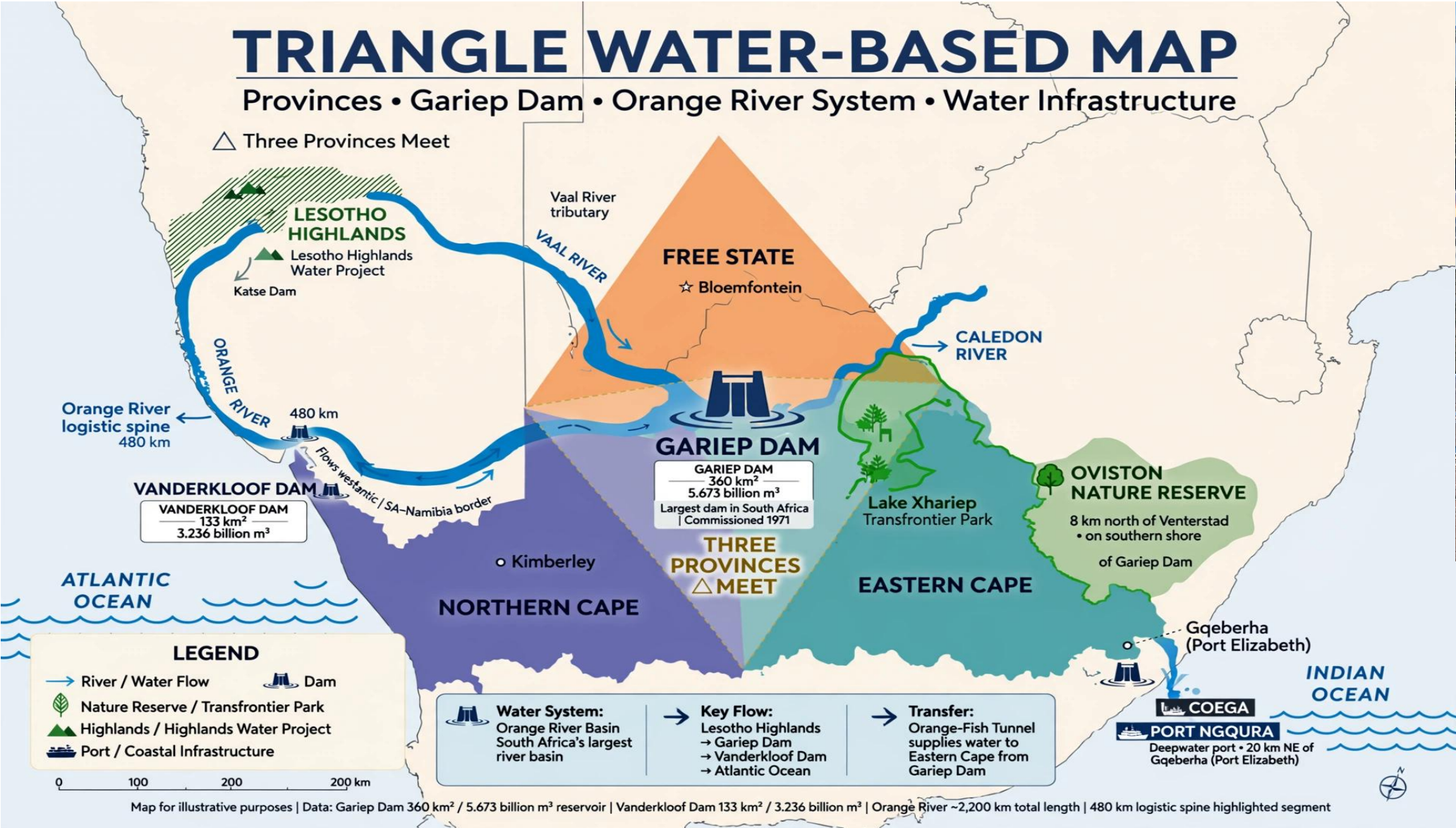
- **Align** water pool with tourism investment and related water business opportunities.
- **Build** smart destination - pool market driven + 5IR, AI, and BDA
- **Develop** RDTIC Framework for safety, water availability, resilience - <400mm climate risk.
- **Recommend** funding model aligned to DFIs, SOEs and PPP models
- Recommend **Gariep Dam Centre of Excellence (COE)** for blue and green jobs for water pool operation



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Location of Gariep Dam for Water Pool Model



Triangle Duplex –Helix –Quantum Water Pool Model in Gariep Dam



GARIEP DAM TRIANGLE-DUPLEX-HELIX-QUANTUM WATER-BASED CENTRE OF EXCELLENCE

Tourism & Hospitality Destination • Xhariep District Municipality • Triangle-Duplex-Helix-Quantum Triologue Water-Based Partnership Model

Commercial • Economic
Financial • Strategic
Integrated Infrastructure
Investment Programmes

TRIANGLE

Tri-Province Governance Triologue



HELIX Penta-Helix Stakeholder Ecosystem



GOVERNMENT

DWS Provincial of Water & Sanitation
NDT- National Department of Tourism

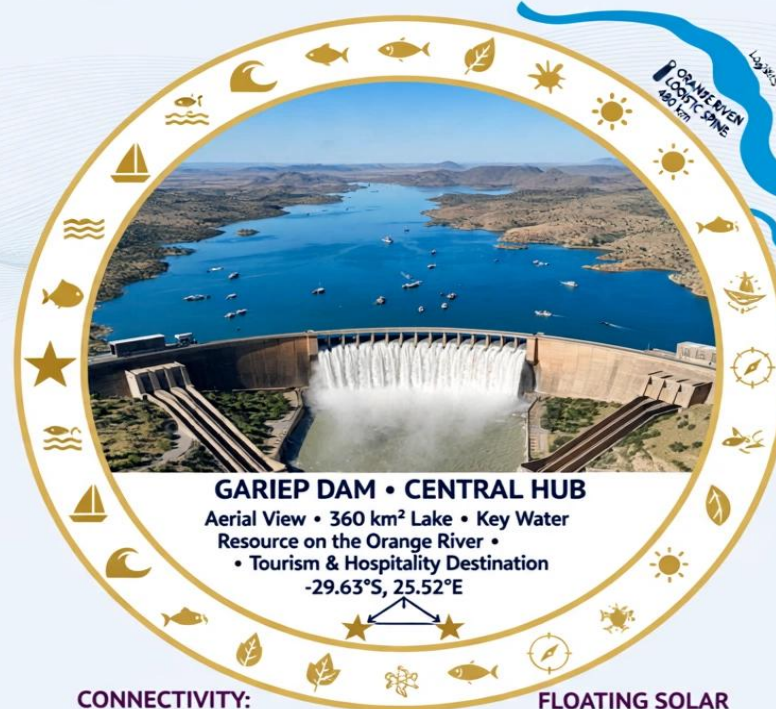


EDTEA- Economic Development, Tourism & Environmental Affairs



UNIVERSITY & EDUCATION

UJ - University of Johannesburg • UFS
University of the Free State • Xhariep TVET
College



GARIEP DAM • CENTRAL HUB

Aerial View • 360 km² Lake • Key Water
Resource on the Orange River •
• Tourism & Hospitality Destination
-29.63°S, 25.52°E

CONNECTIVITY: 5G / 6G / 7G



Smart Network Connectivity
Digital Infrastructure for Remote
Operations



CRYSTALLAGOONS®
Tilapia & Catfish Farming Ponds

FLOATING SOLAR



Floating Solar Farms on Reservoir
Renewable Energy
Reduced Evaporation



33x LES1 WATER
Reduced Evaporation

<< DUPLEX

Inland Marine ↔ Coastal Marine



Sailing & Recreational Sailing
Regattas & Leisure Boating



Houseboating & Eco-Tourism Lodges
Sustainable Waterfront Stays



Angling & Recreational Fisheries
Species Management & Tourism



Aquaculture
Tilapia & Catfish Farming
Ponds



Olympic Swimming
Training Academy &
Community Pool

<< COASTAL MARINE

Port Ngqura & Coega IDZ



Port Ngqura Container Terminal
Deepwater Port & Logistics Hub



Coega IDZ Special Economic Zone
Manufacturing & Export Cluster



Mari-culture & Aquaculture Zone
Sustainable Seafood Production



Export Corridor
Agricultural & Aquaculture Exports to Global Markets



Shipping & Export
Inter-Regional Trade
Gateway

INTEGRATED SUPPLY CHAIN: Agri-produce • Aquaculture Products
• Tourism Flow • Freight & Logistics Connectivity

QUANTUM • Non-Linear Entangled Value Creation



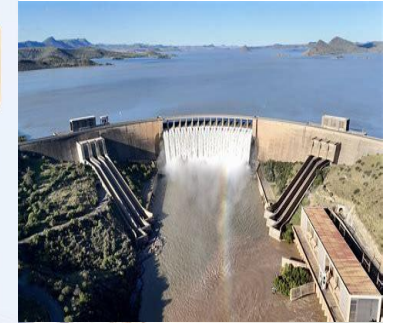
SIR HUMAN-CENTRIC TECHNOLOGY
AI, IoT, Digital Twins for
& Resource Management



BIG DATA ANALYTICS
Real-Time Monitoring
Predictive Analytics for Water,
Tourism & Tourism Flows



SUSTAINABLE DEVELOPMENT GOALS
Swimming • Canoeing • Rowing • Sailing • Triathlon
International Training & Event Destination



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XHARIEP DISTRICT MUNICIPALITY • THREE LOCAL MUNICIPALITIES



LESEMENG • LOCAL MUNICIPALITY
Towns: Petrusburg • Jacobsdal
Koffiefontein

KOPANONG • LOCAL MUNICIPALITY
Towns: Trompsburg • Jagersfontein
Phillipolis • Fauresmith • Edenburg

MOHOKARE • LOCAL MUNICIPALITY
Towns: Zastron • Rouxville
• Smitfield

Xhariep District Municipality
Strategic Node Linking Three Provinces

PARTNERSHIP MODEL IMPACT

ECONOMIC:
Inclusive Growth
Jobs in Tourism,
Aquaculture,
SOCIAL
Skills Development
Community

