The delineation and importance Strategic Water Source Areas for South Africa

David Le Maitre[1], Helen Seyler[2], Lindie Smith-Adao[1] and Jeanne Nel[1]

1: Natural Resources and the Environment, CSIR

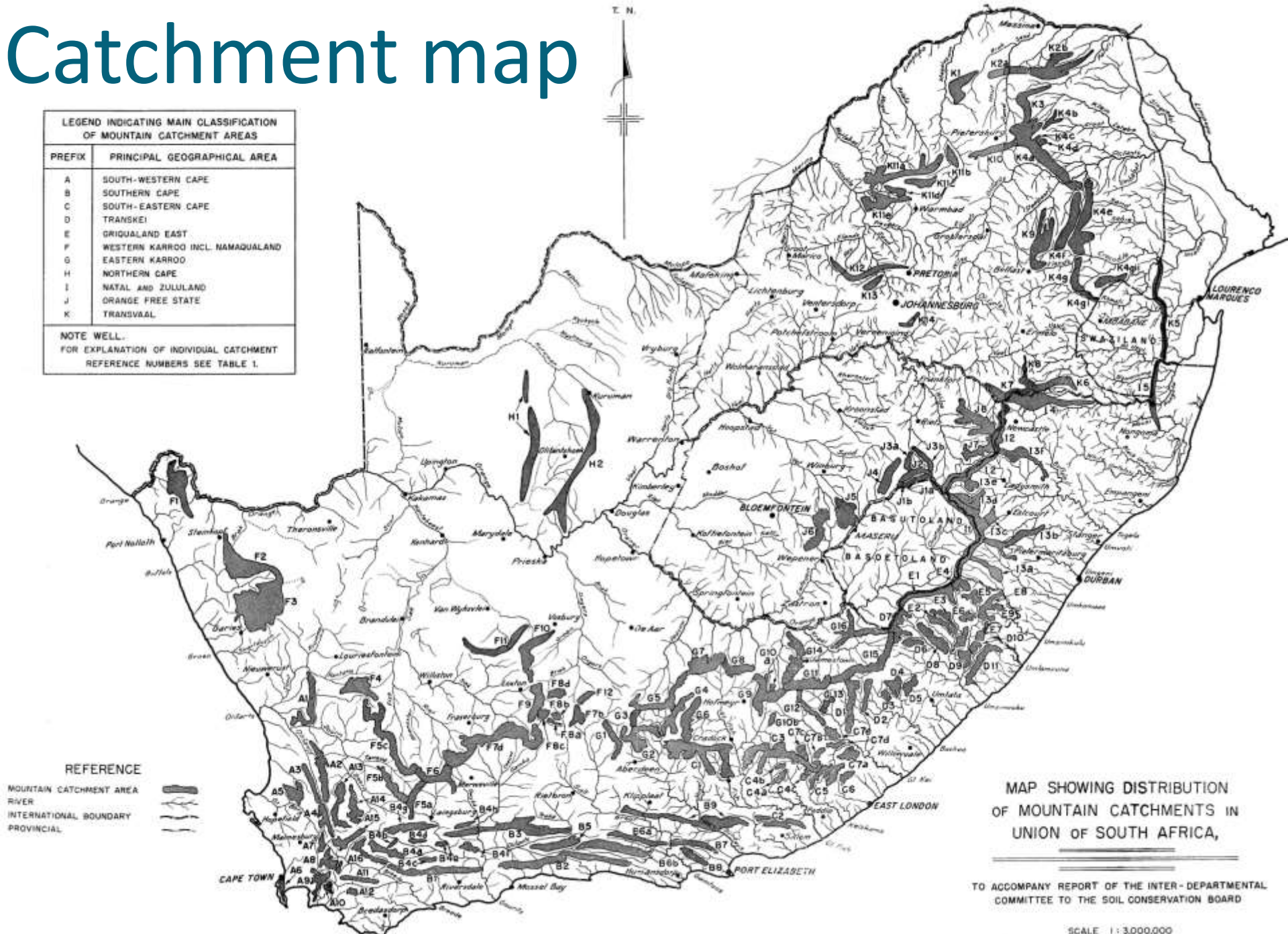
2: delta-H

Supported by the WRC

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



Strategic Water Source Areas 2013 (WWF-SA)

