



Eva Masemola and Kevin
Pietersen

Stakeholder Workshop: Conjunctive Use Guideline



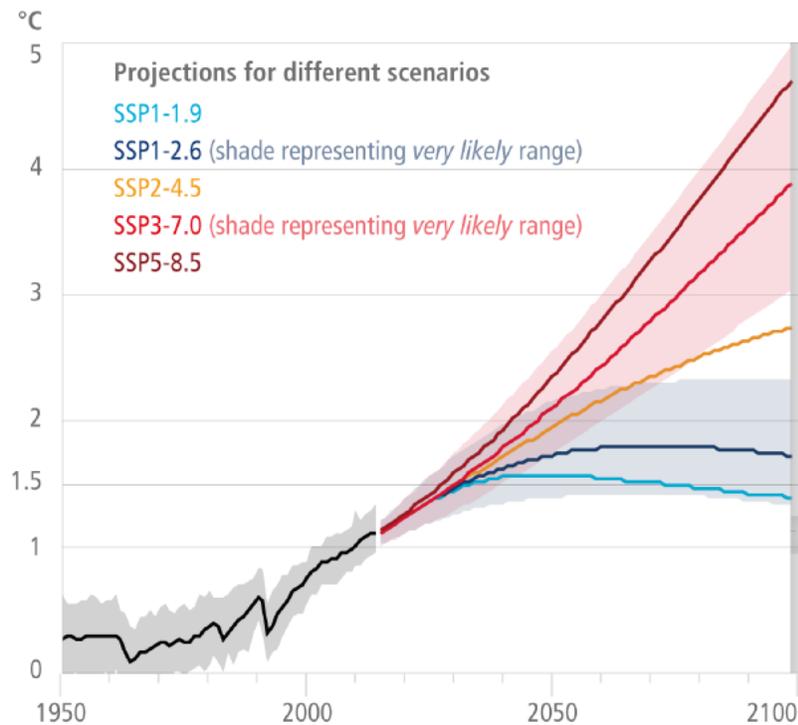
Agenda for the workshop

- 09:30 – 09:45: Welcome - Kevin Pietersen
- 09:45 – 10:00: Purpose of the stakeholder workshop - Kevin Pietersen
- 10:00 - 10:30: Presentation of conjunctive water use guideline Eva Masemola
 - Overview of conjunctive water use
 - Option analysis
 - Cost-benefit analysis
- 10:30 – 11:30: Facilitated discussion – Yazeed Van Wyk

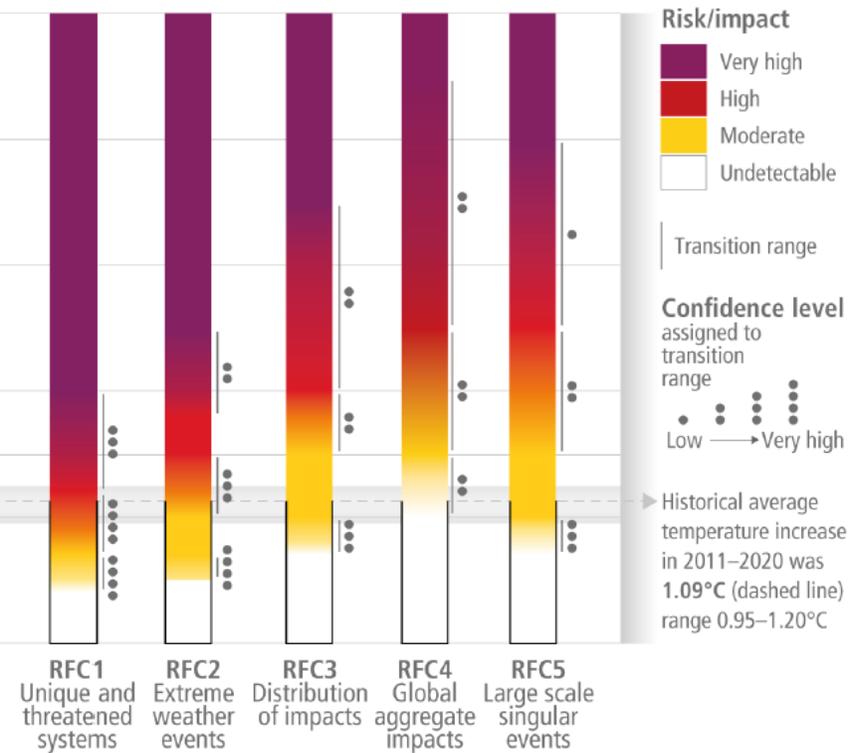
Climate change

Climate Change 2022

(a) Global surface temperature change
Increase relative to the period 1850–1900



(b) Reasons for Concern (RFC)
Impact and risk assessments assuming low to no adaptation