ENVIRONMENTAL:
33x Water Efficiency
Renewable Energy
Eco-fish
SOCIAL
Community &
Grilling

ENVIRONMENTAL:
33x Water Efficiency
Renewable
Ecosystem Restoration
SOCIAL
Skills Community Empowerment
Heritage Preservation



INTERNATIONAL HERITAGE
INTEGRATING DIVERSE
PEOPLE BACK TO ROOTS

Cultural Heritage • San History & Knowledge Systems •
Inclusive Community Development

Green and Blue Economy Skills institutionalised- Duplex Water Model



GARIEP DAM • SOUTH AFRICA

GARIEP DAM CAPACITY



TOTAL STORAGE CAPACITY
5,340,000 MEGALITRES
• 5.34 BILLION CUBIC METERS
• 5,340 hm³



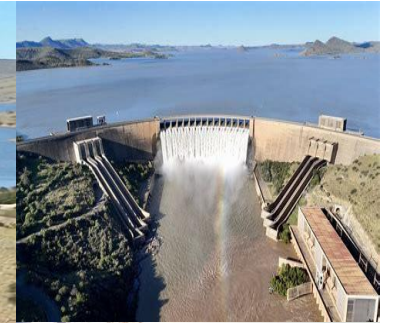
DAM WALL
88m HIGH × 914m LONG



SURFACE AREA
374 km²
• 374,000,000 m²
• 37,400 HECTARES



KEY FACT
LARGEST DAM IN
SOUTH AFRICA
ON THE ORANGE RIVER



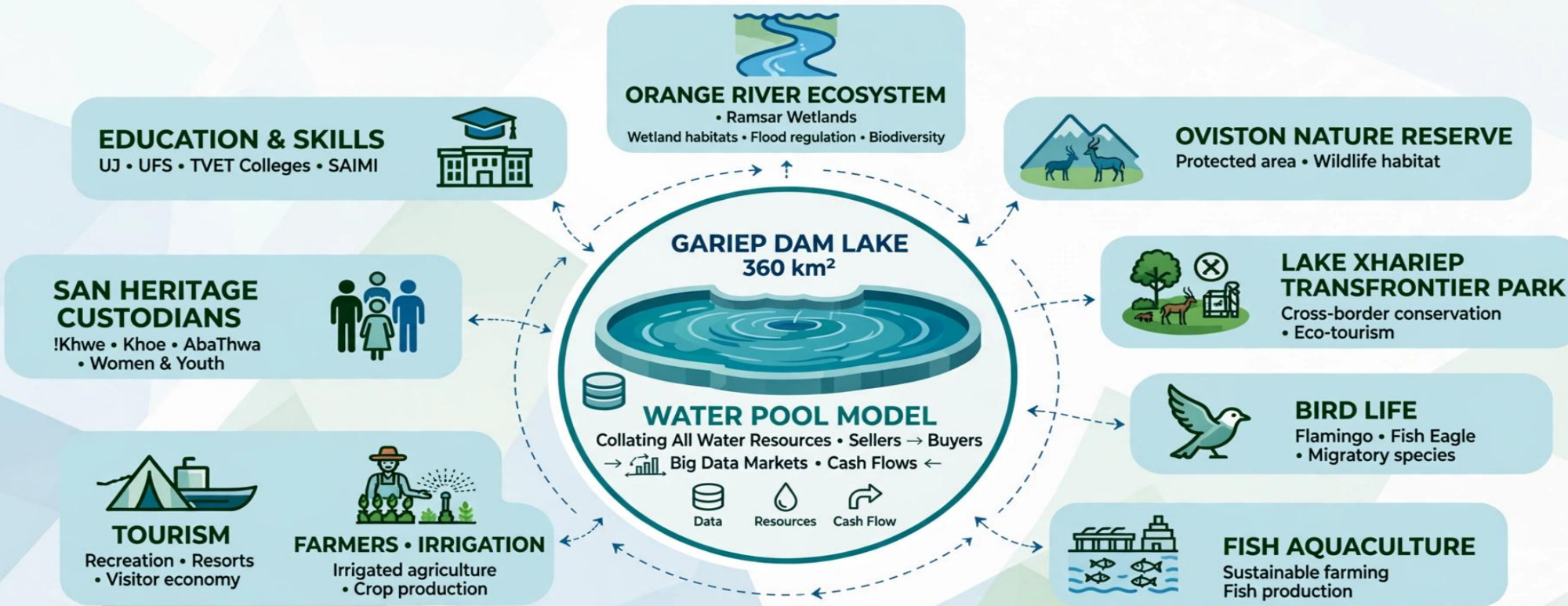
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Gariep Dam — Completed 1971 • Located on the Orange River, border of Free State & Eastern Cape Province

Eco-System of Water Pool

GARIEP DAM ECOSYSTEM — Stakeholder Infographic

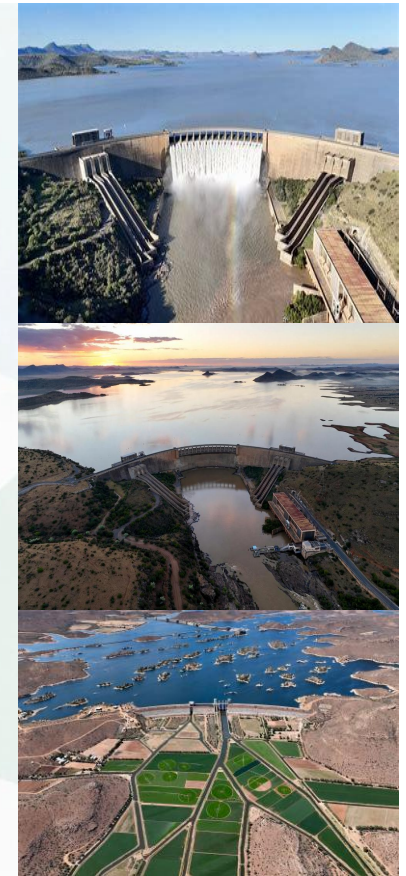
Integrated Water, Ecology & Livelihoods for Stakeholders • 360 km² Lake System



STAKEHOLDERS — COLLABORATIVE NETWORK



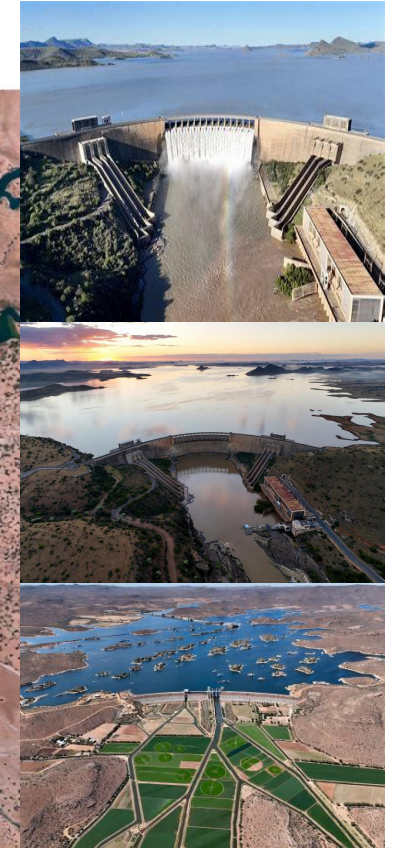
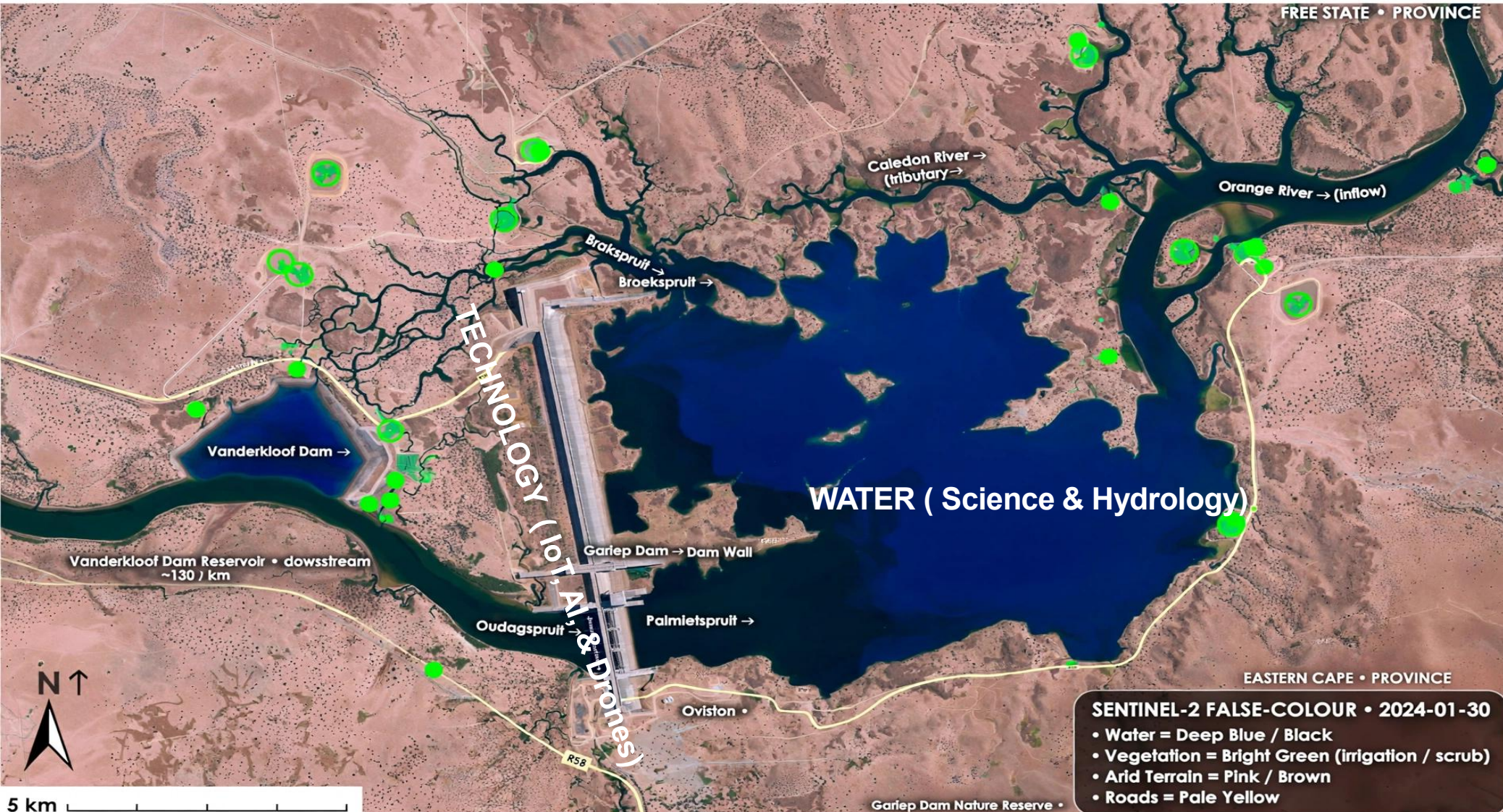
Integrated Model for Sustainable Water Governance & Stakeholder Partnerships • 2024