8% of land area provides 50% of the surface water

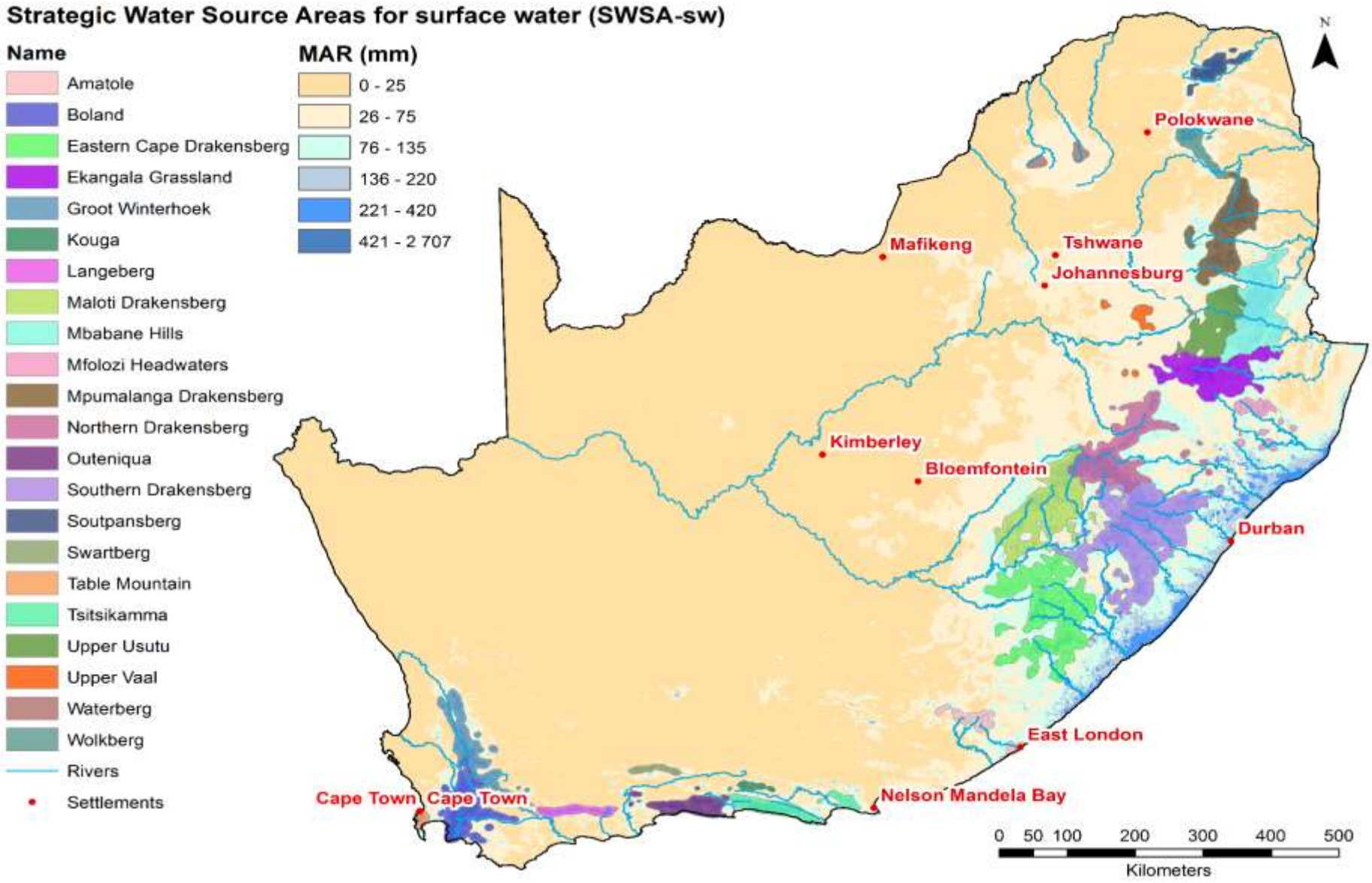
The WRC project

- 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

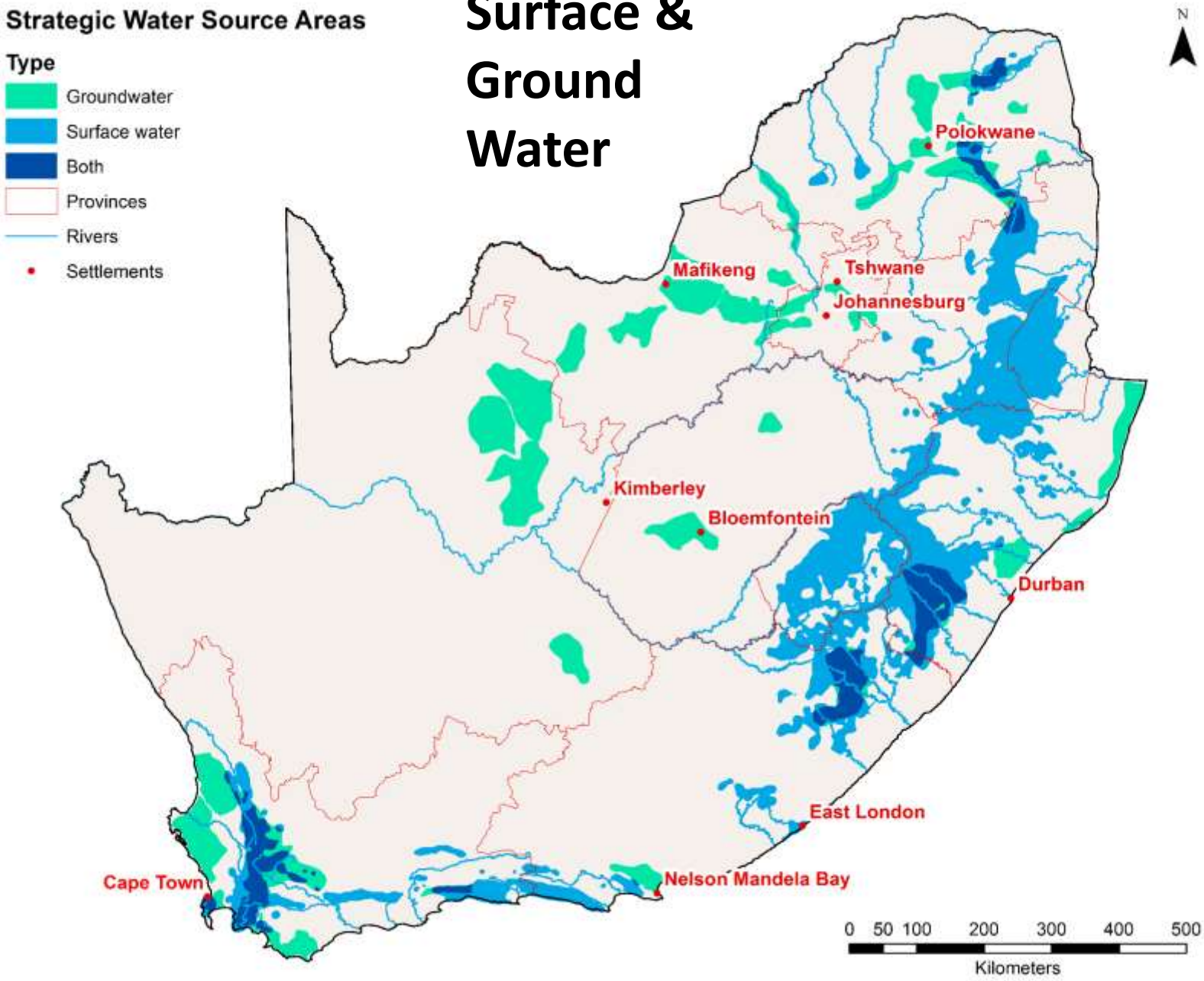
Definition

- 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



Surface & Ground Water



Key statistics for surface water

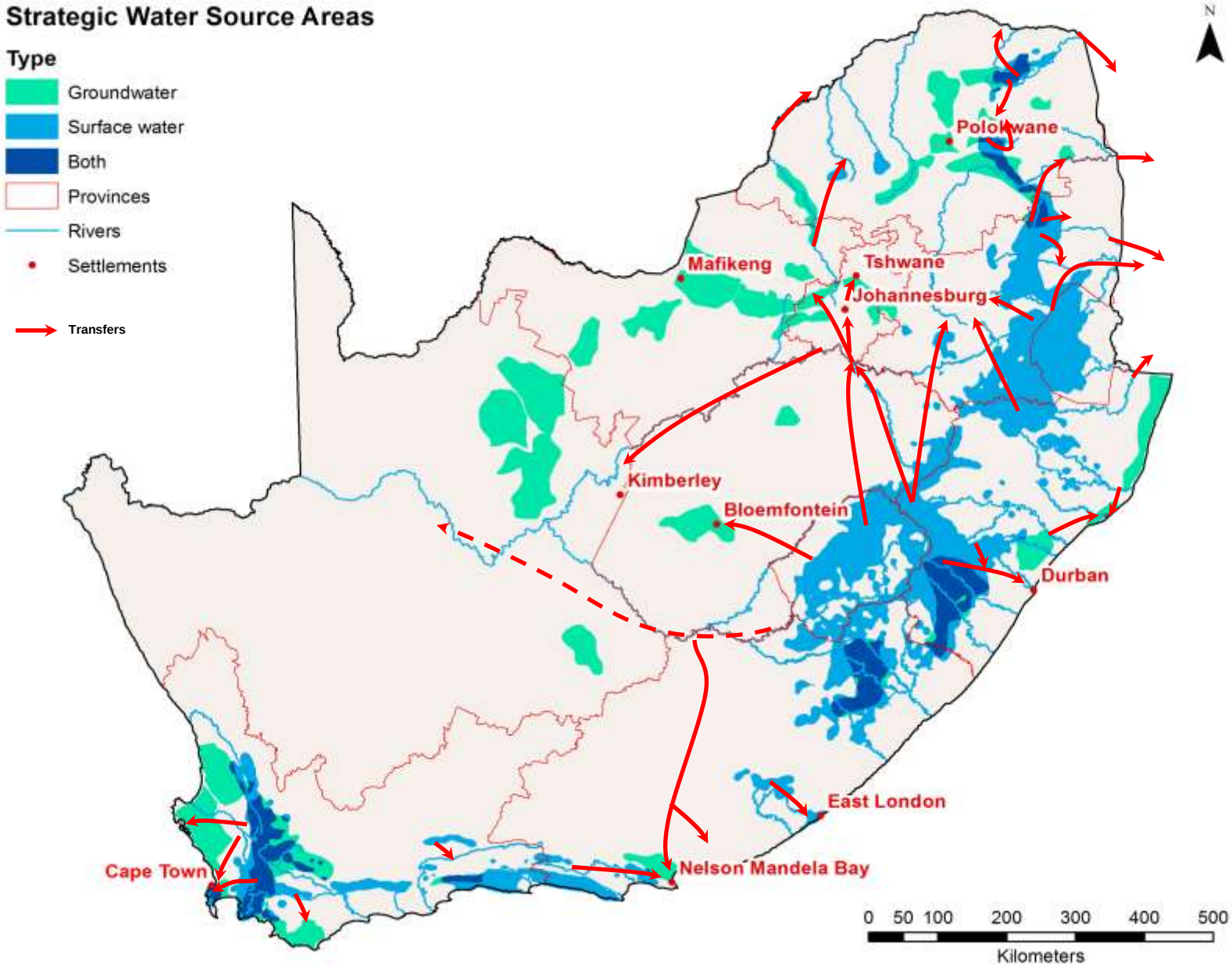
- 22 national SWSA-sw
  - Total area 12.41 million ha (9.78%)
  - Total MAR 24.95 billion m^3 (50.39%)
  - Excluding Lesotho & Swaziland
    - 9.61 million ha, MAR 19.38 billion m^3 (39.13%)
- Feed water supply systems for >50% of population
- Supply urban/industrial areas that generate >64% of GVA
- 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