There is a rapidly narrowing window of opportunity to enable climate-resilient development

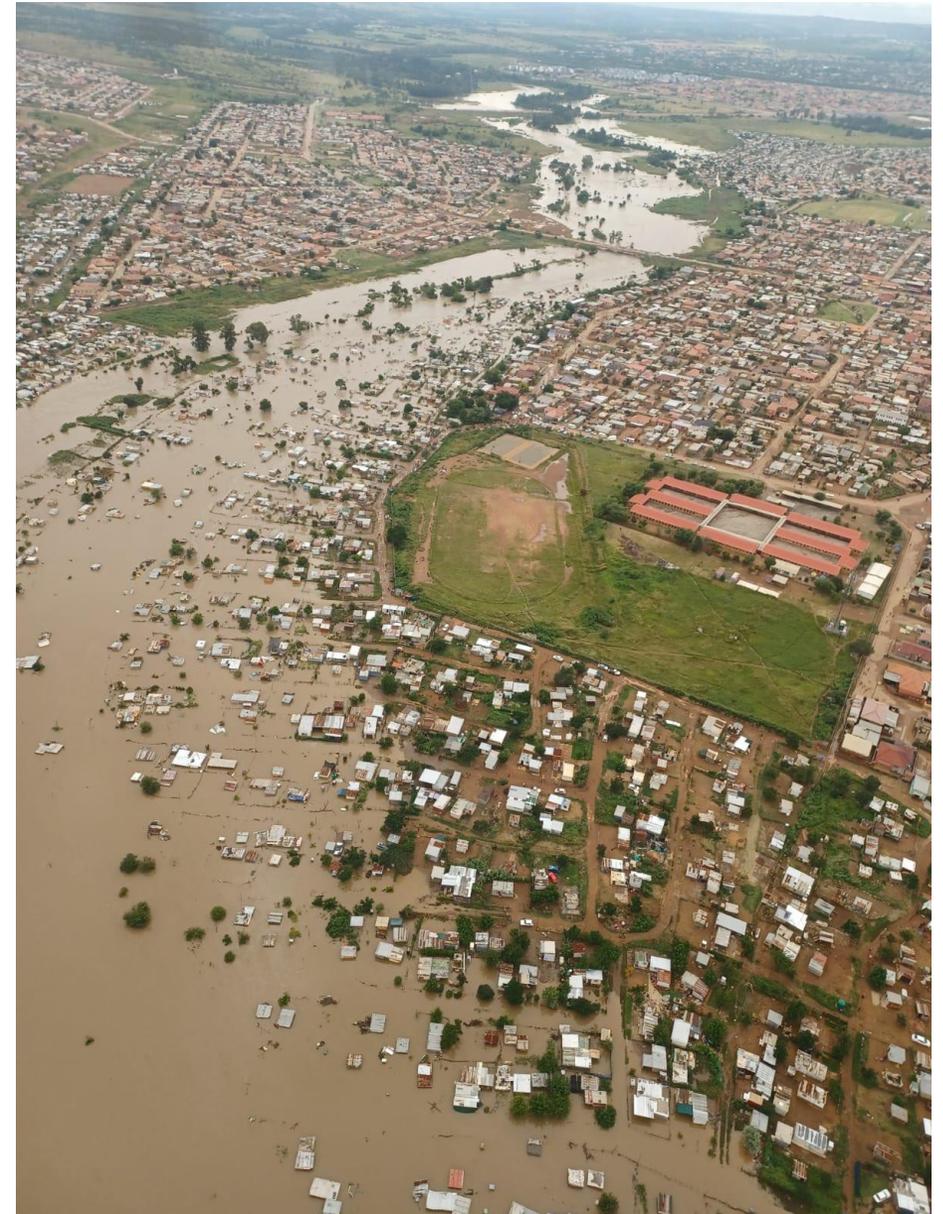
Water resilience

- Resilience is the ability of social-ecological systems to weather and recover from shocks and stresses while remaining adaptable to an uncertain future, and “**water resilience**” refers to those characteristics in a water system
- Key shocks and stresses
 - Drought
 - Flooding
 - Poverty and inequality
 - Earthquakes
 - Habitat losses
 - State collapse or crisis
 - Disease