Green and Blue Economy Skills institutionalised- Duplex Water Model

GARIEP DAM — SATELLITE FALSE-COLOUR MAP • SOUTH AFRICA

Orange River, Caledon River tributary, and Vanderkloof Dam downstream shown • Labeled tributaries: Brakspuit, Broekspuit, Palmietspruit, Oudagspruit



Gariep Dam is where nature meets with Animals and Humans –Helix



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FOCUS: Triangle of Duplex-Helix-Quantum Approach

GARIEP DAM TRIANGLE-DUPLEX-HELIX-QUANTUM

CENTRE OF EXCELLENCE — Tourism & Hospitality



TRIANGLE

Free State • Eastern Cape • Northern Cape
tri-province



DUPLEX

Inland Marine ↔ Coastal Marine
Port Ngqura • Coega



HELIX

Penta-Helix

Government • University • Industry • Community • Environment



QUANTUM

5IR • AI • 5G/6G/7G

Floating Solar • Crystal Lagoons • Olympic Games



International Heritage —
Integrating Diverse People —
Back To Roots

Xhariep District Municipality
Letsemeng • Kopanong • Mohokare



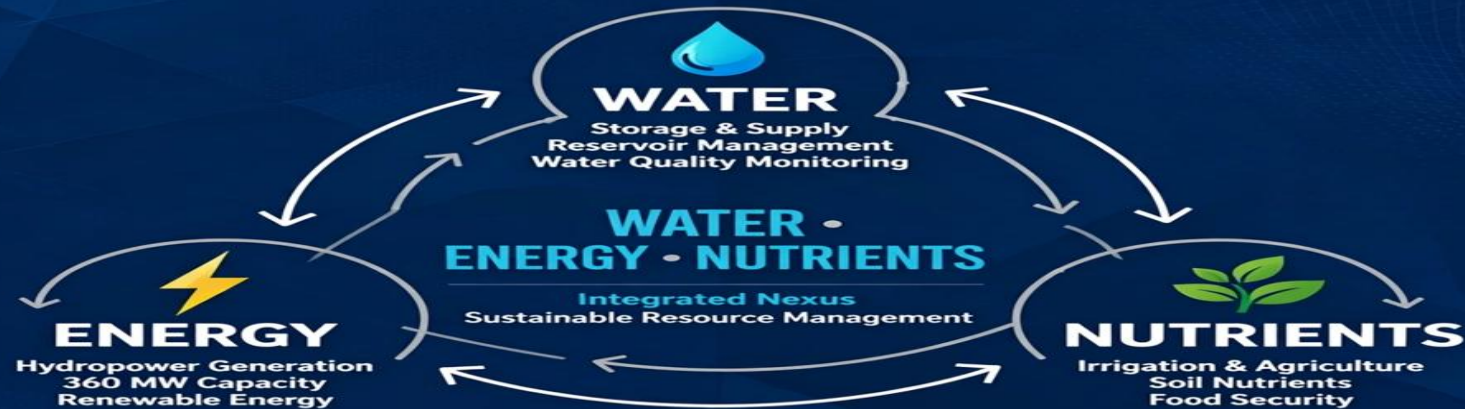
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WATER ENERGY AND FOOD NEXUS

Gariep Dam • South Africa

Height: 88 m • Length: 914 m • Reservoir: 374 km²

The largest dam in South Africa — Impounding the Orange River • Power • Irrigation • Water Security




Research & Development


Data & Innovation


Capacity Building & Training


Ecosystems & Conservation

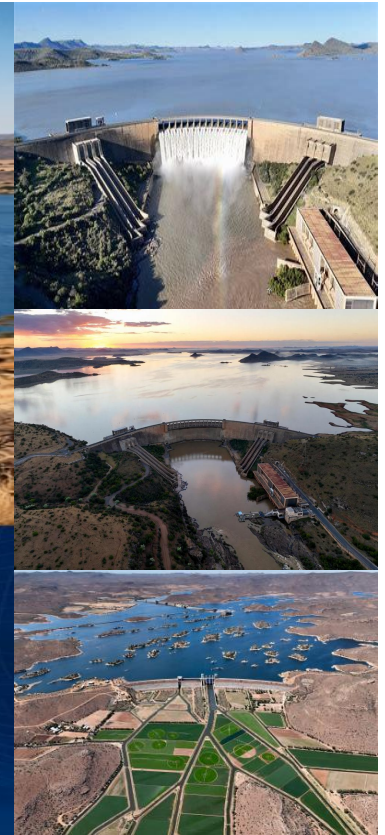
GARIEP WATER POOL - Centre of Excellence

Advancing Science • Collaboration • Sustainability for South Africa

Owned by Dept. of Water & Sanitation • Operated for Innovation & Sustainability



CENTRE OF EXCELLENCE
• EST. 2024

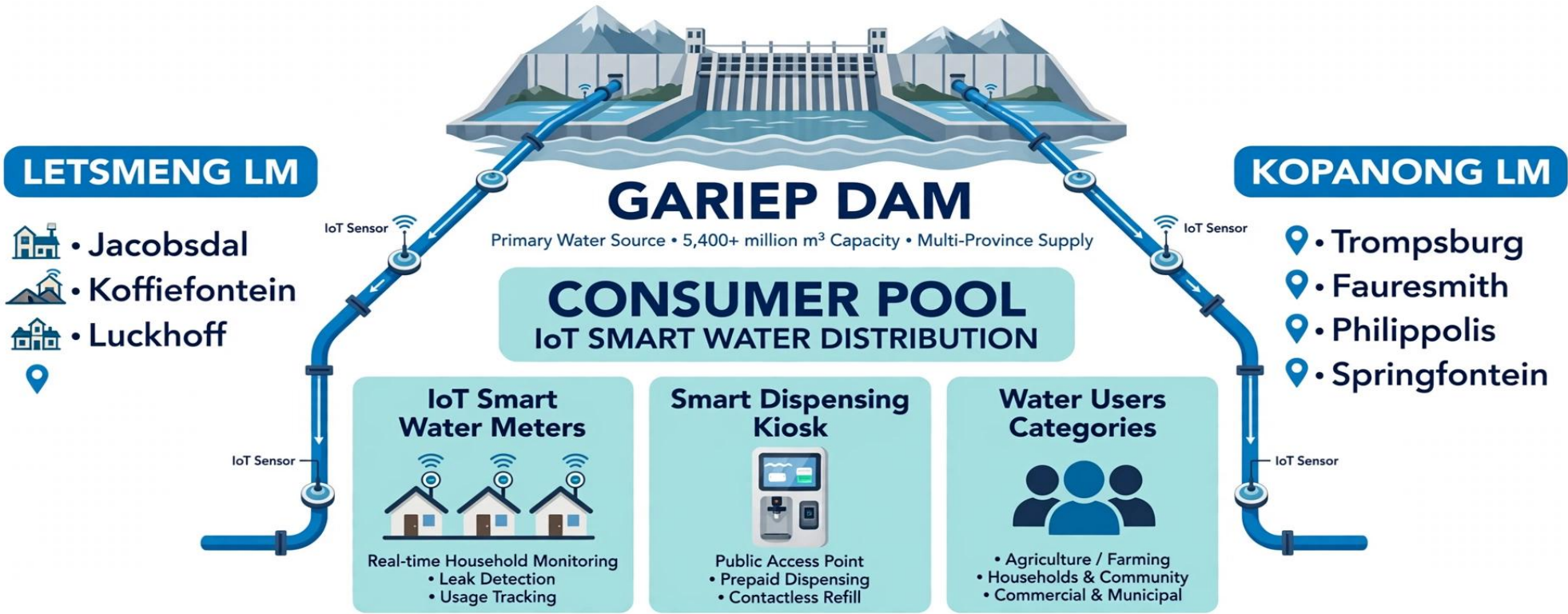


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WATER CONSUMPTION- TRI-PROVINCE TRADE POOL

GARIEP DAM WATER CONSUMPTION

Letsemeng & Kopanong
Tri-Province Trade Pool



FREE STATE

WRC • Water Research Commission
• Research & Regulatory Oversight

TRI-PROVINCE TRADE POOL PARTNERS



EASTERN CAPE

UJ • University of Johannesburg



NORTHERN CAPE

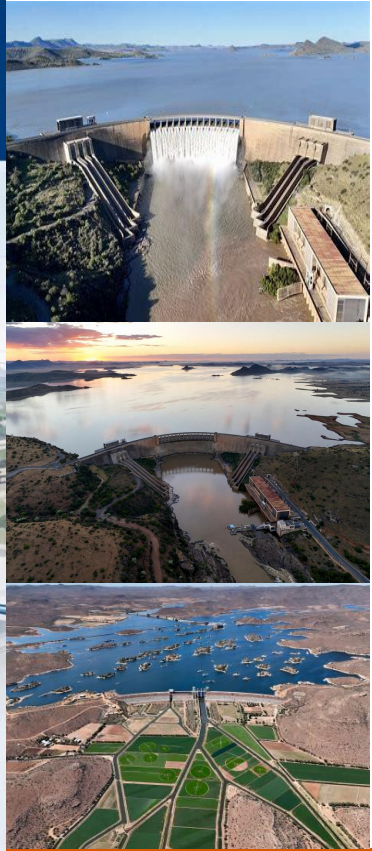
Johannesburg Water
Water Services & Supply Partner

