

The delineation and importance Strategic Water Source Areas for South Africa

David Le Maitre¹, Helen Seyler², Lindie Smith-Adao¹ and
Jeanne Nel¹

1: Natural Resources and the Environment, CSIR

2: delta-H

Supported by the WRC

delta h CSIR
WATER SYSTEMS MODELLING
our future through science



Introduction

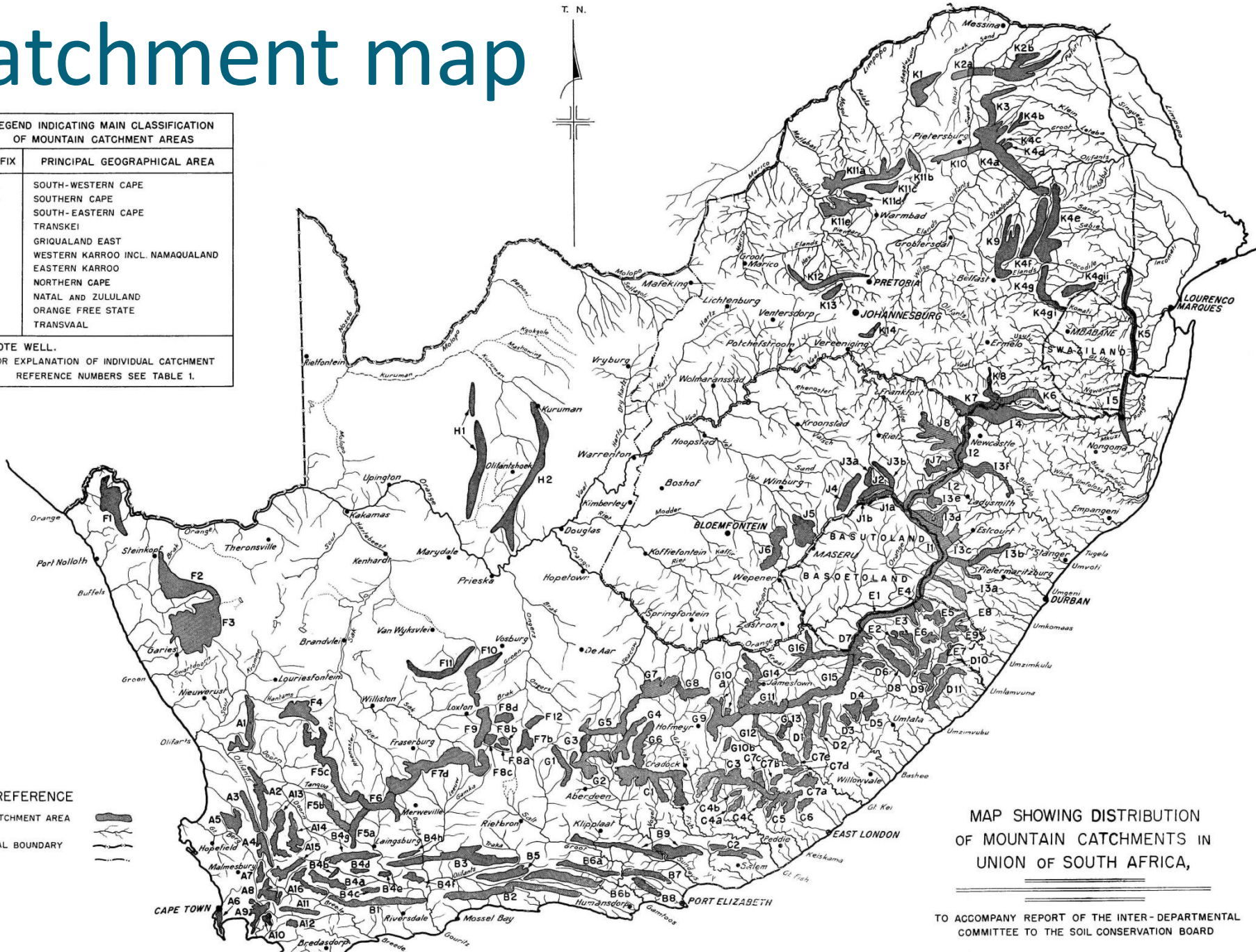
- Water Source Areas
 - Not a new concept
 - Emerged as a concern in the 1800s in South Africa
 - 1961 report – mountain catchment areas
 - 20th century - Water towers
 - 2013 – *Strategic Water Source Areas for South Africa*
 - Areas producing a high volume of river flows
 - **And/or critical for water security**

Catchment map



LEGEND INDICATING MAIN CLASSIFICATION OF MOUNTAIN CATCHMENT AREAS	
PREFIX	PRINCIPAL GEOGRAPHICAL AREA
A	SOUTH-WESTERN CAPE
B	SOUTHERN CAPE
C	SOUTH-EASTERN CAPE
D	TRANSKEI
E	GRIQUALAND EAST
F	WESTERN KARROO INCL. NAMAQUALAND
G	EASTERN KARROO
H	NORTHERN CAPE
I	NATAL AND ZULULAND
J	ORANGE FREE STATE
K	TRANSVAAL

NOTE WELL. FOR EXPLANATION OF INDIVIDUAL CATCHMENT REFERENCE NUMBERS SEE TABLE 1.
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REFERENCE