ENVIRONMENT

Our future is here: Empty taps, dry lands,
thirsty power plants

Sipho Kings 25 Oct 2019

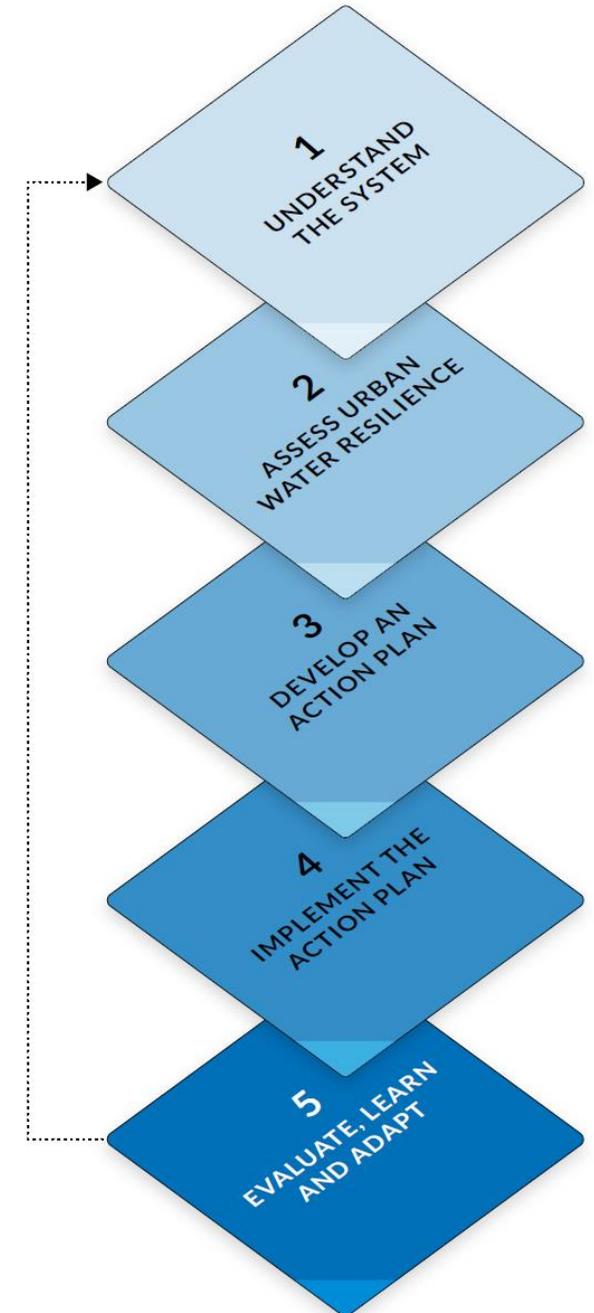


Flood in Tshwane, South Africa, February 2022. Photo: City of Tshwane

Water resilience portfolio

First, plug the leaks

- Maintain and diversify water supplies
- Protect and enhance natural ecosystems
- Build infrastructure connections
- Be prepared



Water supply diversification

- Watershed upgrade and restoration
- Storage projects such as reservoirs and dams
- Groundwater supply
- Managed aquifer recharge
- Groundwater banking
- Rainwater and stormwater harvesting
- Water reuse
 - Water reuse can transform domestic wastewater into agricultural irrigation water to promote food security.
 - In industry, many kinds of process wastewater can be treated and reused
 - Mine water reuse (acid mine drainage, non-impacted, decant)
- Desalination also has become widely viable since operating expenses have dropped and demand has increased, especially in coastal areas, on islands, or above brackish aquifers