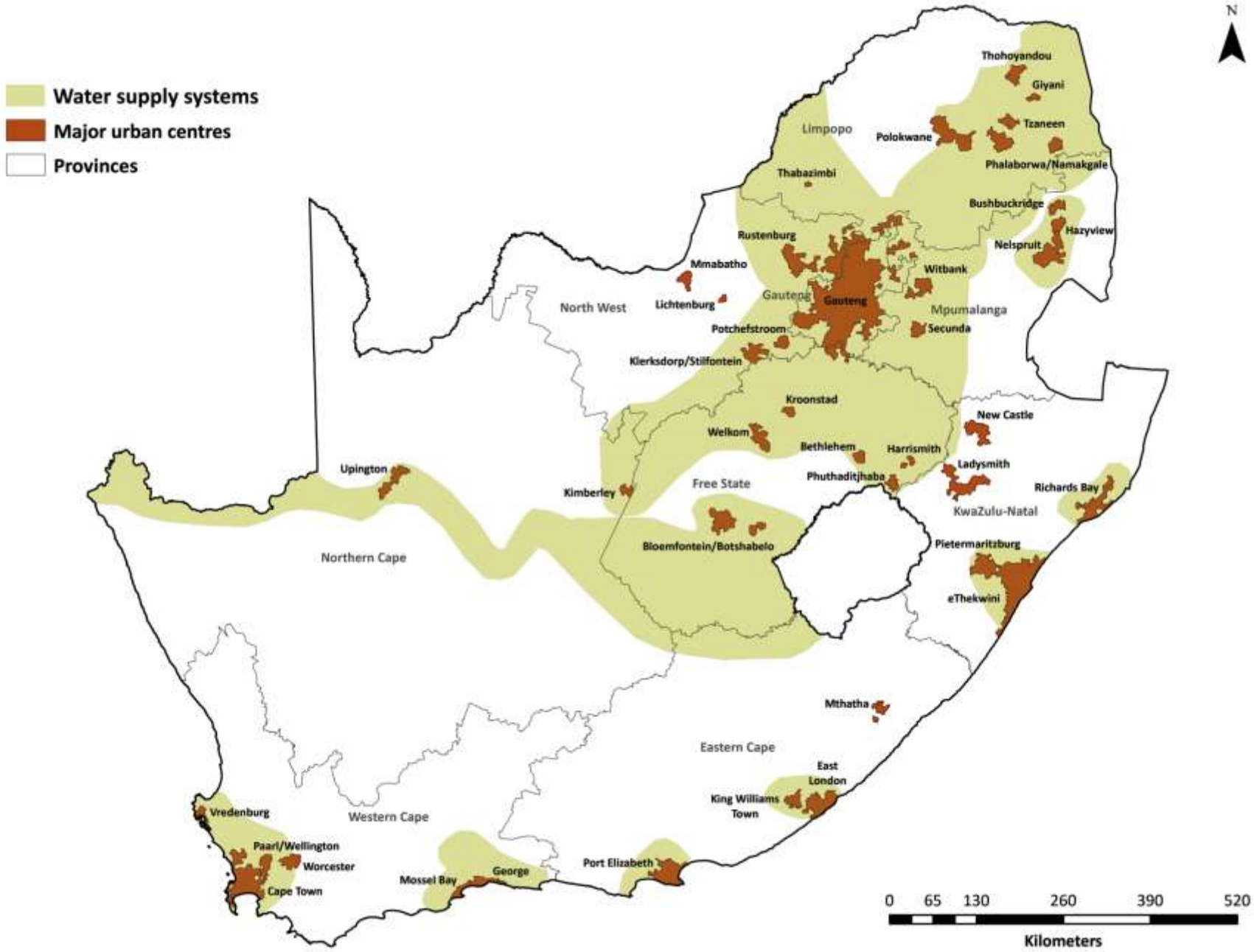
Investment in infrastructure

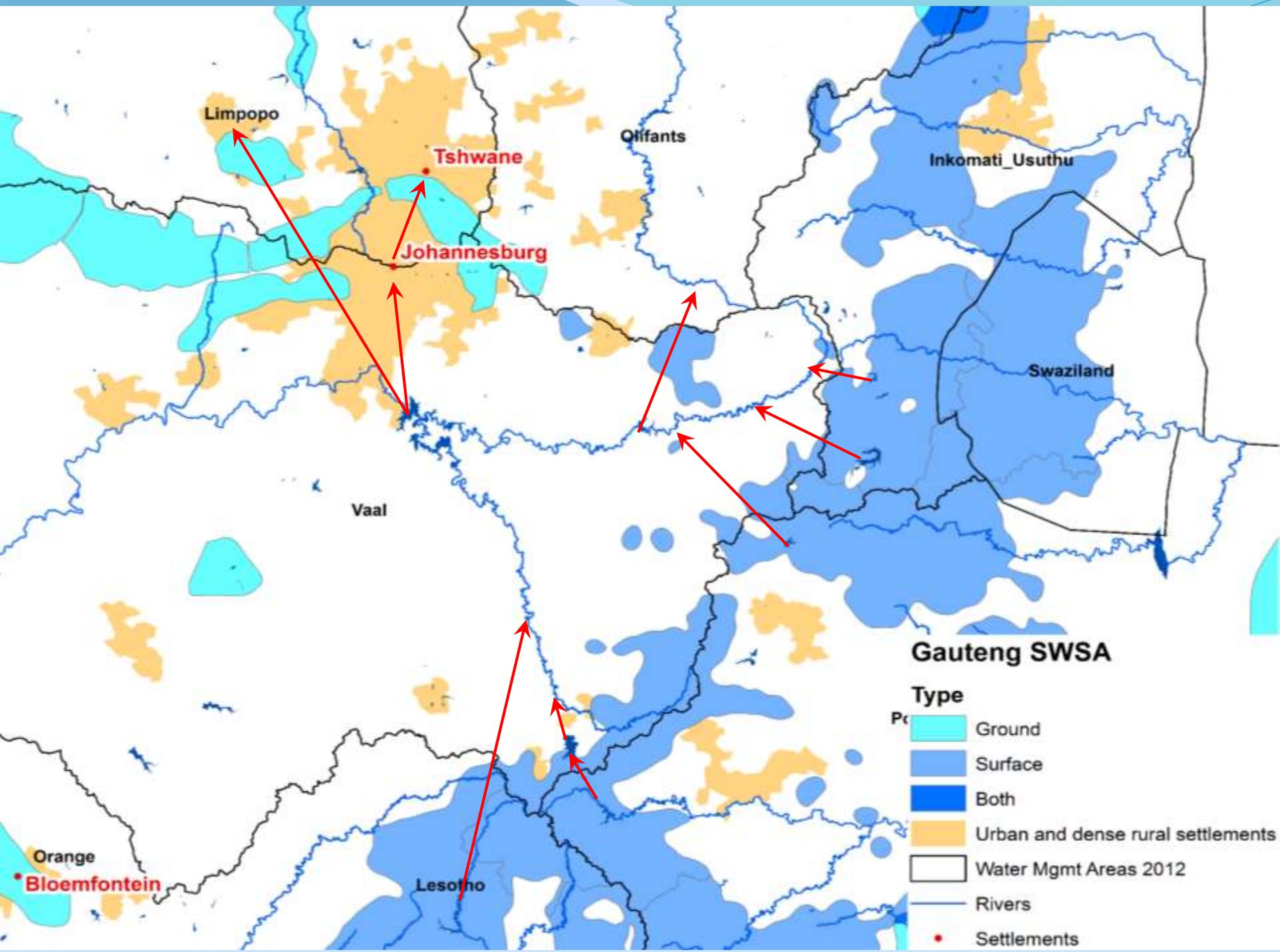
- South Africa has made huge investments
  - Dams
  - Complicated water transfer schemes
  - To sustain
    - Economic development centres
    - Strategic industries
    - Power generation
    - Irrigated agriculture
  - To enhance water security
- **Now we need to invest in the sources of the water**