- MOUNTAIN CATCHMENT AREA
- RIVER
- INTERNATIONAL BOUNDARY
- PROVINCIAL

MAP SHOWING DISTRIBUTION OF MOUNTAIN CATCHMENTS IN UNION OF SOUTH AFRICA,

TO ACCOMPANY REPORT OF THE INTER-DEPARTMENTAL COMMITTEE TO THE SOIL CONSERVATION BOARD

SCALE 1:3,000,000

The WRC project

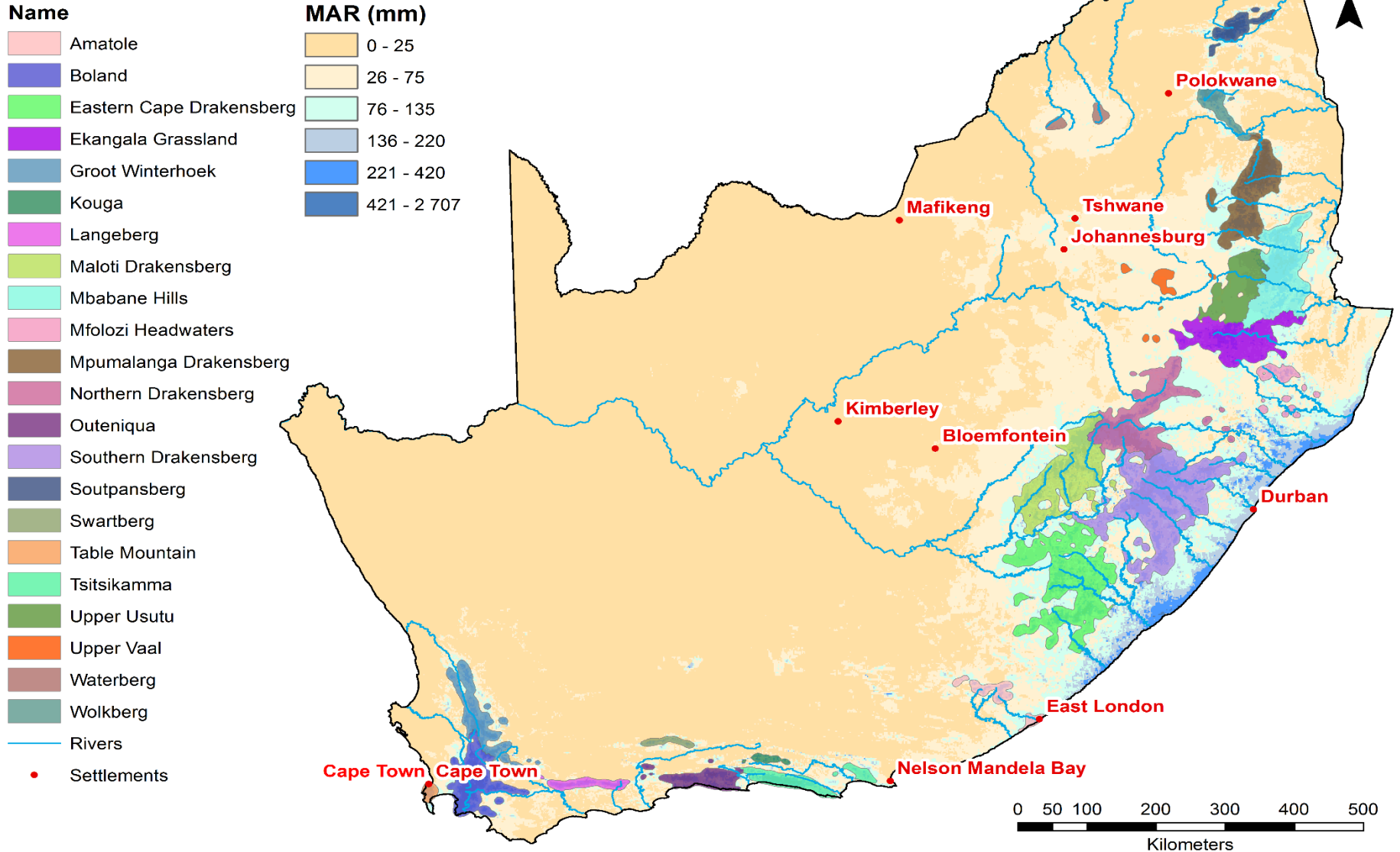
- WRC funded initiative
 - Include groundwater SWSAs
 - Obtain stakeholder buy-in – nationally strategic
 - Link SWSAs to benefit flows
 - Identify and quantify pressures & threats
 - Develop protection options & management guidelines

Definition

- Strategic Water Source Areas (SWSAs) are areas of land that either:
 - (a) supply a disproportionate amount of mean annual surface water runoff in relation to their size and are considered nationally important (**surface water**); or
 - (b) have high groundwater recharge **and** where the groundwater forms a nationally important resource (groundwater: high use and dependence);
 - (c) or areas that meet both criteria (a) and (b) (**overlaps**)

New SWSAs – surface water

Strategic Water Source Areas for surface water (SWSA-sw)

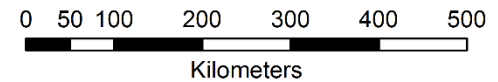
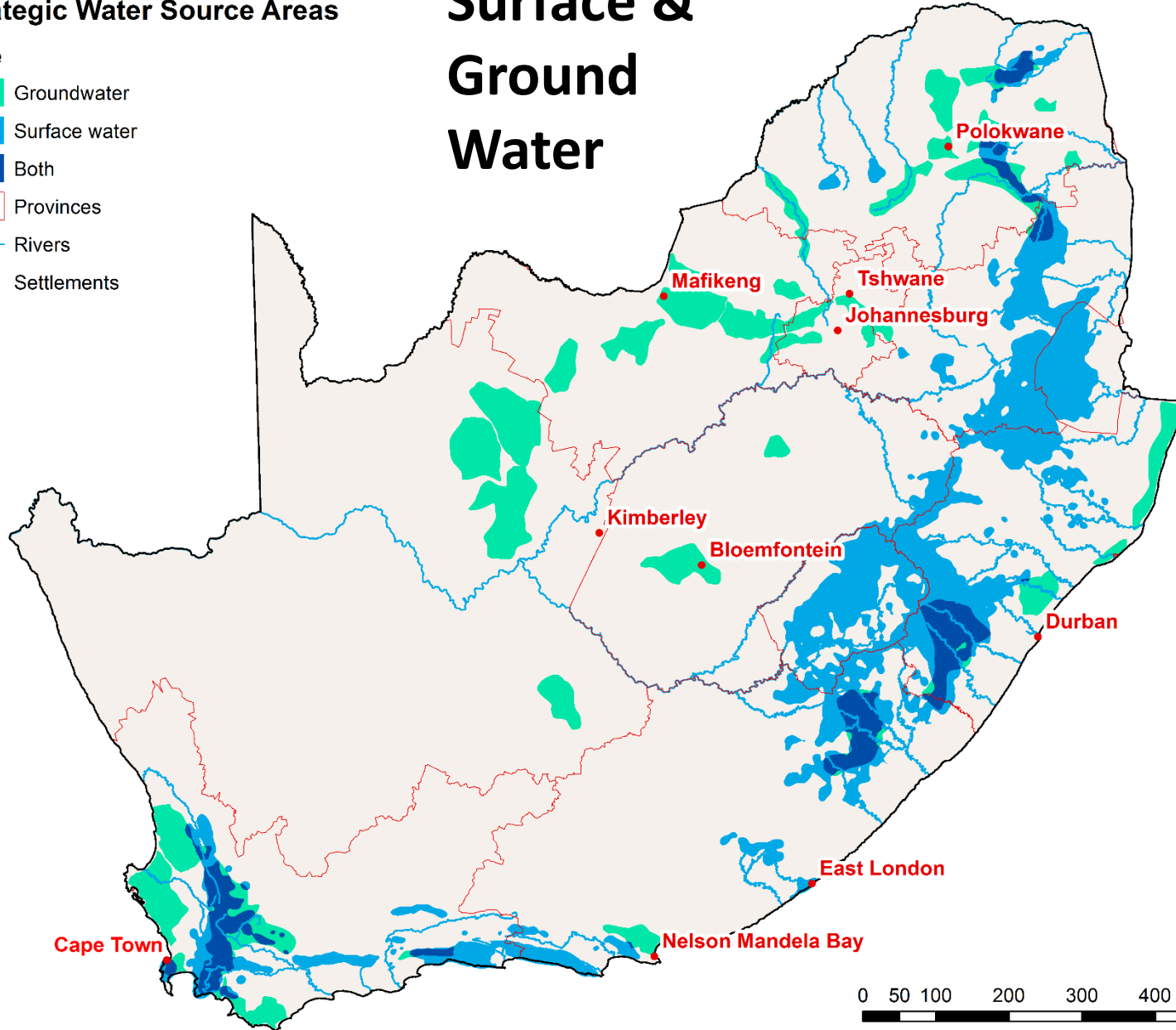