Interventions to support water resilience

1. Groundwater supply
2. Conjunctive management
3. Managed aquifer recharge
4. Groundwater reuse and recycling
5. Differentiated groundwater use
 - i. Domestic use
 - ii. Agriculture use
 - iii. Mine water use
6. Desalination of brackish groundwater

Water resilience: Aquifer and groundwater recharge solutions are essential to building future security



Despite knowing that South Africa's water demand will outstrip supply by 17% in under 10 years and despite the El Niño-induced droughts, the ANC has taken a casual and ignorant approach to water, while the DA has no understanding of water as a commons, and the EFF ignores the impact of the climate crisis on the country's water system. (Photo: Alaister Russell / The Sunday Times)



By Shafick Adams

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Conjunctive management

CONJUNCTIVE USE OF GROUND AND SURFACE WATERS: CLASSICAL APPROACHES AND CALIFORNIA'S EXAMPLES

Manuel PULIDO¹, Guilherme F. MARQUES², Marion W. JENKINS³, and Jay R. LUND²

Temporal strategy	Problem	Time Period	Strategy
Drought cycling	Droughts, inter-annual imbalances in water availability and demands	Annual to decadal time-frame	Store and use surface water in wetter years, use more groundwater in drier years
Seasonal cycling	Seasonal imbalances in water availability and demands	Seasonal, within year	Greater wet season use and recharge of surface water, and dry season use of groundwater
Initial intensive exploitation	The initial stage of regional development and conjunctive use	Initial development of Conjunctive management	Initial intensive groundwater withdrawals support early economic development, deferring or phasing investments in surface infrastructure
Continuous	Saline intrusion, contaminants dispersion in aquifer	Continuous	Reallocation of pumping and surface water, recharge management, freshwater injection.
Mixed	Combination of above	Mixed	Integrated mixture of above strategies

Example of season cycling

Groundwater as part of the water supply mix

**It is not either/or.
It's both.**

CAPE TOWN NEEDS GROUNDWATER

**A Note on the Potential of the Cape Flats Aquifer Unit
to Supply Groundwater for Domestic Use in the Cape Town Metropolitan Area**

By: L.G.A. Maclear
Geohydrology Directorate, Department of Water Affairs and Forestry, CAPE TOWN
Technical Report No. Gh3868, August 1995.