Strategic Water Source Areas
Type
Groundwater
Surface water
Both
Provinces
Rivers
Settlements
Transfers
N
Polokwane
Mafikeng
Tshwane
Johannesburg
Kimberley
Bloemfontein
Durban
East London
Nelson Mandela Bay
Cape Town
0 50 100 200 300 400 500
Kilometers

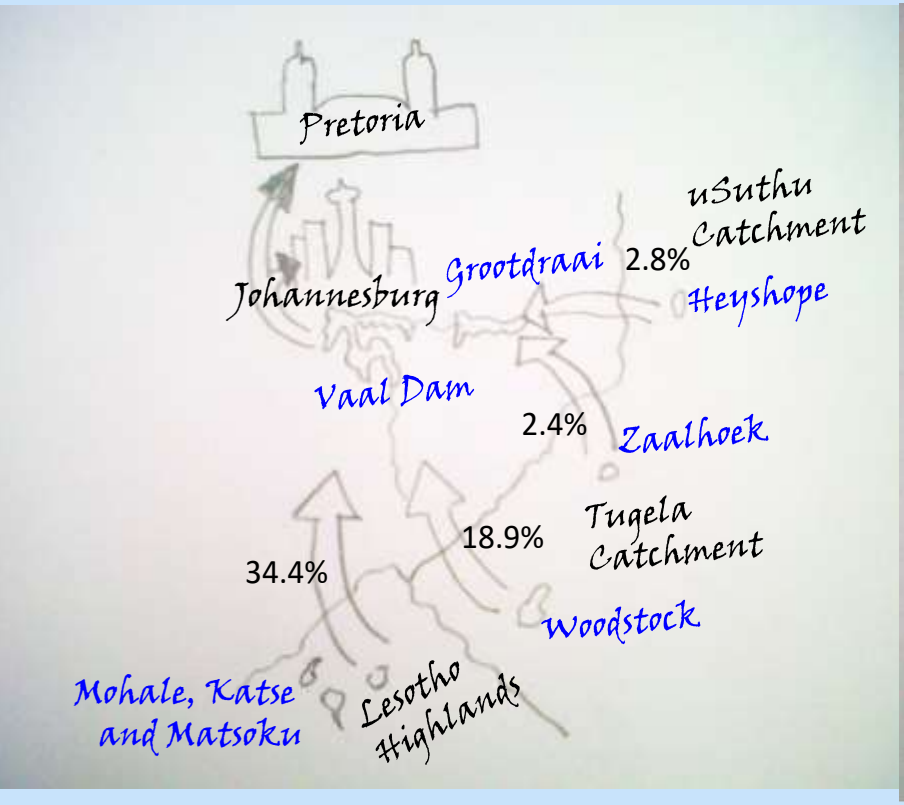
Selecting economic centres

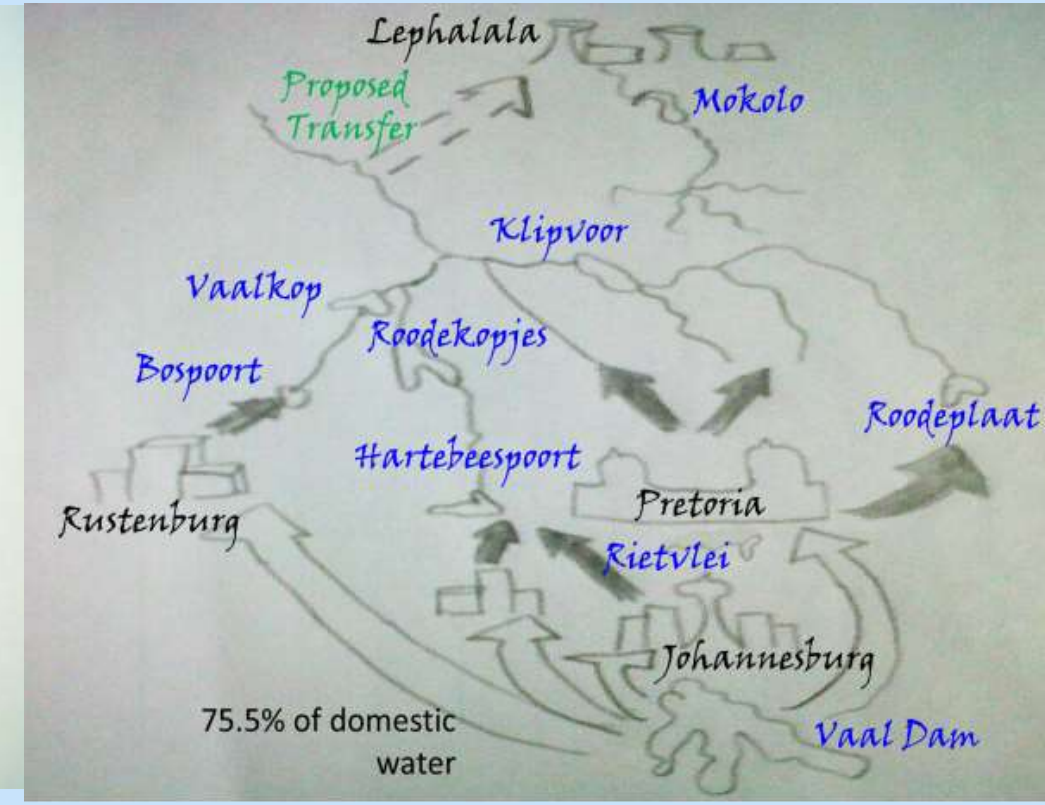
- 26 areas of national economic importance
  - National Water Resources Strategy
  - 17 selected using various factors, including
    - population
    - level of economic activity
- These include 60% of the population (2011)
- Accounted for ±75% of the national GVA (2011)
- Conservatively all or most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


Water supply systems
Major urban centres
Provinces
N
Thohoyandou
Giyani
Limpopo
Polokwane
Tzaneen
Phalaborwa/Namakgale
Thabazimbi
Bushbuckridge
Hazyview
Nelspruit
Rustenburg
Witbank
Mmabatho
North West
Lichtenburg
Gauteng
Gauteng
Mpumalanga
Secunda
Potchefstroom
Klerksdorp/Stilfontein
Kroonstad
New Castle
Welkom
Bethlehem
Harrismith
Ladysmith
Upington
Kimberley
Free State
Phuthaditjhaba
Richards Bay
KwaZulu-Natal
Bloemfontein/Botshabelo
Pietermaritzburg
Northern Cape
eThekwini
Mthatha
Eastern Cape
East London
King Williams Town
Vredenburg
Western Cape
Paarl/Wellington
Worcester
Cape Town
Mossel Bay
George
Port Elizabeth
0 65 130 260 390 520
Kilometers


Limpopo
Tshwane
Johannesburg
Olifants
Inkomati_Usuthu
Swaziland
Vaal
Orange
Bloemfontein
Lesotho
Gauteng SWSA
Type
Ground
Surface
Both
Urban and dense rural settlements
Water Mgmt Areas 2012
Rivers
Settlements