Data: IoT-Enabled Monitoring • Real-Time Flow & Consumption • Sustainable Water Management for Tri-Province Collaboration | Key: IoT Sensor = Smart Monitoring & Control

WATER POOL MODEL APPLIED

5IR Solution - 5G 6G 7G Connectivity

Modern Water Storage Facility • Gariep Dam • 5th Industrial Revolution



Artificial Intelligence (AI)

Big Data Analytics (BDA)

5G 6G 7G Connectivity

Water-Gig Economy

Internet of Everything

Advanced Robotics

Automation

Nanotechnology



University of Johannesburg • Partner



Water Research Commission • Partner

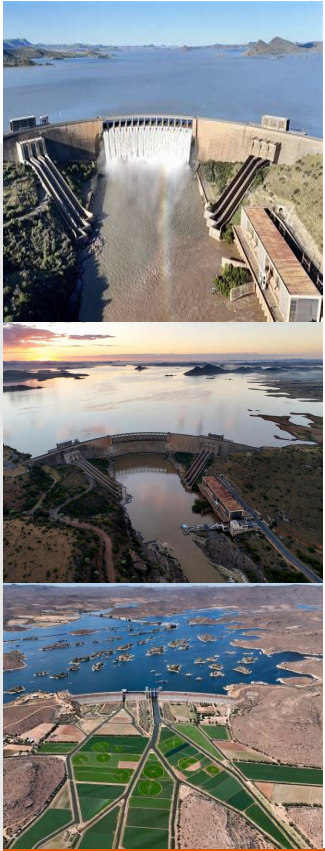
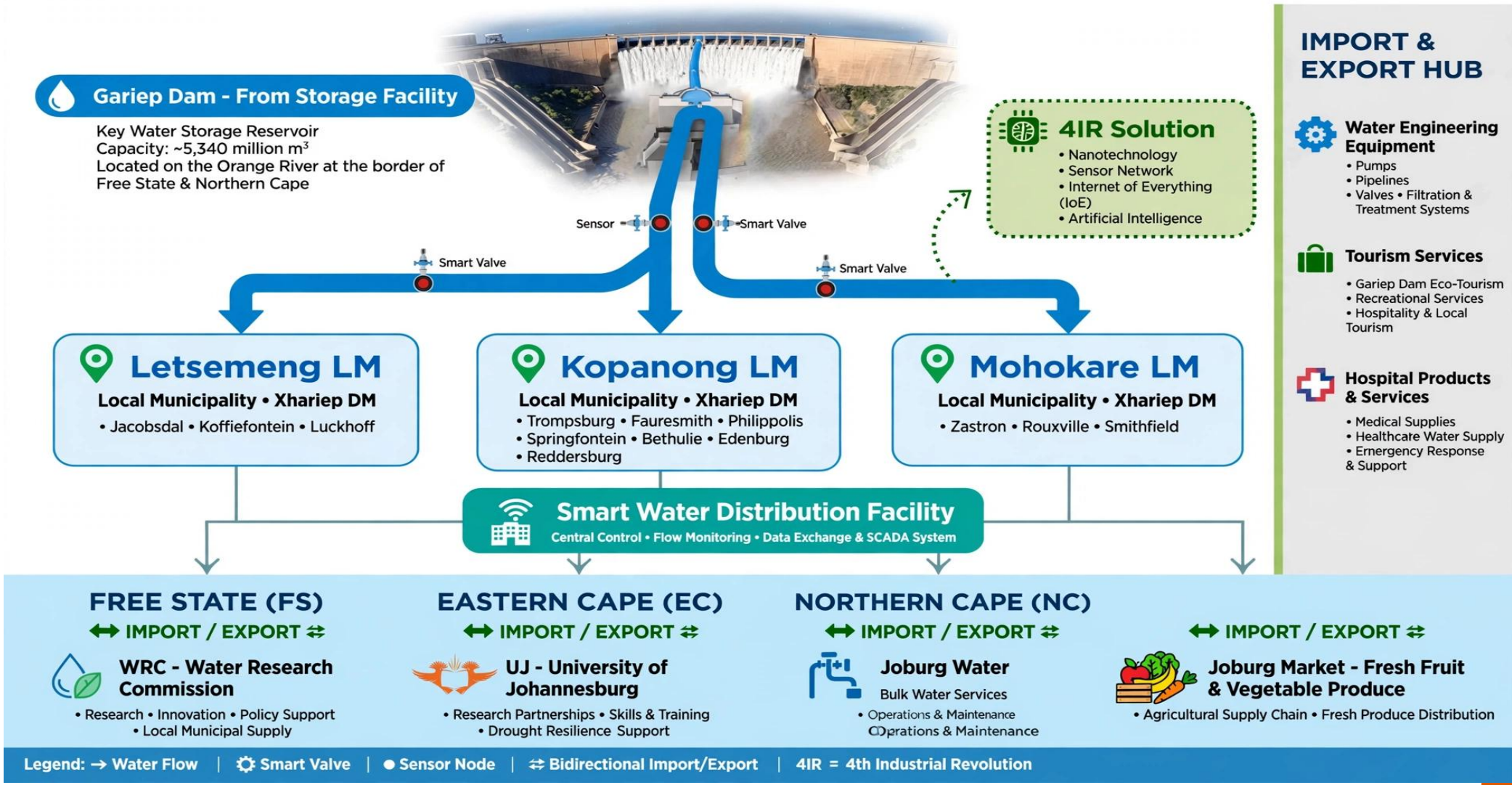


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WATER DISTRIBUTION MODEL – GARIEP DAM TRIA-PROVINCE HUB

GARIEP DAM WATER DISTRIBUTION MODEL - Xhariep DM Tri-Province Hub

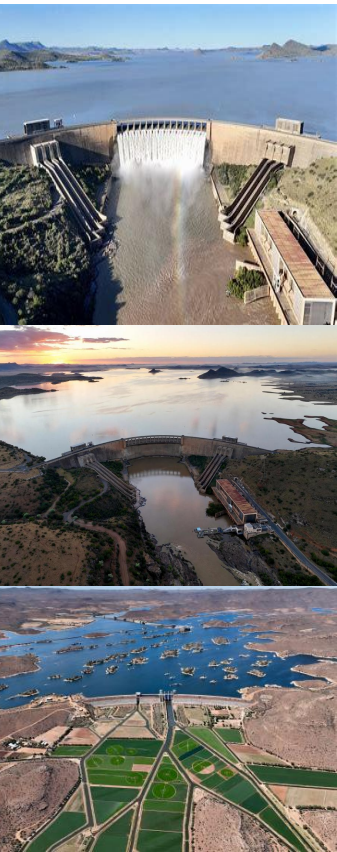
Integrated Water Supply • 4IR Smart Infrastructure • Stakeholder Partnerships | Xhariep District Municipality



WATER POOLING – Smart Units for Gig Economy

Smart Water Dispensing Units & IoT Sensors

Gariep Dam Water Gig Economy • Real-Time • IoT-Enabled • Pay-Per-Use



SMART WATER DISPENSING KIOSK / ATM

Real-time Monitoring

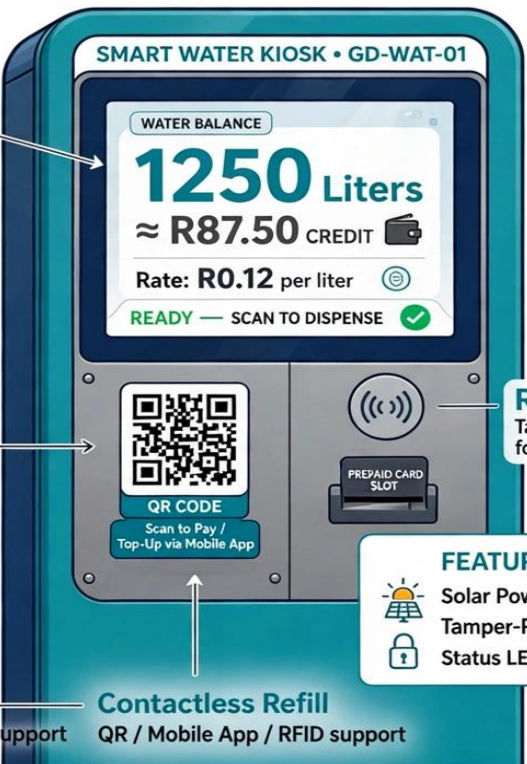
Live balance updates
• Instant transaction logging

Pay-per-use

Pay only for water used
• Transparent pricing

Contactless Refill

QR / Mobile App / RFID support

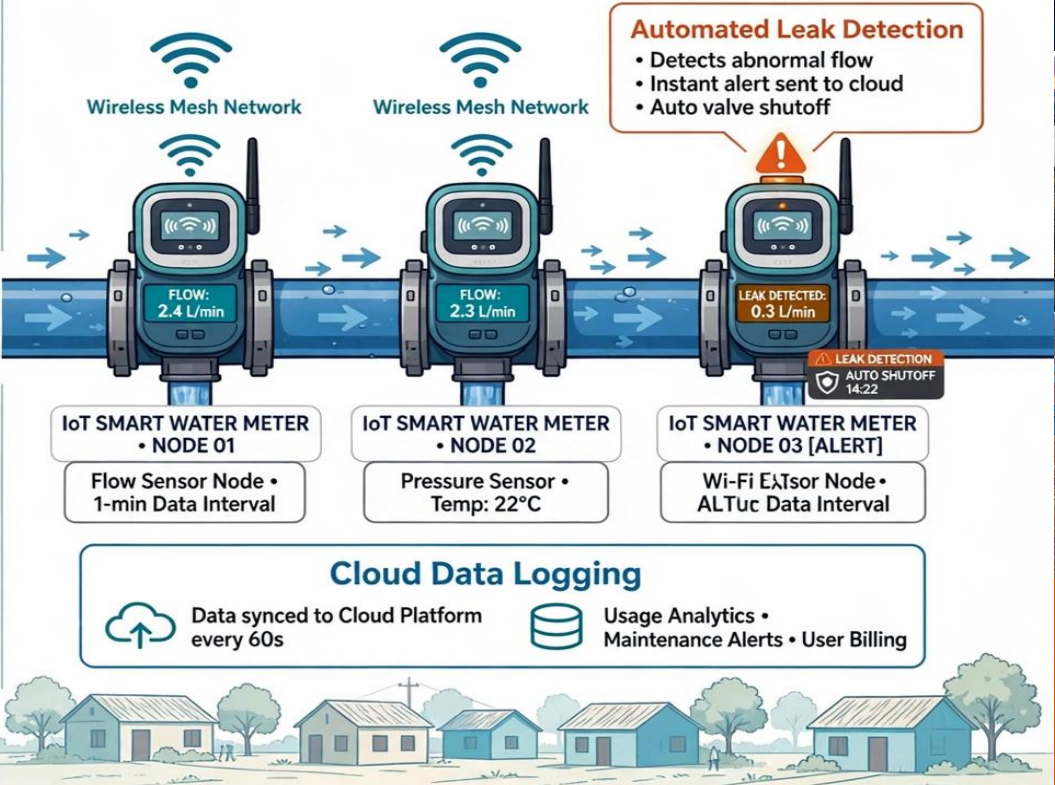


RFID TAP
Tap Card / RFID Tag for Instant Access

FEATURES:

- Solar Powered • 5W Panel
- Tamper-Proof Enclosure
- Status LED: ONLINE / ACTIVE

IoT SMART WATER METERS & SENSOR NETWORK



BACKGROUND: Rural Community — Gariep Dam Surrounding Area

Cloud Data Logging

Real-time Monitoring

Automated Leak Detection

Pay-per-use

Contactless Refill

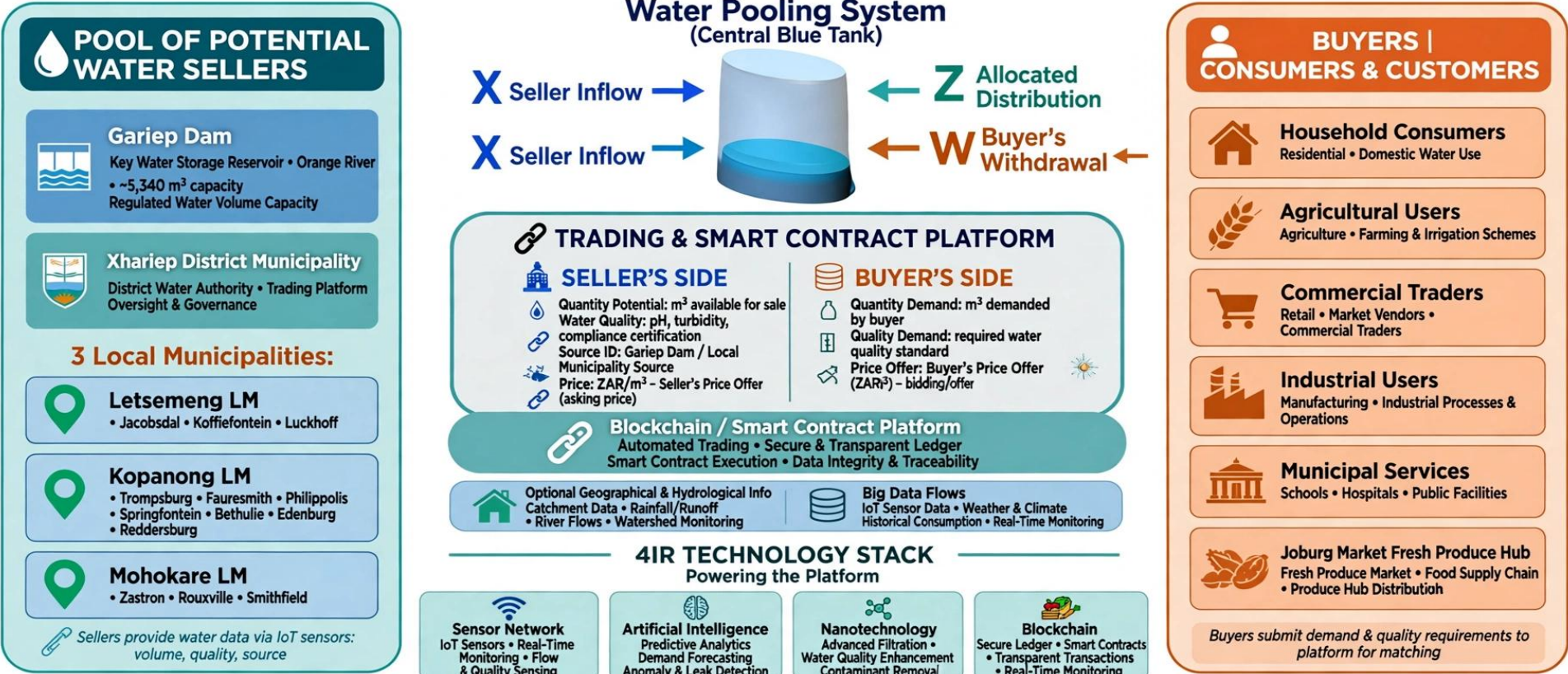
SYSTEM: IoT • Solar • Secure • Remote Monitoring

Gariep Dam Water Gig Economy • Empowering Rural Water Access

WATER POOLING – A CASE OF GARIEP DAM

Xhariep DM Water Trading & Pooling Platform

Gariep Dam Consumer & Customer Trading – Integrated Water Trading & Pooling System



TRADE PARTNERS & STAKEHOLDERS

Partner Organizations & Logos – 9 Stakeholders



Integrated • Secure • Sustainable • Data-Driven Water Trading Platform | Supporting Xhariep DM Water Security, Economic Development & Efficient Resource Sharing



WATER TRADING GARIEP DAM AND XHARIEP AS A WSA

ZOOM: Water Trading & Selling - Gariep Dam to Xhariep DM 3 LMs - Transaction Flow

Real-Time Blockchain-Enabled Trading • 3 Local Municipalities • Volume Allocation • Price & Revenue Summary



Gariep Dam Water Seller Pool

Water Seller Pool • releasing X volume
Source: Gariep Dam Reservoir | Orange River

Volume Released: X = 500,000 m³
Storage: ~5,340 Mm³ capacity • Regulated Discharge

CENTRAL WATER POOLING TANK

Aggregation & Distribution Hub — Central Pooling Point



BLOCKCHAIN SMART CONTRACT PLATFORM
Automated Trading, Secure Ledger & ZAR Bidding/Offer

FLOW → **500,000 m³**

- **Automated Trading**
Smart contracts execute bids/offers instantly
- **Secure Ledger**
Immutable, tamper-proof on-chain record
- **ZAR Bidding/Offer**
Transparent auction pricing in ZAR/m³
- **Secure & Auditable**
Real-time tracking & audit compliance

Allocated Distribution Z = 500,000 m³ split to 3 LMs



Letsemeng LM

Local Municipality

**Allocation: Z₂ = 180,000 m³**

**Seller Price Offer: ZAR 8.50 /m³**

**Buyer Price Offer: ZAR 9.20 /m³**

**Volume: 180,000 m³**

**Quality Certification: SANS 241:2015**
Certified • pH 7.2 | Turbidity <5 NTU

**Buyer's Withdrawal W₁ = 180,000 m³**

**To Final Consumers: Households • Agriculture • Local Businesses**



Kopanong LM

Local Municipality

**Allocation: Z₂ = 200,000 m³**

**Seller Price Offer: ZAR 8.40 /m³**

**Buyer Price Offer: ZAR 9.00 /m³**

**Volume: 200,000 m³**

**Quality Certification: SANS 241:2015**
Certified • pH 7.1 | Turbidity <4 NTU

**Buyer's Withdrawal W₂ = 200,000 m³**

**To Final Consumers: Community Users • Schools • Farms & Farming**



Mohokare LM

Local Municipality

**Allocation: Z₃ = 120,000 m³**

**Seller Price Offer: ZAR 8.60 /m³**

**Buyer Price Offer: ZAR 9.30 /m³**

**Volume: 120,000 m³**

**Quality Certification: SANS 241:2015**
Certified • pH 7.3 | Turbidity <5 NTU

**Buyer's Withdrawal W₃ = 120,000 m³**

**To Final Consumers: Small Businesses • Municipal Services**

TRANSACTION ECONOMICS Consolidated Summary

TOTAL VOLUME TRADED
500,000 m³
Distributed across 3 LMs

WEIGHTED AVERAGE PRICE
ZAR 9.16 /m³
Average buyer offer across LMs

TOTAL REVENUE GENERATED
ZAR 4,580,000
Calculated: 500,000 m³ × ZAR 9.16

TRADE PARTNERS — Stakeholders & Partners

**Gariep Dam**

**Xhariep DM**

**Letsemeng LM**

**Kopanong LM**

**Mohokare LM**

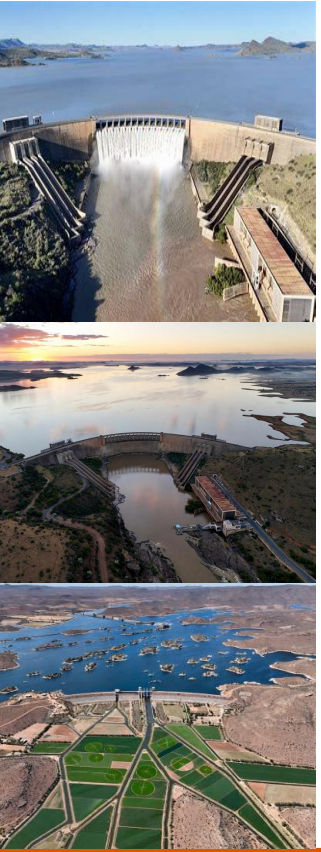
**WRC Water Research Commission**

**University of Johannesburg Official Orange Logo**

**Johannesburg Water**

**Joburg Market**

Legend: X = Released Volume from Seller • Z = Allocated Volume to LMs • W = Buyer Withdrawal to End Consumers • All trades secured via blockchain smart contract for transparency & traceability