Daily consumption average of 526ML/day

CoT website accessed 15/02/2018

Adopt peak water supply approach

Short term : 100 ML/day

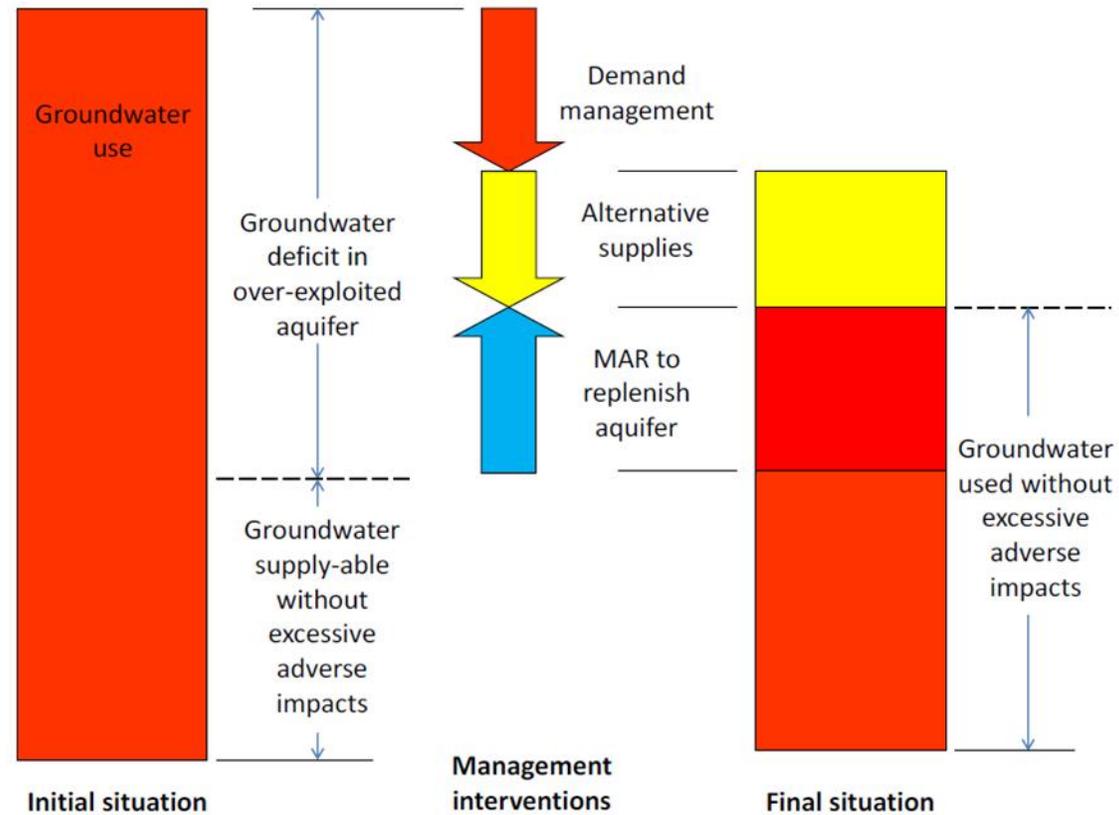
Barry Wood CoT



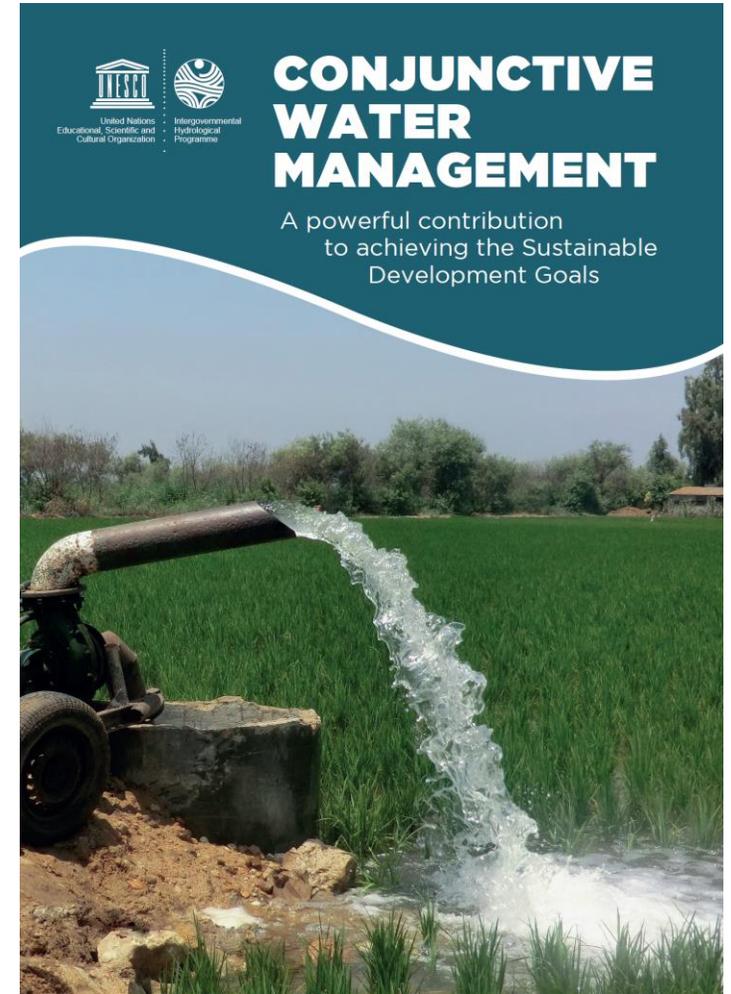
**Cape Flats aquifer yield (12 month cycle):
50 ML/day**

**Cape Flats aquifer yield (4 month
cycle): Perhaps > 150 ML/day**

Managed aquifer recharge



- More water resources available for use and lower risk of water shortages
- Water resources sustainability
- Environmental benefits
- Economic and social benefits
- Elimination or reduction of planning flaws and errors
 - Double counting
- Synergy with high-level global policy priorities related to water