Strategic Water Source Areas

Type

- Groundwater
- Surface water
- Both
- Provinces
- Rivers
- Settlements

Surface & Ground Water



Key statistics for surface water

- 22 **national** SWSA-sw
 - Total area 12.41 million ha (9.78%)
 - Total MAR 24.95 billion m³ (50.39%)
 - Excluding Lesotho & Swaziland
 - 9.61 million ha, MAR 19.38 billion m³ (39.13%)
- Feed water supply systems for >50% of population
- Supply urban/industrial areas that generate >64% of GVA
- Supply ±70% of irrigation water

Key statistics for groundwater

- 37 **national** SWSA-gw, 9% of SA
- Areas receiving >65mm/a recharge equate to 50% recharge volume over SA (overlaps)
- SWSA-gw:
 - Account for up to 42% of the baseflow in their areas
 - Support 24% of the population
 - Supply:
 - 46% of the groundwater used by agriculture
 - 47% of the groundwater used for industrial purposes

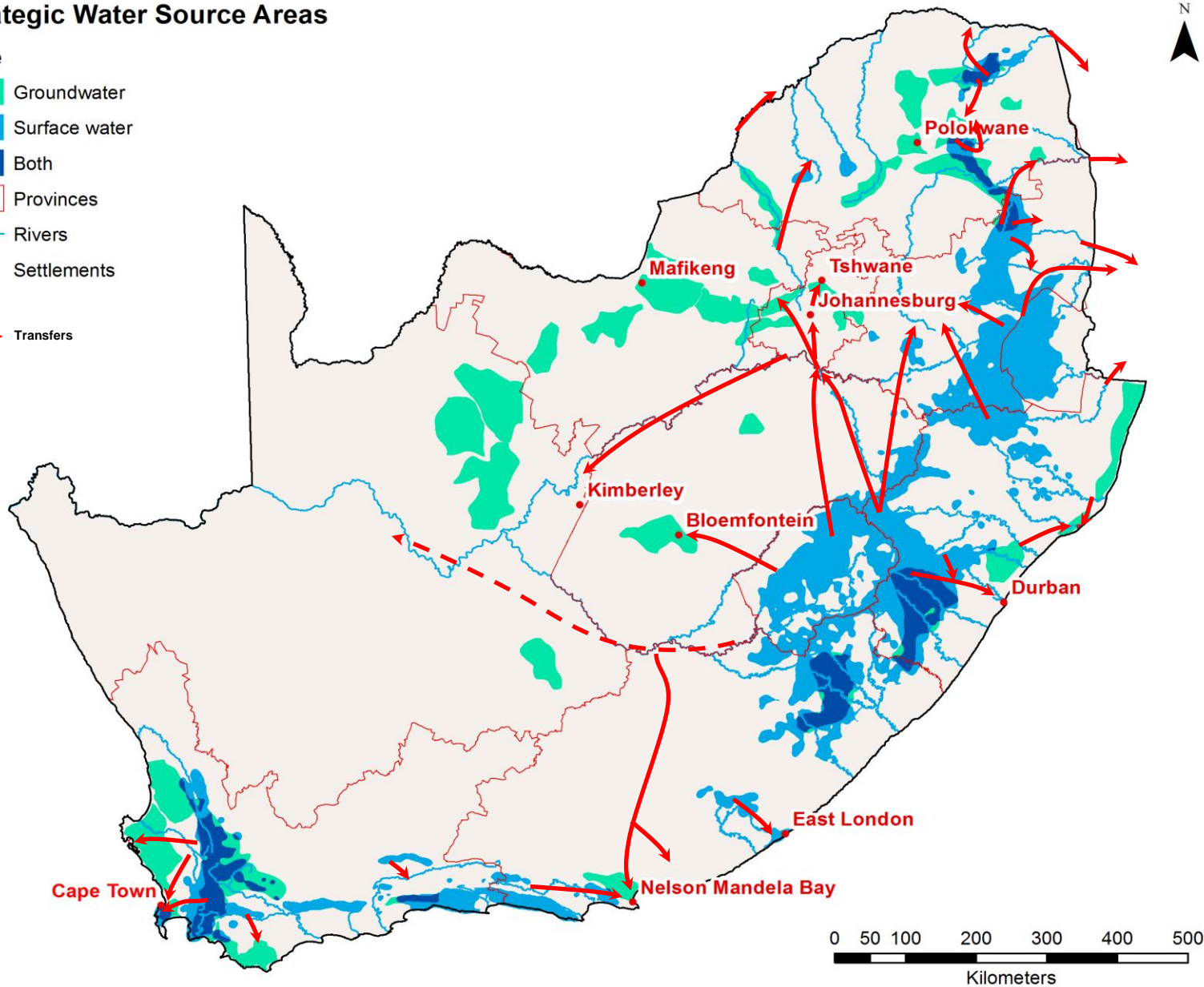
Investment in infrastructure

- South Africa has made huge investments
 - Dams
 - Complicated water transfer schemes
 - To sustain
 - Economic development centres
 - Strategic industries
 - Power generation
 - Irrigated agriculture
 - To enhance water security
- **Now we need to invest in the sources of the water**

Strategic Water Source Areas

Type




- Groundwater
- Surface water
- Both
- Provinces
- Rivers
- Settlements
- Transfers