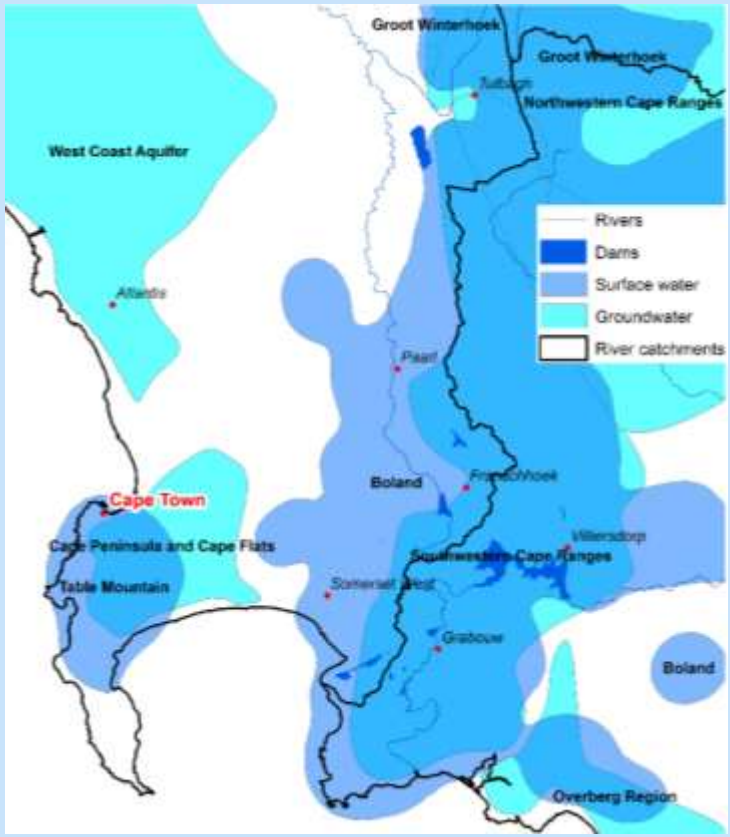
Gauteng

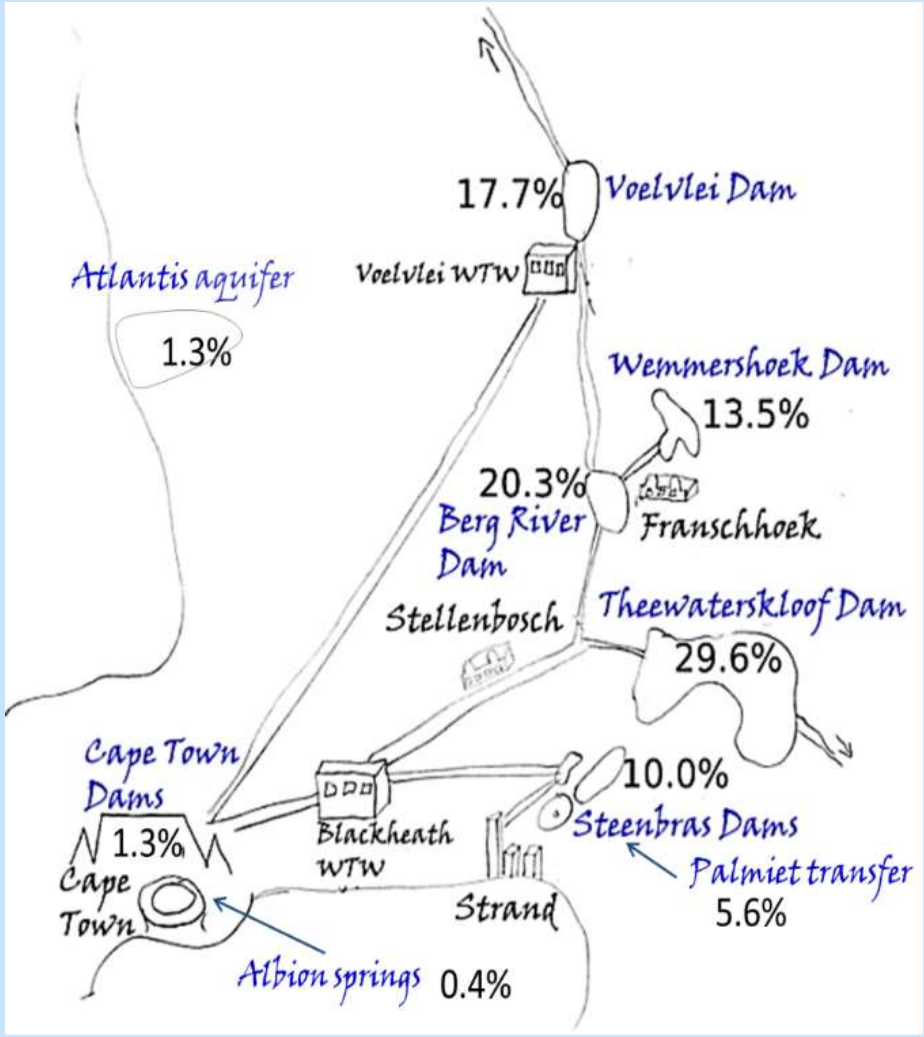




71% of the water in Vaal WSS
Johannesburg, Pretoria, East and West Rand
Population ±13.19 million (25.5% of the population) (2011)
Gross Value Added of R587 billion (36.1%) (2011)