WATER POOL MODEL APPLIED TO TRADING PARTNERS

OTHER TRADING PARTNERS OUTSIDE Gariep Dam & Xhariep DM 3 LMs

Extended Trade Ecosystem — Outward Trading Flows & Value Exchange

🔍 Zoom: External Trade Partners Beyond Core • Knowledge • Technology • Commercial Offtake • Revenue • Compliance



VALUE FLOWS OUTWARD FROM XHARIEP DM 3 LMs

KNOWLEDGE
Research Outputs • Policy Insights •
Training & Skills Development

TECHNOLOGY
IoT Sensors • Blockchain Platform
AI Analytics • Smart Metering

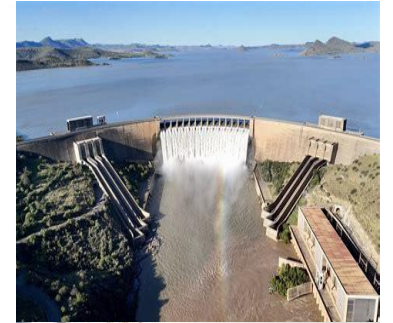
COMMERCIAL OFFTAKE
Produce & Bulk Water • Agro-market Supply
• Commercial Trade Deals

REVENUE
Payment Flows • Trading Revenue
• Economic Returns

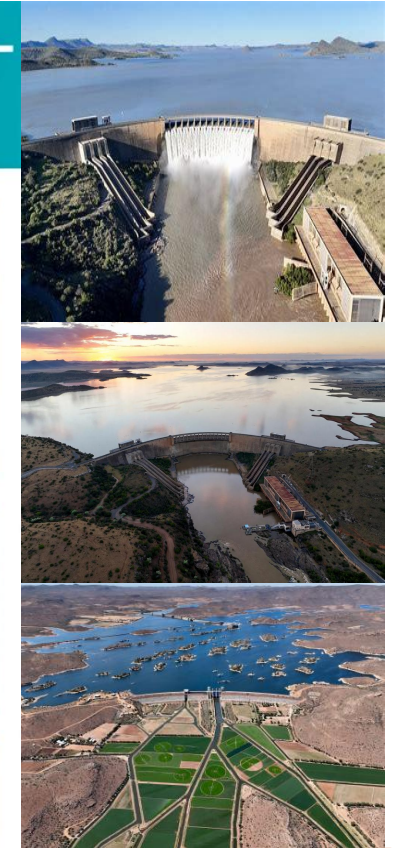
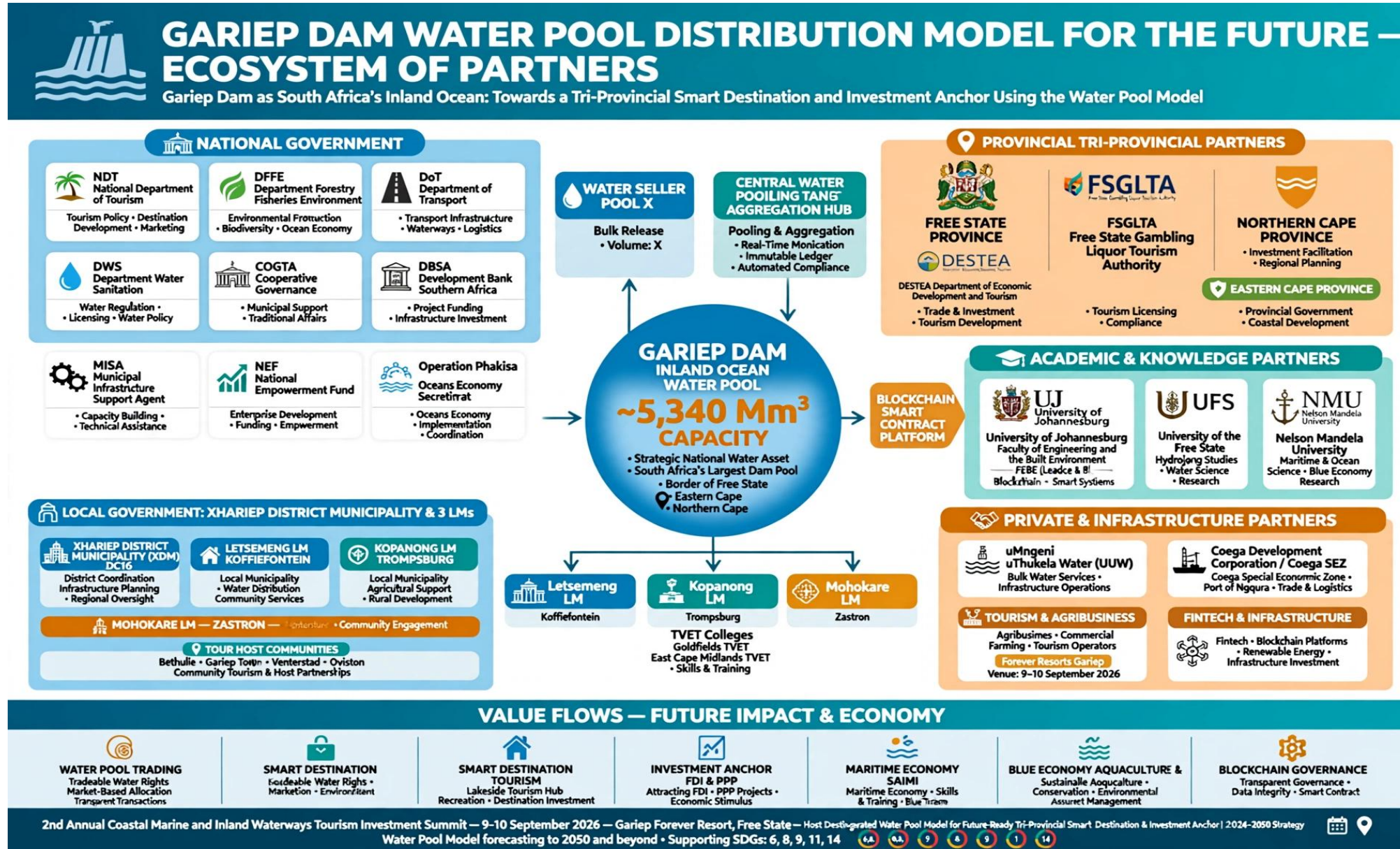
COMPLIANCE
SANS 241 Certification • Regulatory Compliance
• Audit & Monitoring

Key: 500,000 m³ of water already traded from Xhariep DM 3 LMs is now flowing outward to external partners — supporting regional innovation, commercial trade, and sustainable water governance beyond the core region

All partnerships enabled via secure blockchain platform • Data-driven trading • Focus on sustainable water ecosystem & economic growth



WATER POOL MODEL APPLIED



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Water Poor Model Socio-Economic Impact

GARIEP WATER POOL MODEL

Integrated Water Management & Community Impact • South Africa | Key Outcomes 2024



Orange River • Gariep Dam | Free State & Eastern Cape Provinces



PROJECT AREA:
370+ km² Reservoir |
48km NE of Colesberg



Sustainable •
Inclusive • Resilient



Public-Private
Partnership | SMME Focus



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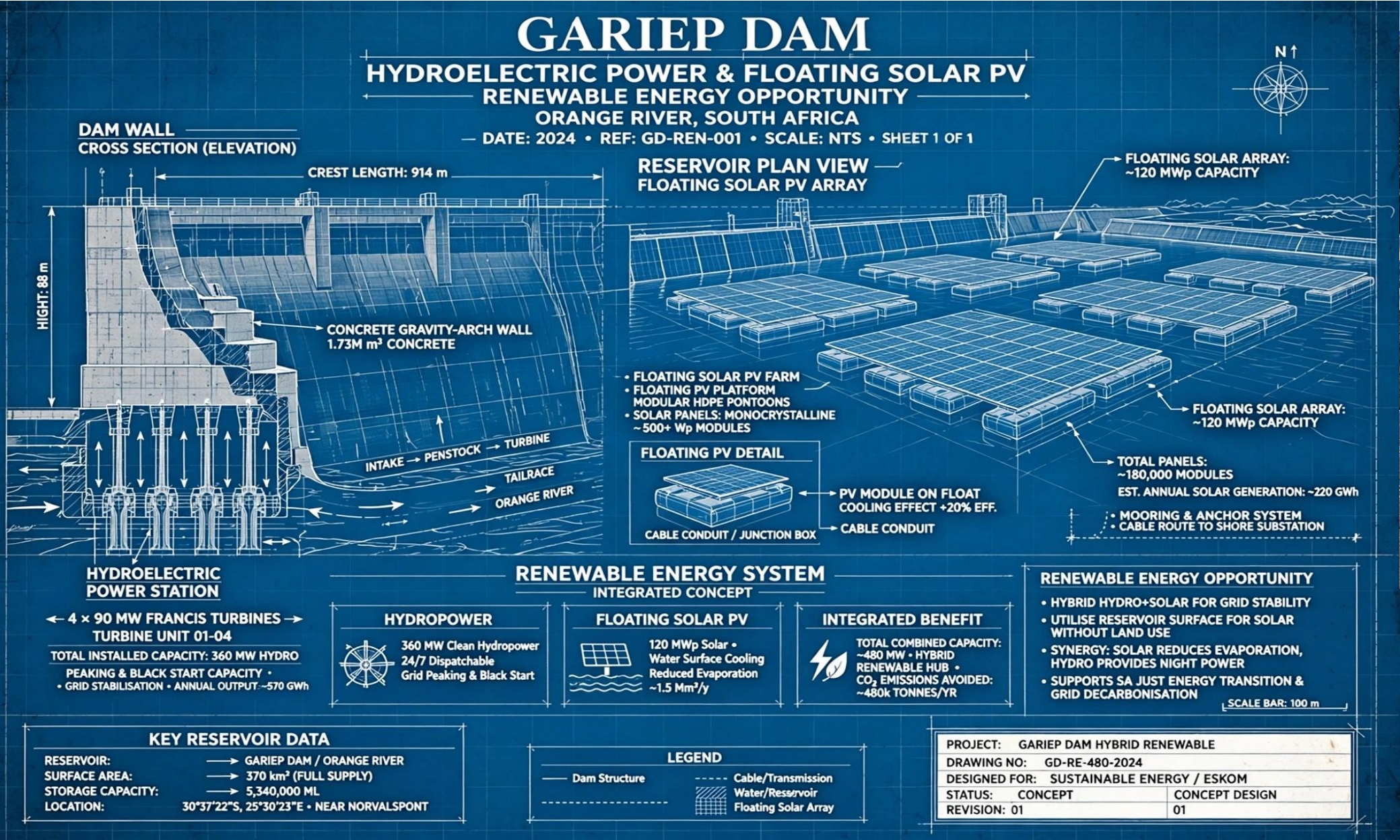
Gariep Water Pool Model: Enhancing water security, livelihoods and ecological resilience through integrated catchment management