Benefits of conjunctive management

Background

- Municipalities developed many water supply schemes using groundwater as a resource
- Groundwater schemes fail due to a lack of knowledge and mismanagement, and the municipalities consider groundwater resources not sustainable
- Limited access to groundwater resources in many parts of South Africa is due more to the infrastructure's functionality than the physical availability of groundwater resources



Open Access Article

Stranded Assets as a Key Concept to Guide Investment Strategies for Sustainable Development Goal 6

by [Robert M. Kalin](#)^{1,*}, [Joseph Mwanamveka](#)², [Andrea B. Coulson](#)³, [Donald J. C. Robertson](#)¹,
[Holly Clark](#)¹, [Jon Rathjen](#)⁴ and [Michael O. Rivett](#)¹

Types of groundwater schemes

Standalone scheme	<ul style="list-style-type: none"> • A spring, borehole or well equipped with a pump. Typically, many standalone schemes only have one water source without a backup in the case of failure <ul style="list-style-type: none"> • Rising main pipeline from the borehole to the storage reservoir • Water treatment and disinfection and disinfected water storage reservoir. Many schemes supply groundwater without treatment or disinfection • Distribution pipelines to communal tap stands or private connections
Group scheme	<ul style="list-style-type: none"> • More than one groundwater source (spring, borehole or well equipped with a pump) • Rising main pipeline from the borehole to a central storage reservoir • Water treatment and disinfection and disinfected water storage reservoir. Some schemes supply groundwater without treatment or disinfection • Distribution pipelines to reservoirs at the individual settlements that may be supplied by gravity or pumped • Distribution pipelines to communal tap stands or private connections
Regional scheme	<ul style="list-style-type: none"> • Multiple groundwater sources or wellfields • Raw water pipelines, pump stations and reservoirs • Water treatment and disinfection facilities • Treated water pipelines, pump stations and reservoirs • Reticulation networks
Private supply	<p>Private supply schemes could range from a borehole or well with a hand pump in the yard to a sophisticated system integrated with a fully plumbed house or institution, including complex water treatment, storage, and a booster pump station.</p>