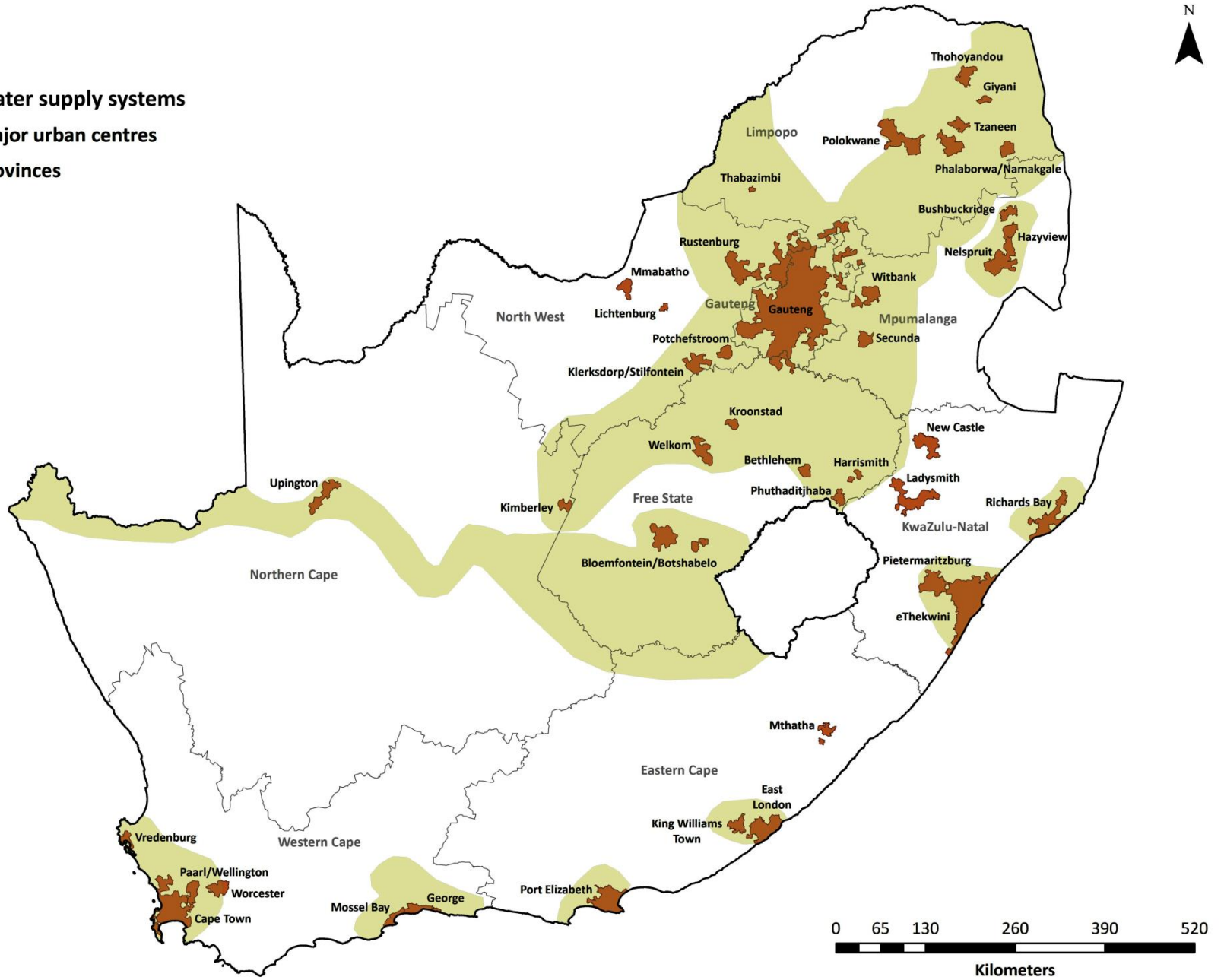


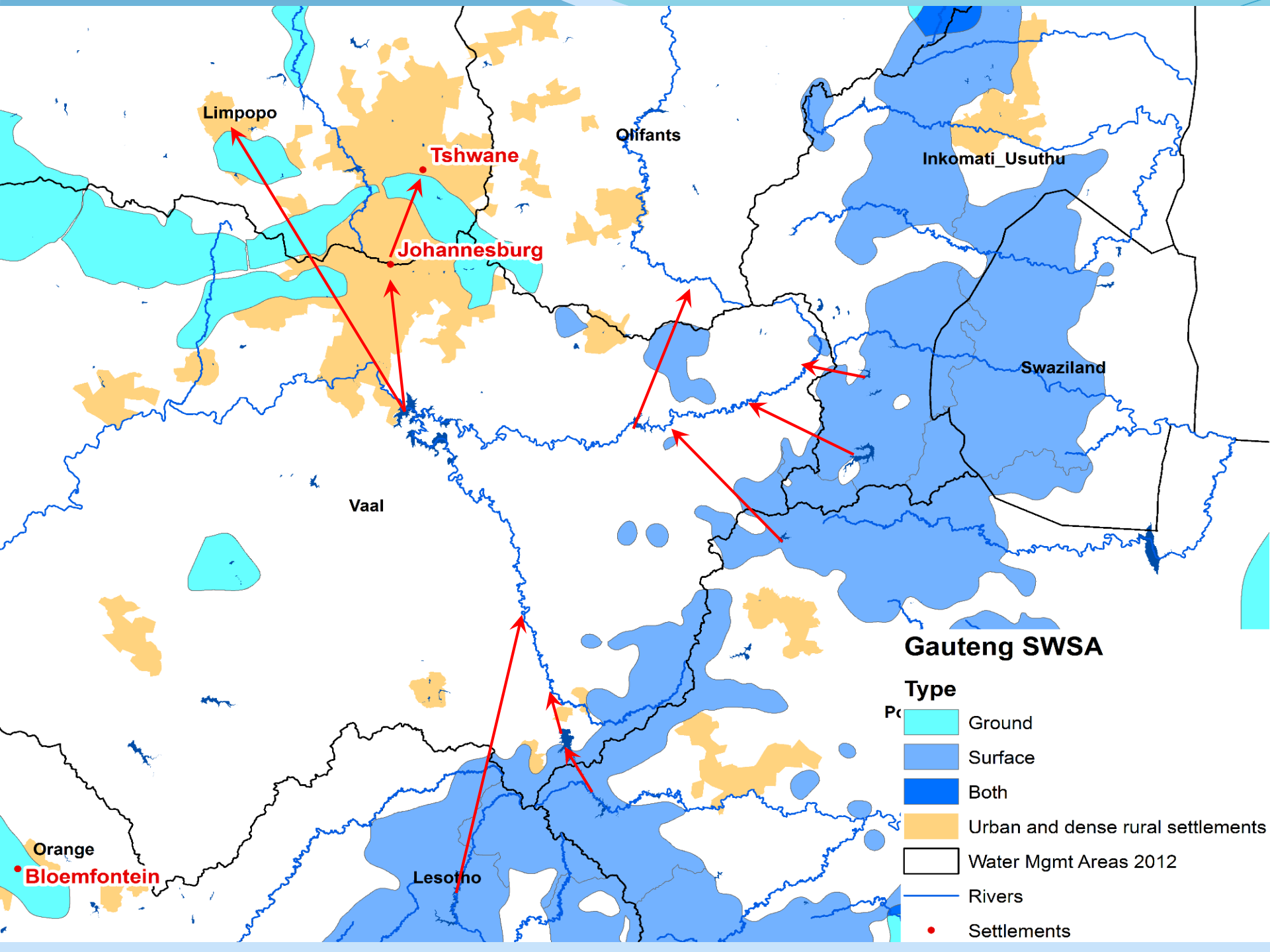
Selecting economic centres

- 26 areas of national economic importance
 - National Water Resources Strategy
 - 17 selected using various factors, including
 - population
 - level of economic activity
- These include 60% of the population (2011)
- Accounted for $\pm 75\%$ of the national GVA (2011)
- Conservatively all or most of the water for:
 - $>50\%$ of the population and $>70\%$ of the GVA