Department of Water & Sanitation • South Africa



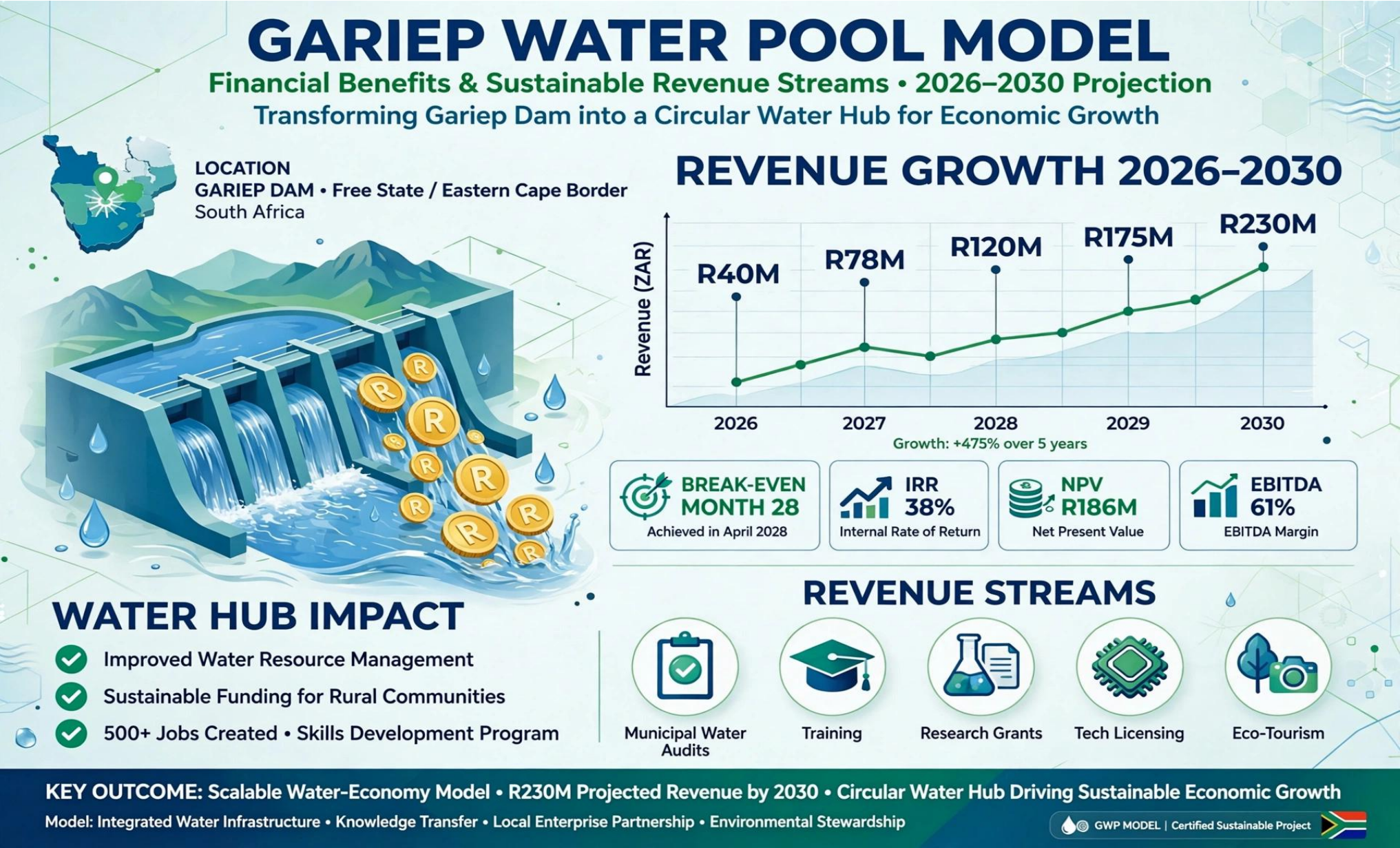
2024

Hydroelectric + Floating Solar Power



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Transforming Gariep Dam into a Water Hub for Economic Growth



Financial Model - Investment & Revenue Streams



GARIEP DAM WATER COMMERCIALIZATION

Financial Model • Investment Flow • Revenue Streams • South Africa • October 2024

Sustainable Water Resource Development | Public-Private Partnership Framework for Commercialization



EXECUTIVE OVERVIEW



TOTAL INVESTMENT
ZAR 2.4 BILLION

CAPEX for infrastructure
& treatment works



**PROJECTED ANNUAL
REVENUE**
ZAR 620 MILLION

Steady state projected for
Year 5 operations

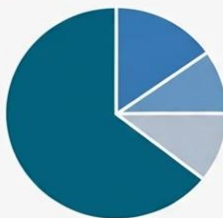


TARGET IRR
12.8%

Weighted average return
on investment



REVENUE STREAMS



- Municipal Water Supply • 42%
- Agricultural Irrigation • 28%
- Hydropower Generation • 15%
- Eco-Tourism & Recreation • 9%
- Bottled Water Export • 6%



INVESTMENT FLOW



INVESTORS & FUNDING

- Public-Private Equity
- Development Finance Institutions
- Government Infrastructure Grant



DEVELOPMENT FUND

- Ringfenced Fund
- Capital Deployment
- Project Management Office



INFRASTRUCTURE & OPERATIONS

- Dam Upgrades
- Water Treatment Plant
- Pipeline Network
- Monitoring Systems



OPERATIONAL DELIVERY

- Commercial Water Supply
- Service Delivery
- Revenue Collection



INVESTMENT ALLOCATION



- Capital Works • 55%
- Operations & Technology • 30%
- Environmental & Community • 15%



FINANCIAL SUMMARY & OUTLOOK

KEY FINANCIALS



NPV (10yr) • ZAR 1.1bn
positive



Payback Period • 6.5 years



EBITDA Margin • 38%
at steady state



VALUE DRIVERS

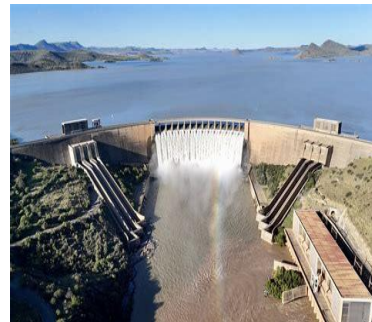
- Regional Agricultural Growth • expanded irrigation demand
- Municipal Supply Contracts • long-term offtake agreements
- Hydropower Generation • renewable energy revenue
- Eco-Tourism Development • sustainable recreation income



RISK & MITIGATION

- Hydrological Variability • diversified supply & storage solutions
- Regulatory Compliance • aligned with National Water Act
- Environmental Safeguards • continuous monitoring & community programs

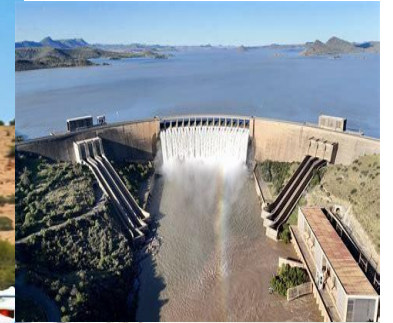
Prepared for Stakeholder Review • Supports regional water security, economic growth, and sustainable resource management • Financial projections based on feasibility study & market analysis



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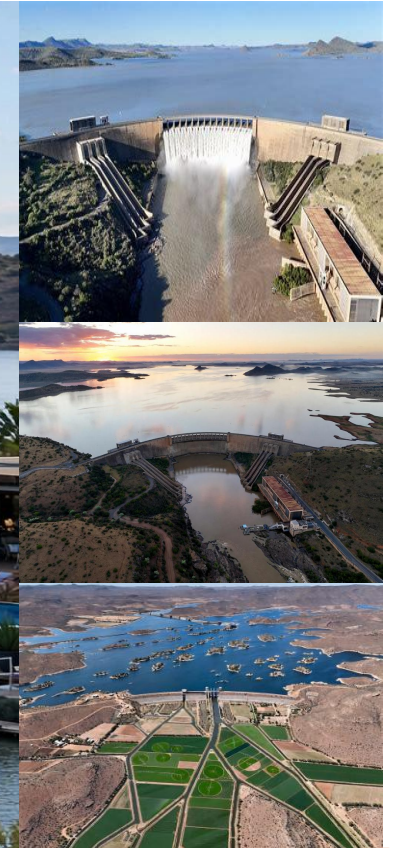
Water Sports Festival & Competitions

Community and Economy Impact - 120 jobs, 300 learners/year, 10 tons fish, tourism boost



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WATER POOL MODEL APPLIED TO GARIEP DAM



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SKILLS FOR THE WATER POOL- Manufacturing

GARIEP DAM WATER POOL TRIANGLE HELIX DUPLEX MANUFACTURING MODEL

MANUFACTURING FOCUS — SMART FACTORY FOR WATER INFRASTRUCTURE COMPONENTS

picture 4 of 4

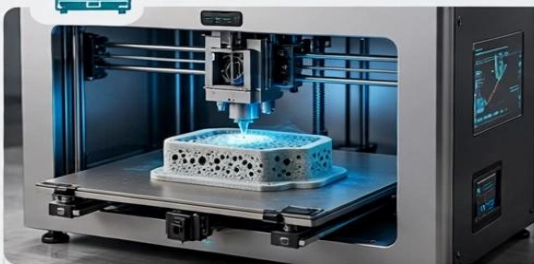
01 • SMART FACTORY & DAM COMPONENTS



Automated fabrication • Quality controlled • Laser-cut steel components



02 • 3D PRINTING WATER TECH



3D printed microfiltration units
• Polymer & ceramic water diffuser components
• Rapid prototyping for flow optimization