a



b



c



d

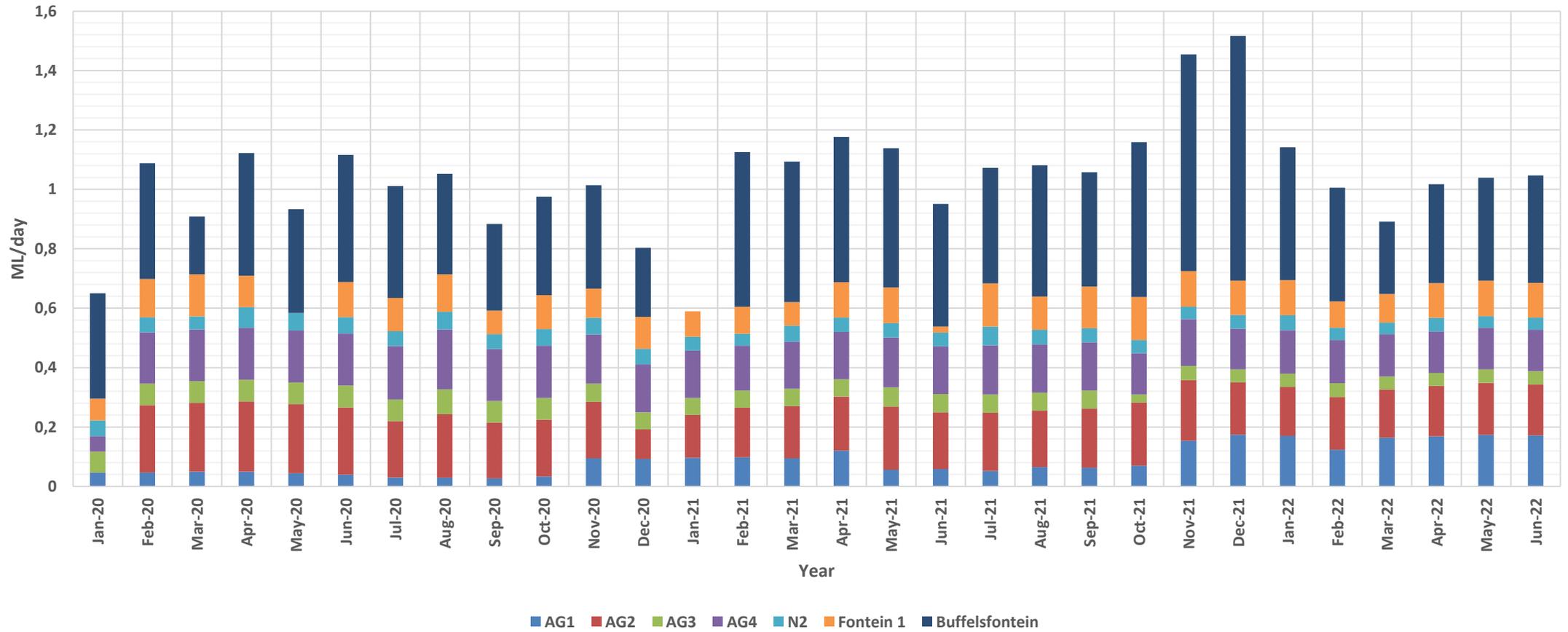


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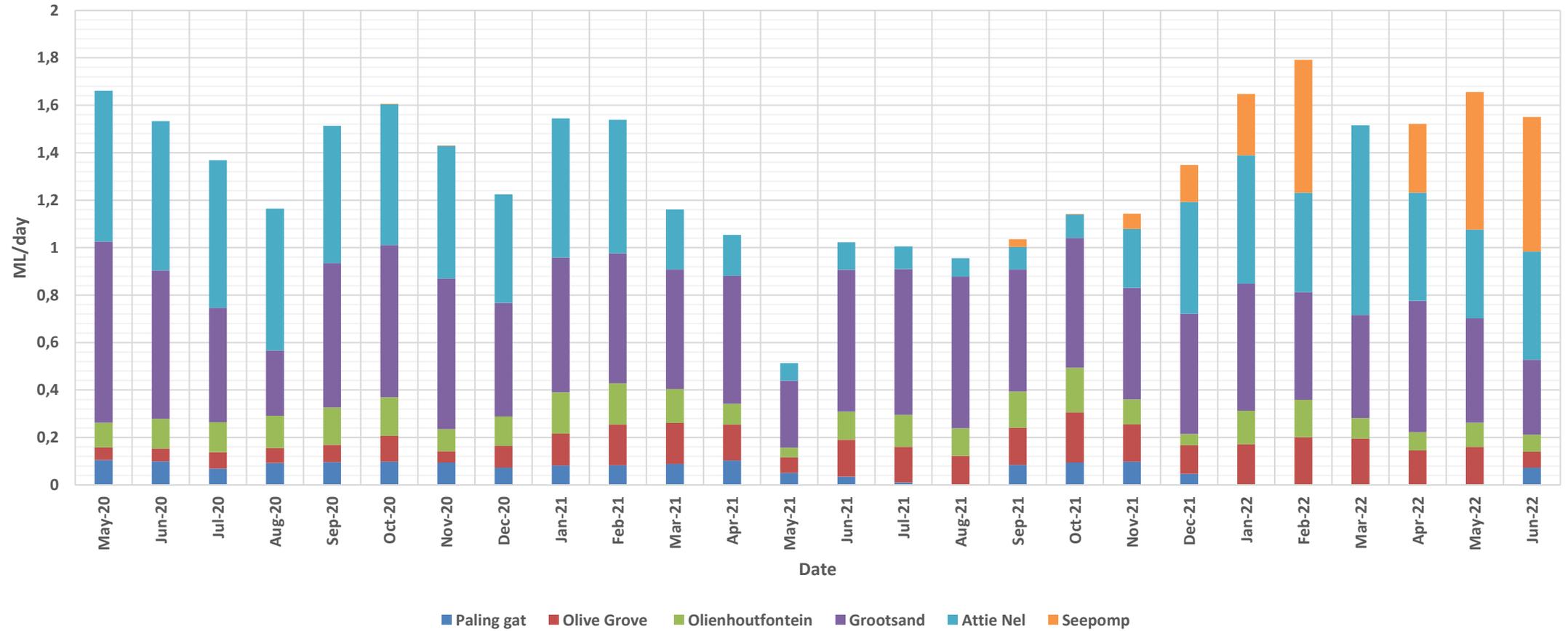