-  Water supply systems
-  Major urban centres
-  Provinces





Limpopo

Tshwane

Johannesburg

Olifants

Inkomati_Usuthu

Swaziland

Vaal

Gauteng SWSA

Type

PC

Ground

Surface

Both

Urban and dense rural settlements

Water Mgmt Areas 2012

Rivers

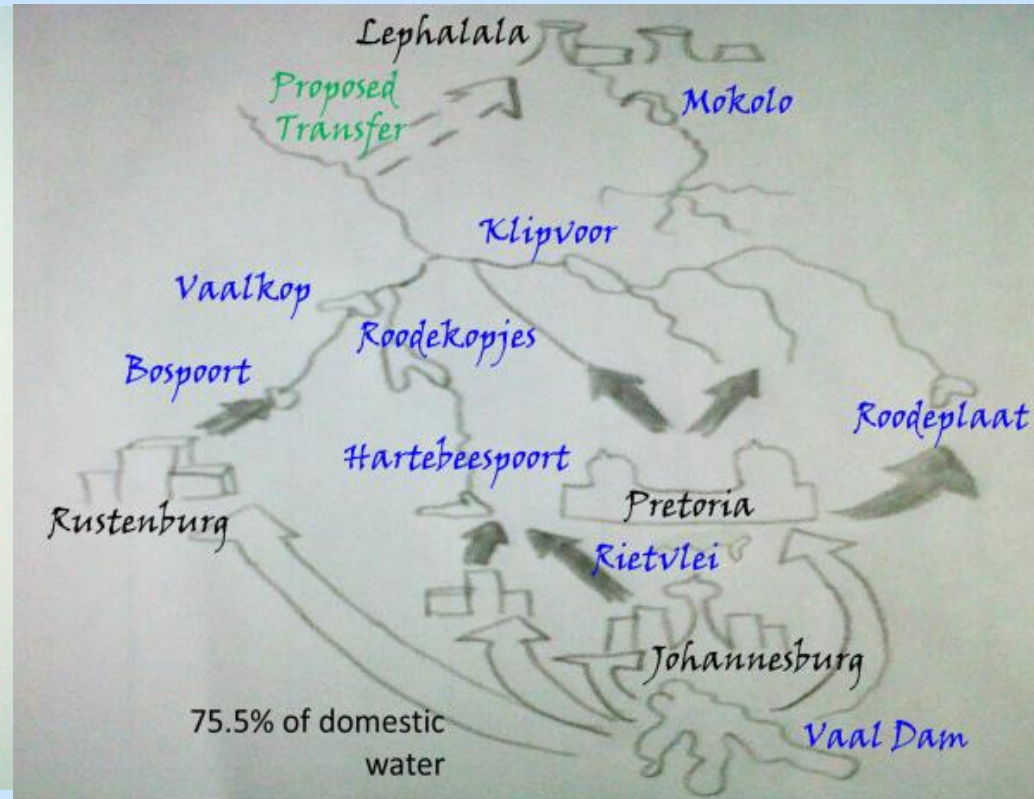
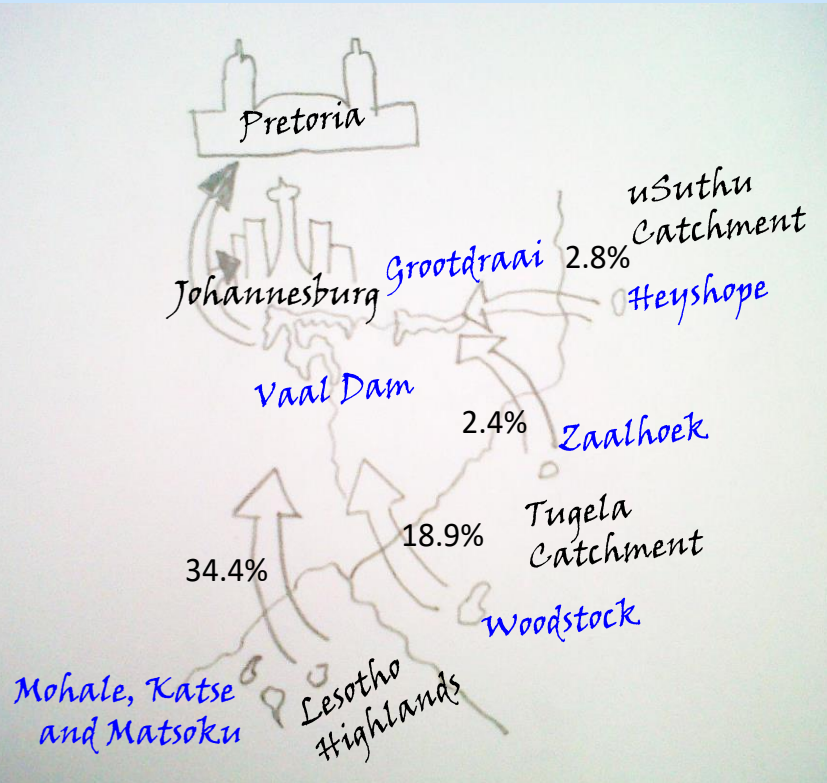
Settlements