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

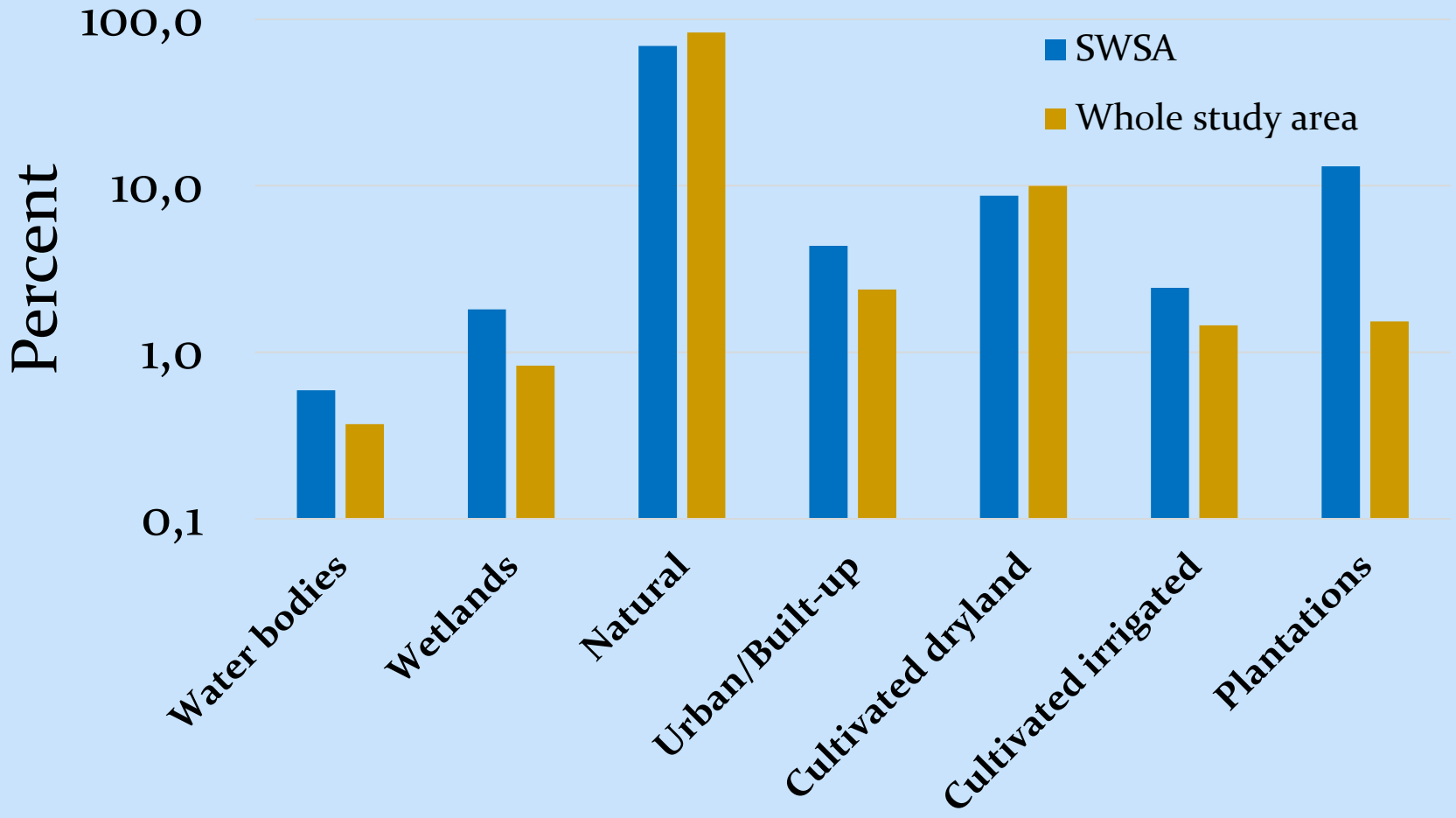
Irrigated agriculture

- Provides almost all the vegetables and fruit for local use and export
- Directly or indirectly supports about 8.5 million people
- Accounts for ±3% of GDP
- Estimated to use 60% of the available water