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Albertinia water supply

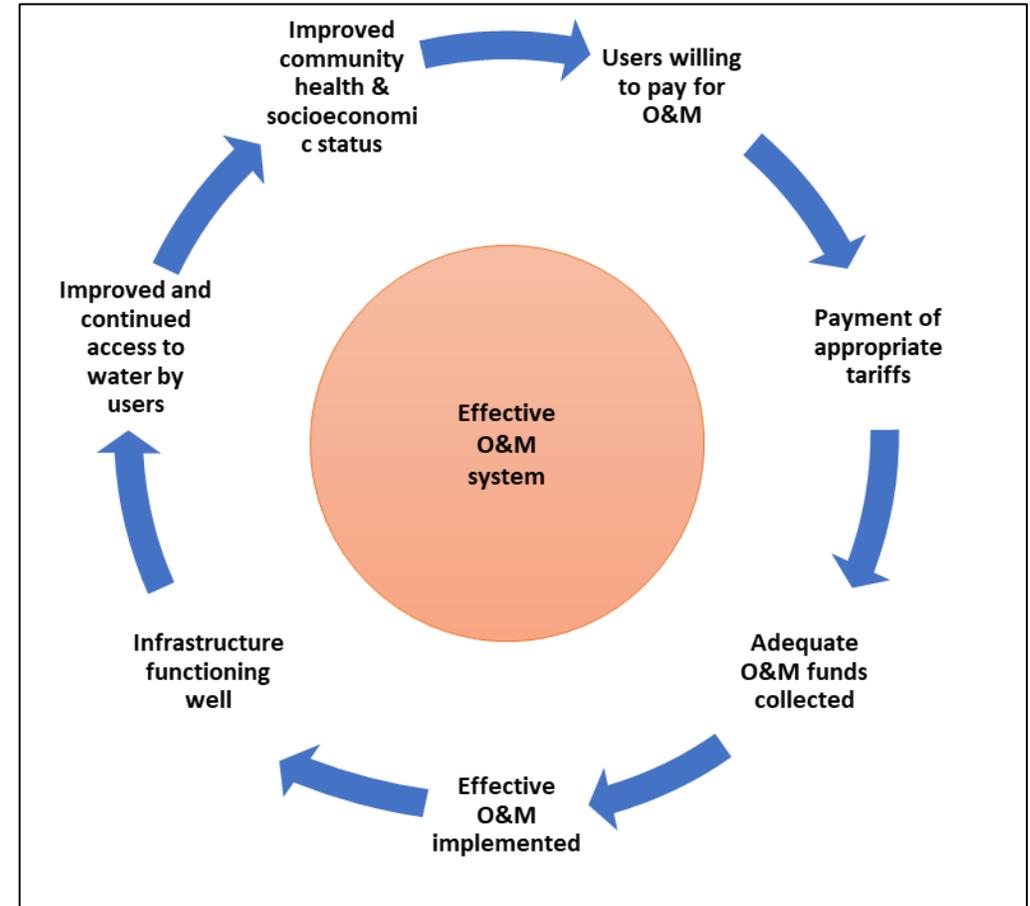


Stillbaai



A vicious cycle of an ineffective and virtuous cycle of effective operation and maintenance systems

- Frequent breakdowns/extended downtimes
- Shortened life of infrastructure
- Dry and collapsed boreholes
- Water scarcity results in the prevalence of water-borne diseases due to the use of unprotected and unsafe water sources
- School dropouts, particularly for the girl child
- Abandonment of schemes and water facilities
- Impaired livelihoods



Purpose of the workshop

- In collaboration with the Danish Embassy, the WRC is developing a series of guidelines as part of the South African Strategic Water Sector Cooperation
- The bilateral cooperation aims to contribute to the South African water sector through knowledge sharing of practical experiences by industry experts
- The benefits that can be gained from conjunctive water use have not yet created a significant shift from a reliance on surface water to more investment into developing groundwater resources
- Groundwater development in South Africa is still lagging

Purpose of the workshop

Present

Present the guideline for conjunctive use and planning

Explore

Explore the benefits of conjunctive management

Facilitate

Facilitate discussion about mainstreaming conjunctive use