Orange

Bloemfontein

Lesotho

Gauteng



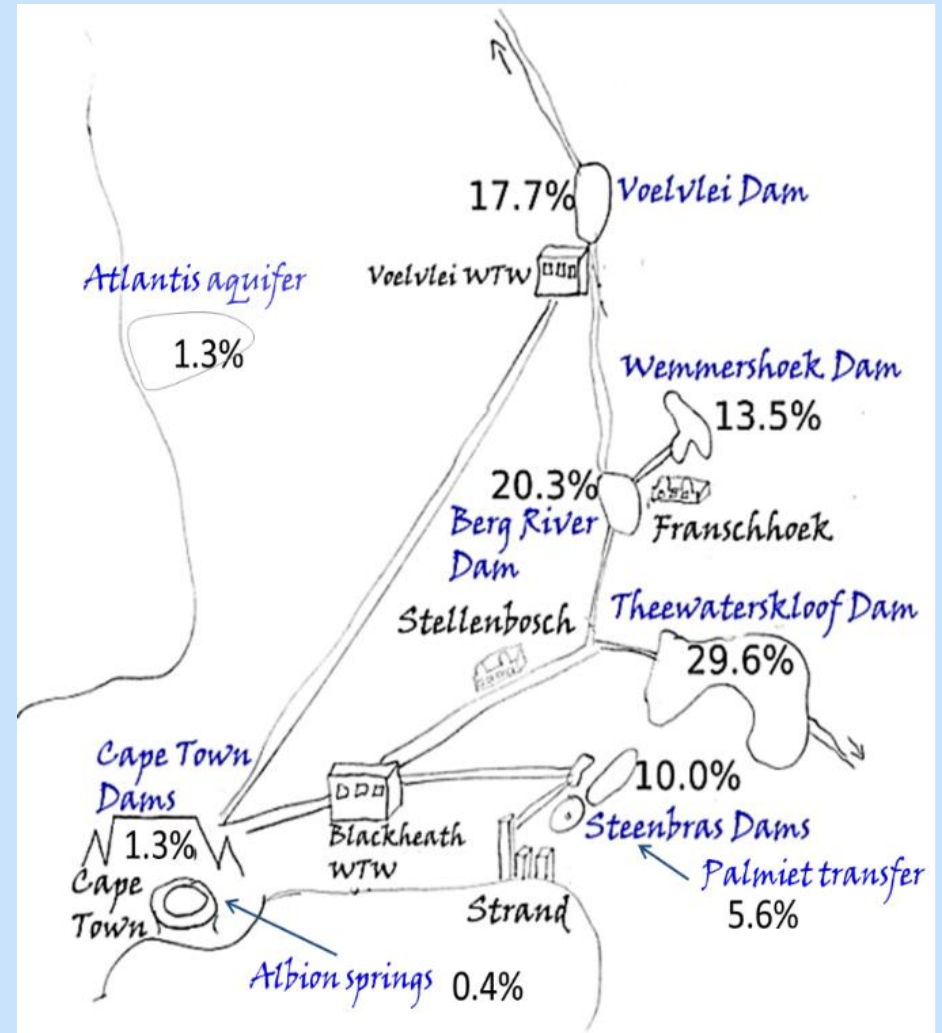
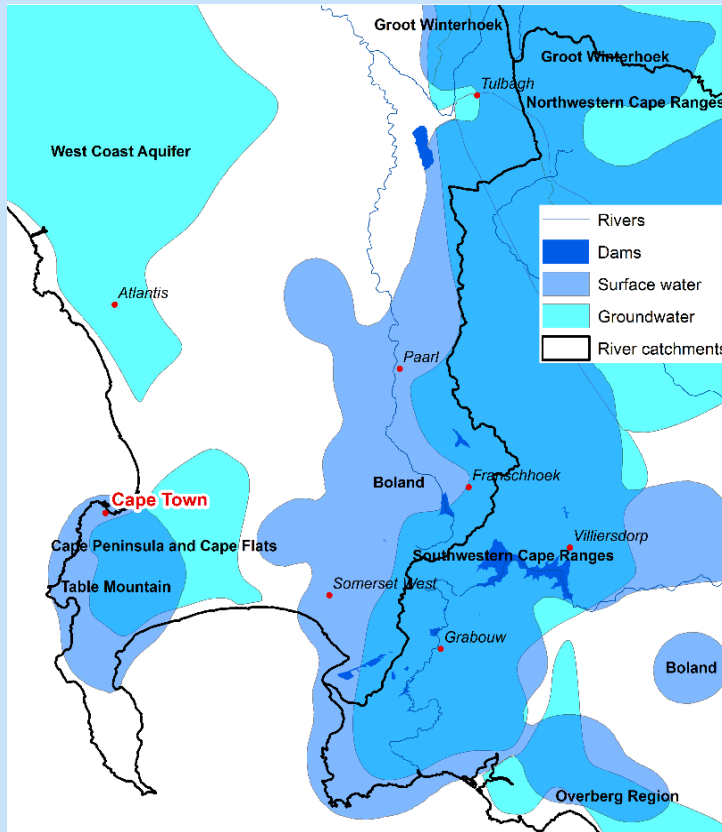
71% of the water in Vaal WSS

Johannesburg, Pretoria, East and West Rand

Population ±13.19 million (25.5% of the population) (2011)

Gross Value Added of R587 billion (36.1%) (2011)

Cape Town



98.4% from surface water

1.6% from groundwater

Population in WSS > 4.2 million (8.2% of the total population) (2011)

GVA R196 billion (12.0% of national GVA) (2011)

2nd after Gauteng, >70% of the Western Cape

Major Water Supply Schemes

WSS	Urban Centre	% linked to SWSA-sw
Vaal	Johannesburg, Midrand, Vereeniging, Rustenburg, Secunda & others	70.6
Crocodile West	Greater Johannesburg, Midrand, Pretoria (Tshwane)	>50.0
Western Cape	Cape Town and Boland towns	100.0
KwaZulu-Natal	Durban Metropole, Pinetown, Pietermaritzburg & others	97.8
Algoa	Nelson Mandela Metropol	91.0

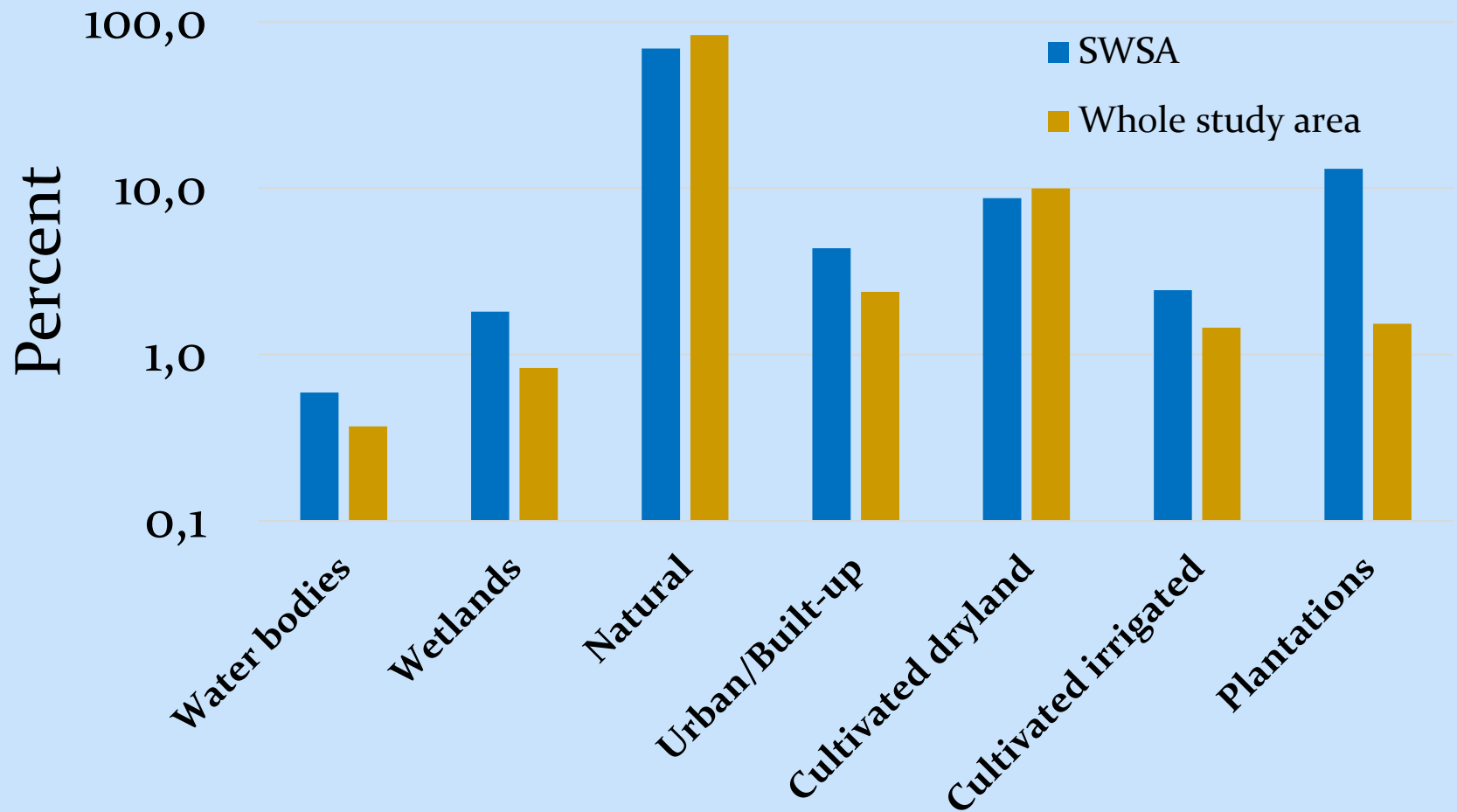
Irrigated agriculture

- Provides almost all the vegetables and fruit for local use and export
- Directly or indirectly supports about 8.5 million people
- Accounts for $\pm 3\%$ of GDP
- Estimated to use 60% of the available water
- Estimated area $\pm 17\,645\text{ km}^2$ (2014)
- $\pm 70\%$ of the water is directly or indirectly from the SWSA-SW
- Groundwater abstraction only 14% of water for agriculture
 - $\pm 47\%$ is from SWSA-gw