03 • IOT SENSOR MANUFACTURING



- WATER LEVEL SENSOR
- FLOW RATE SENSOR
- PRESSURE MONITOR



SMT assembly line • Environmental sensors • Wireless telemetry modules
• Calibration testing chamber

04 • PUMP & PIPELINE + ROBOTICS & DIGITAL TWIN



Centrifugal pump assembly • HDPE pipeline fabrication • Robotic welding & testing
• Digital twin real-time simulation & predictive maintenance



INDUSTRY 4.0 INTEGRATION
• IoT • AI Analytics • Cloud



REAL-TIME DATA
Sensors feed live to cloud dashboard

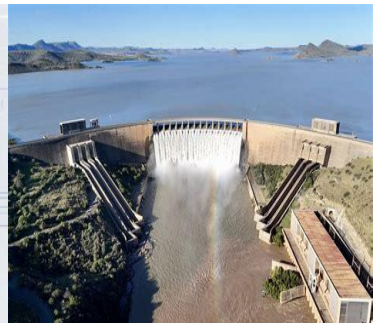


ROBOTICS AUTOMATION
• 24/7 Automated Production



SUSTAINABLE MANUFACTURING
• Energy Efficient • Low Waste

GARIEP DAM WATER POOL • ADVANCED MANUFACTURING FOR WATER SECURITY & INFRASTRUCTURE | MODEL: TRIANGLE HELIX DUPLEX | INDUSTRY 4.0



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SKILLS FOR THE WATER POOL- Manufacturing Projects

SKILLS FOR THE WATER POOL - Manufacturing Research and Innovation Products

Manufacturing Research and Innovation Products

GARIEP DAM WATER POOL TRIANGLE HELIX DUPLEX MANUFACTURING MODEL - MANUFACTURING FOCUS — SMART FACTORY FOR WATER INFRASTRUCTURE COMPONENTS



SMART FACTORY & DAM COMPONENTS



- Robotic assembly of dam sluice gates
- Precision CNC machining
- Laser-cut steel components
- Quality assurance & structural testing



3D PRINTING WATER TECH



- Additive manufacturing of microfiltration units
- H2O-POLY filament (polymer/ceramic composite)
- Polymer & ceramic diffuser components
- Rapid prototyping for water tech



IOT SENSOR MANUFACTURING



- SMT assembly line for water sensor PCBs
- Sensors: Water level, Flow rate, Pressure monitoring
- LoRa/WiFi telemetry modules
- Calibration & environmental testing



PUMP & PIPELINE + ROBOTICS & DIGITAL TWIN



- Robotic welding of centrifugal pumps
- HDPE pipeline fabrication
- Digital twin simulation on monitor
- Predictive maintenance & analytics



HYDRO TURBINE & VALVE MANUFACTURING



- CNC machining of hydro turbine blades
- Smart valve assembly with actuator
- Sustainable corrosion-resistant alloys
- Performance testing & hydraulics



ADVANCED MATERIALS & FILTRATION RESEARCH



- Nanomaterial water filtration membranes
- Graphene oxide composite filters
- Ceramic membrane development
- Lab research & materials characterization



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W.E.A.L.T.H.

Partnership • Research • Advancement • Learning • Technology

P.R.I.D.E.

Partnership • Research • Innovation • Development • Excellence





INDUSTRY 4.0 INTEGRATION

IoT • AI • Cloud



REAL-TIME DATA

Sensors feed live to cloud dashboard



ROBOTICS AUTOMATION 24/7

Automated Production



SUSTAINABLE MANUFACTURING

Energy Efficient • Low Waste



RESEARCH & INNOVATION

University R&D • Prototyping

IDZ Industrial Park linked to Gariep Water

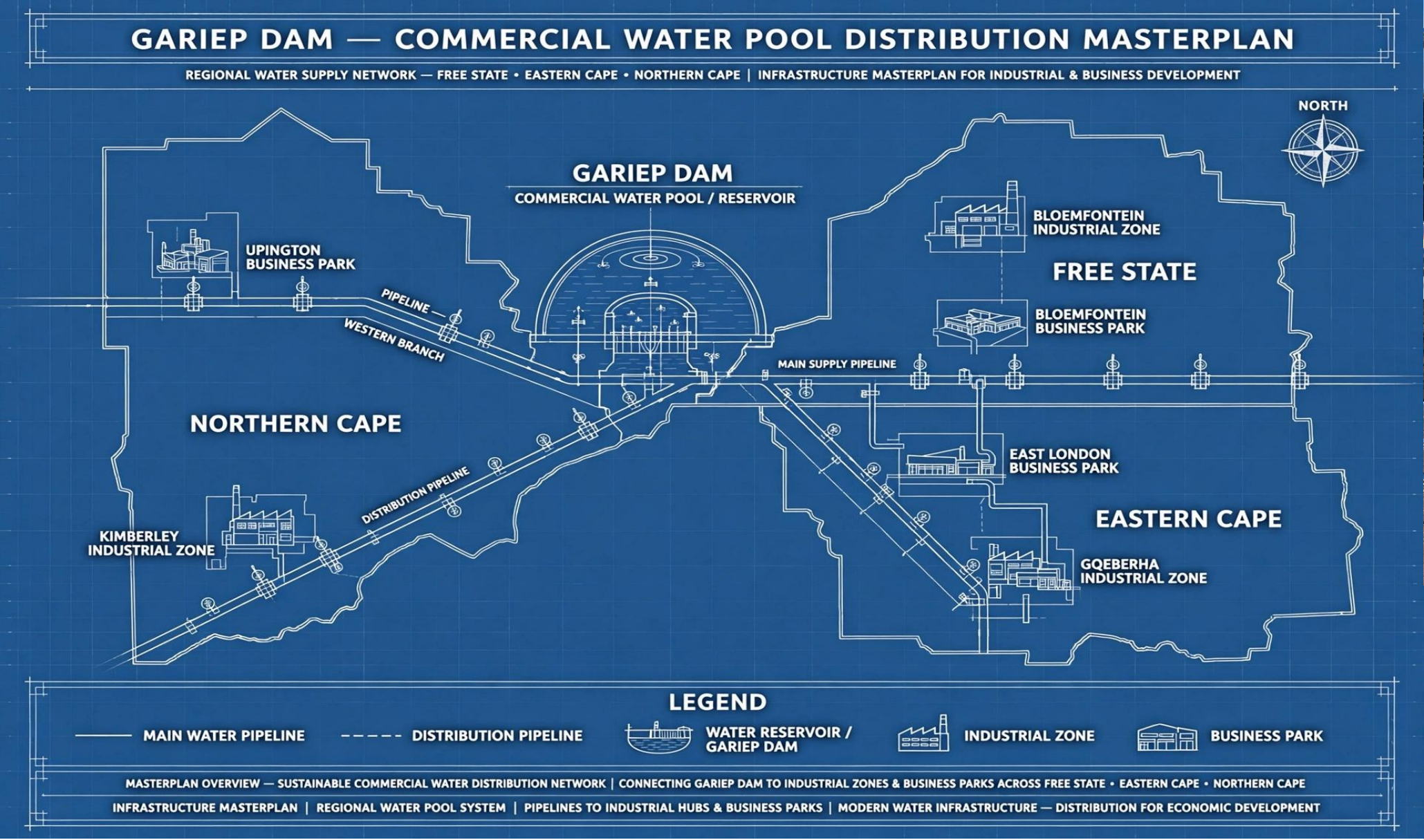


Gariep Dam Water Pool IDZ Model

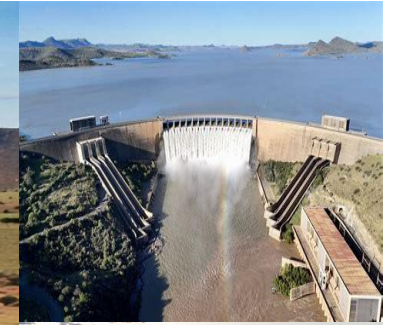


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Commercial Water Pool Distribution Master Plan



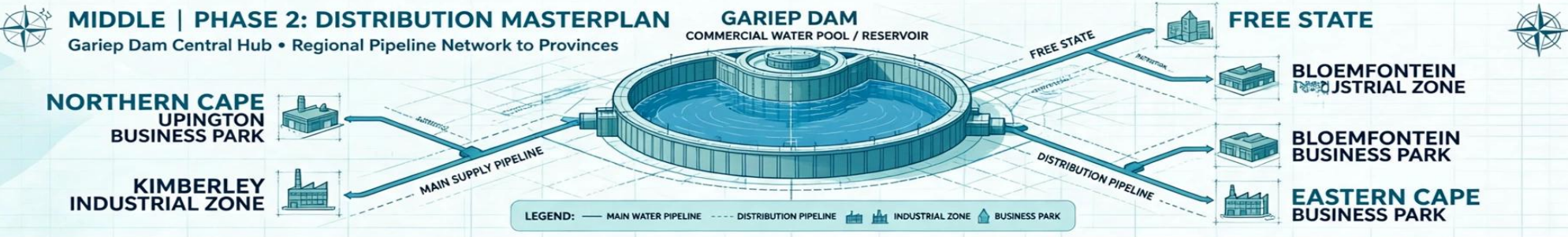
RESOLUTION : Gariep Water Hub COE beyond 2063 AU Agenda



RESOLUTION : Gariep Water Hub COE beyond 2063 AU Agenda

GARIEP WATER POOL - INTEGRATED ROADMAP TO DISTRIBUTION MASTERPLAN

Linking Strategy to Infrastructure to Impact



Gariep Water Pool Model: Enhancing water security, livelihoods and ecological resilience through integrated catchment management

Department of Water & Sanitation • South Africa • 2024



Thank You

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