Groundwater and settlements

Item	Count	Population (approximate)
Sole GW source settlements within SWSA-gw	94 (24% of all sole GW source settlements, or 10% of all settlements)	1 127 042 (17% of the population within sole GW source settlements, or 2% of all South Africans)
All sole GW source settlements	394 (41% of all settlements)	6 726 172 (12% of South Africans)
All South Africa	966	54 000 000

Land cover 2014



Coal mining

- ☒ Coal fields
- Surface and groundwater combined
- Type
- Surface water
- Groundwater
- Both
- ▭ Lesotho and Swaziland
- Rivers
- Towns

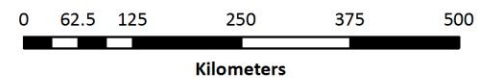
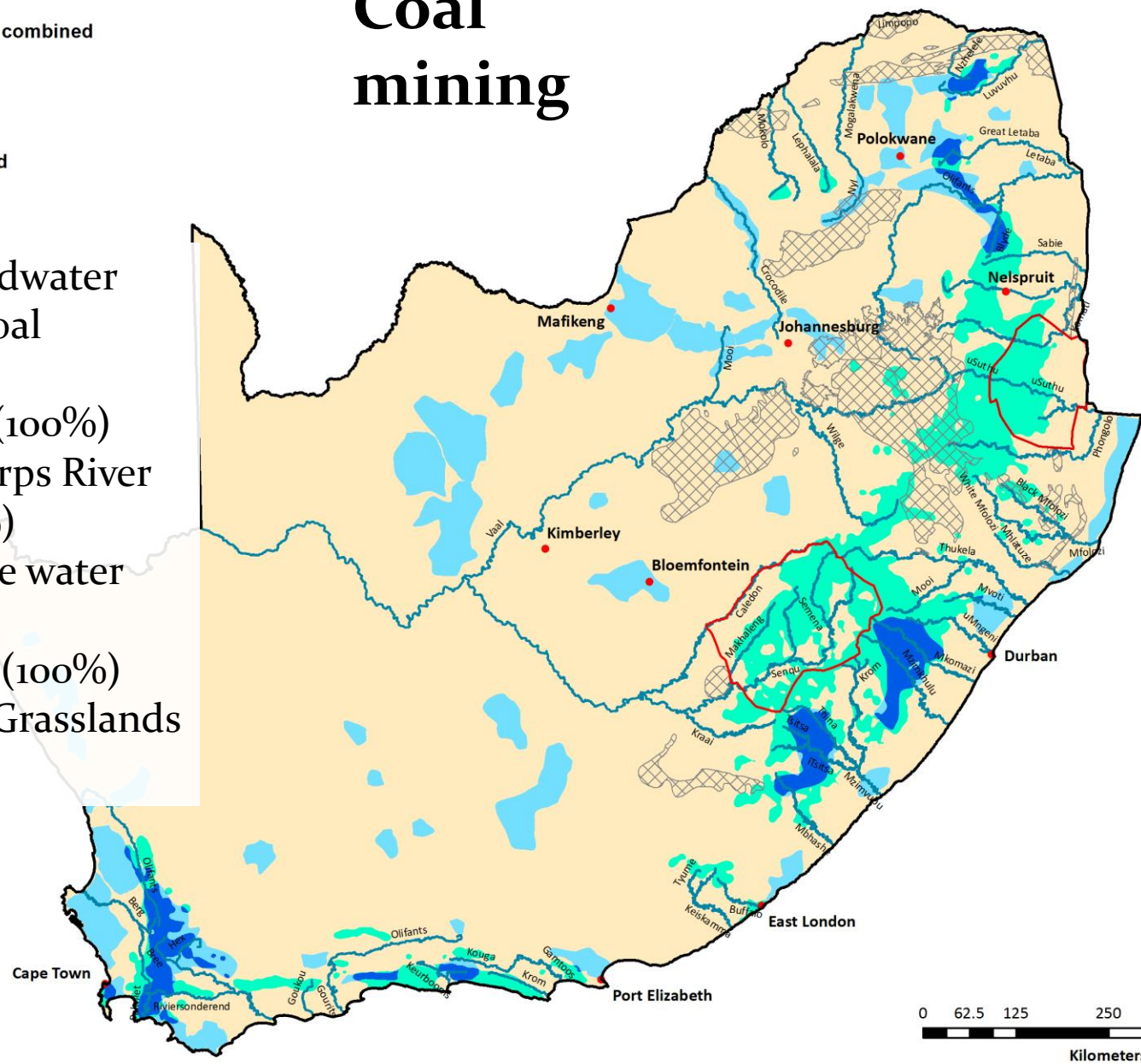


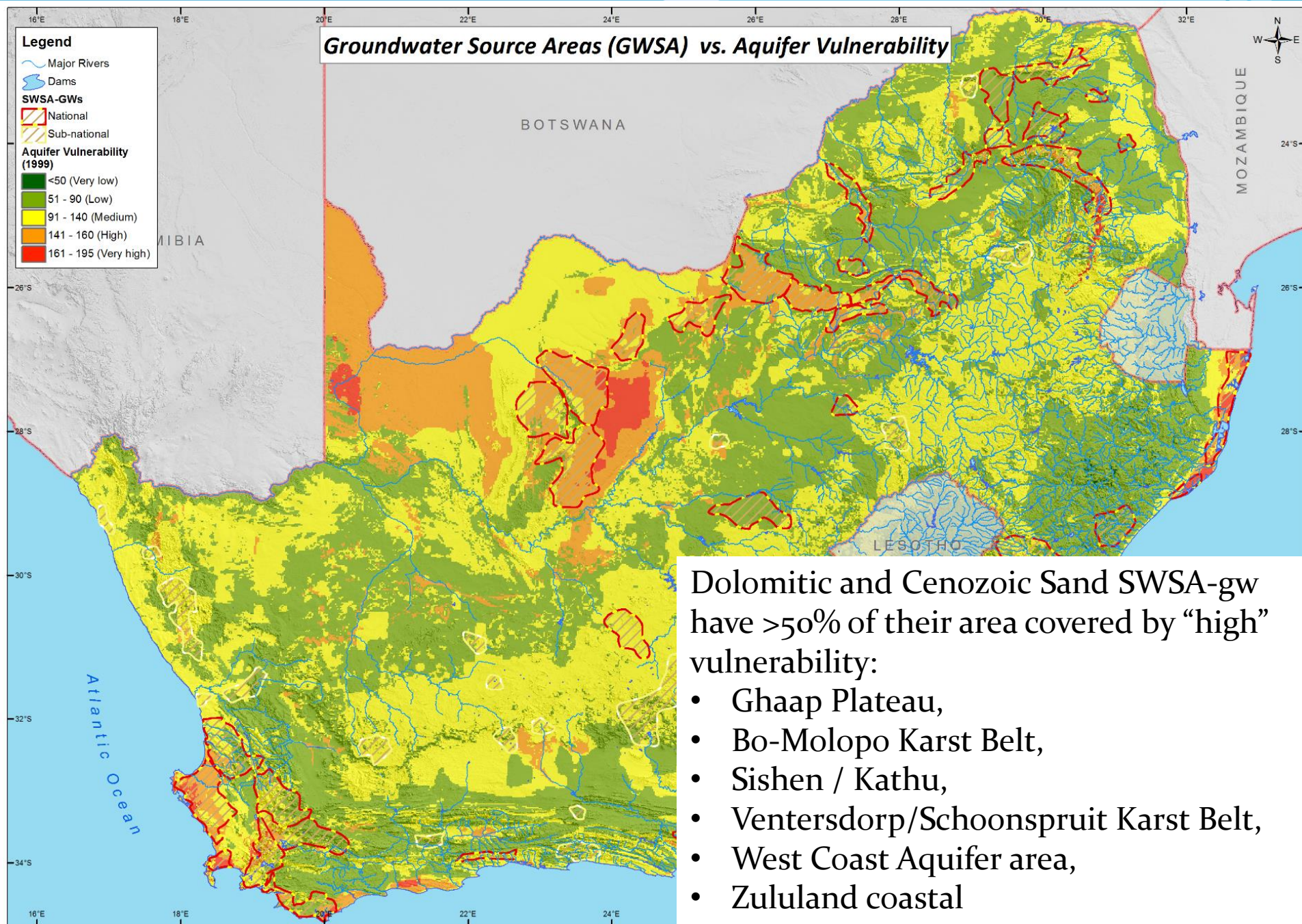
Highest groundwater overlap with coal reserves:

- Kroonstad (100%)
- Nyl and Dorps River Valley (38%)

Highest surface water overlap:

- Upper Vaal (100%)
- Enkangala Grasslands (42%)





Alien plant invasions

- Total condensed invaded area 313 984 ha (55% Wattles)
- Total MAR reduction 485.8 million m³ (2.6% of SWSA-sw MAR) & 33.6% of total reduction
- Greatest volumes: Boland, Eastern Cape Drakensberg & Southern Drakensberg
- Greatest %: Maloti Drakensberg, Amatola, Outeniqua

Protection in Protected Areas

- 92 SWSAs have a portion in formal PAs
 - <2% to 72%
 - 13.6% of the SWSAs
- 51 SWSAs have a portion in informal PAs
- 15 SWSAs have no PAs (mainly groundwater, Upper Vaal)

A new approach to protection?

- Embracing the whole landscape
- Integrating biodiversity conservation
- Recognising that landscapes are interacting systems:
 - Ecosystems in various states delivering water for people
YES
 - But ecosystems require appropriate management
 - Impacts of human activities are necessary in places but must be minimised
 - Water going local and circular

Elements of an approach

- Forward-looking – **the long view**:
 - Involves influencing complex social-ecological systems
 - Context of uncertainty and change (risk)
 - Building resilience in a changing environment
 - Integrated Water Resource Management – vertical and horizontal
 - Locally implemented in a participatory fashion
 - Scalable – managing complex, linked systems

Elements of an approach (2)

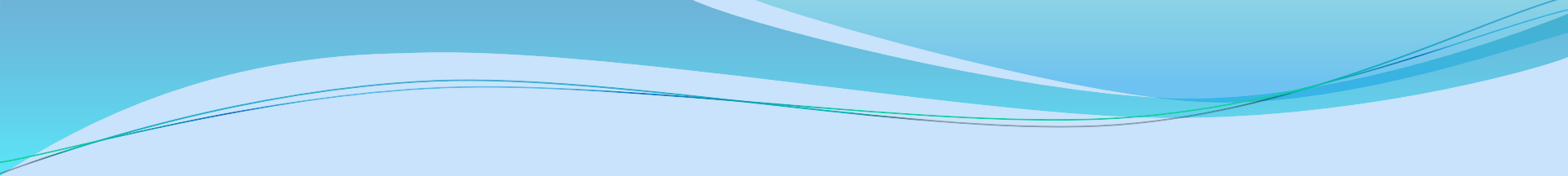
- Key features from the social perspective:
 - Beyond the utilitarian
 - Addressing how humans on the land behave and why:
 - Values, meaning and purpose
 - Developing a land & water ethic and practice
 - Building relationships and trust
 - Land & water stewardship to balance land rights
 - Safe and just sharing of the land's benefits
 - Co-learning through co-design and implementation
 - Co-operating on governance – top down & bottom up

What has happened so far?

- DWS
 - They are being taken up:
 - National Water and Sanitation Master Plan
 - Update of National Water Resources Strategy
- DEA – translation into policy
 - Formal protection
 - Restriction (prohibition) of activities
- Provinces
 - Provincial biodiversity conservation plans
- Spatial Development Frameworks

In conclusion

- SWSAs are critical for water security and require effective protection
- This is a significant challenge
- Achieving effective & appropriate protection measures will require:
 - Multi-government level & multi-sectoral approach
 - & Effective bottom-up participation
 - Land & water stewardship
- There are examples globally as Dhesigen and others have emphasised



Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land.

Attributed to Luna Leopold

Amongst the many things I learned, as a president of our country, was the centrality of water in the social, political and economic affairs of the country, continent and indeed the world

Nelson Mandela

Management Framework and Implementation Guidelines

- Not intended to be a comprehensive guide
 - There are many reports & guidelines already
- Aimed at different spheres and parts of government
 - National, provincial, local
 - Policy makers
 - Planners
- Summary of:
 - Why SWSAs are important
 - Impacts of human activities
 - How to incorporate SWSAs into planning (SDFs) & land management

Knowledge Dissemination Report

- Broad audience
- Key information on SWSAs and their importance
- Previous reports have described each one:
 - WWF Journey of Water
 - CER Booklet
- New one needs to deal with both surface and groundwater
 - Too many areas in total
 - Focus on some representative examples
 - Describe importance of SWSAs (sw & gw)
 - Options for the future

The future is not some place we are going to but one we are creating. The paths to it are made not found, and the activity of making, changes both the maker and the destinations.... – John Schaar