- Estimated area ±17 645 km² (2014)
- ± 70% of the water is directly or indirectly from the SWSA-sw
- Groundwater abstraction only 14% of water for agriculture
  - ±47% is from SWSA-gw

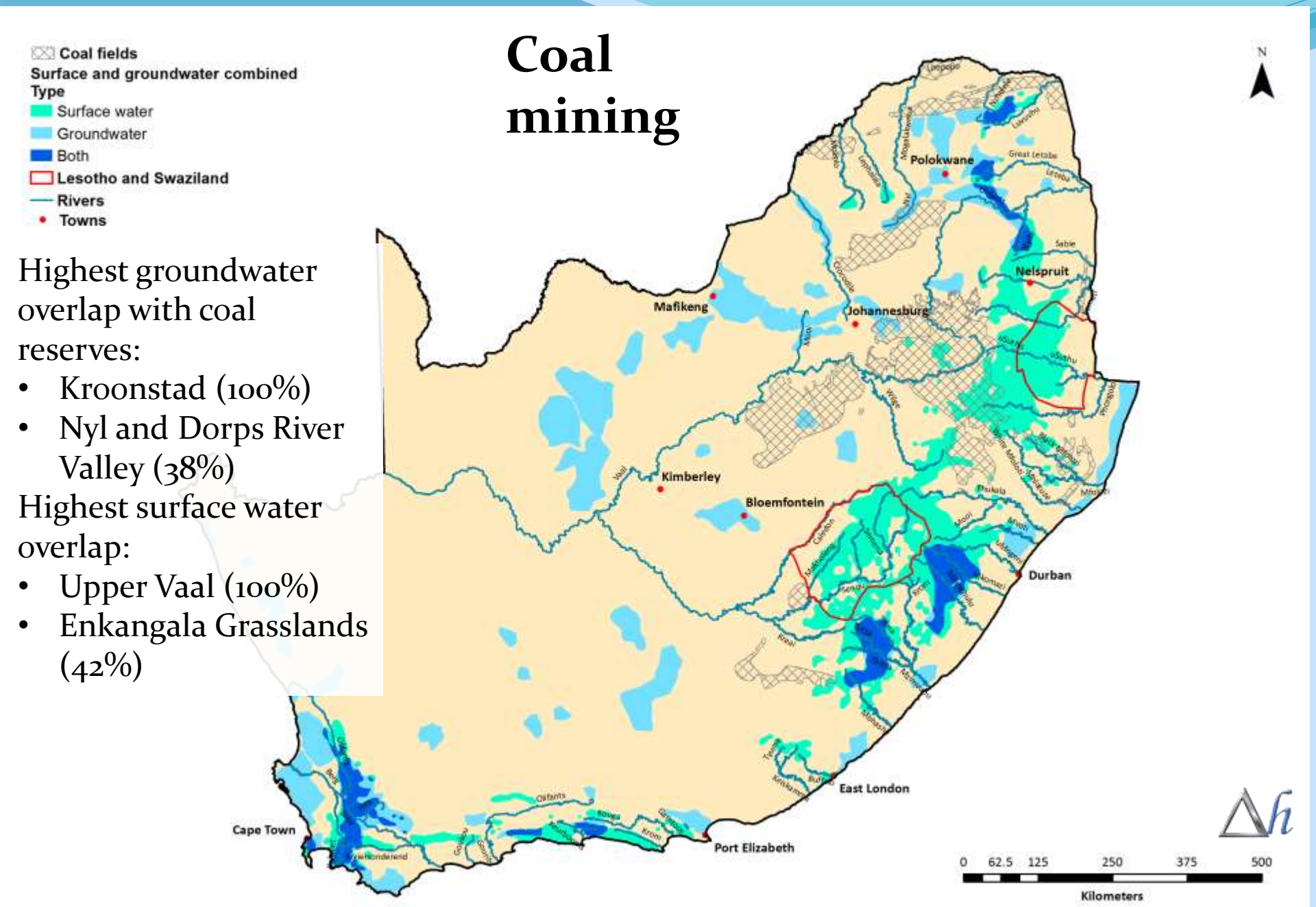
Groundwater and settlements

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

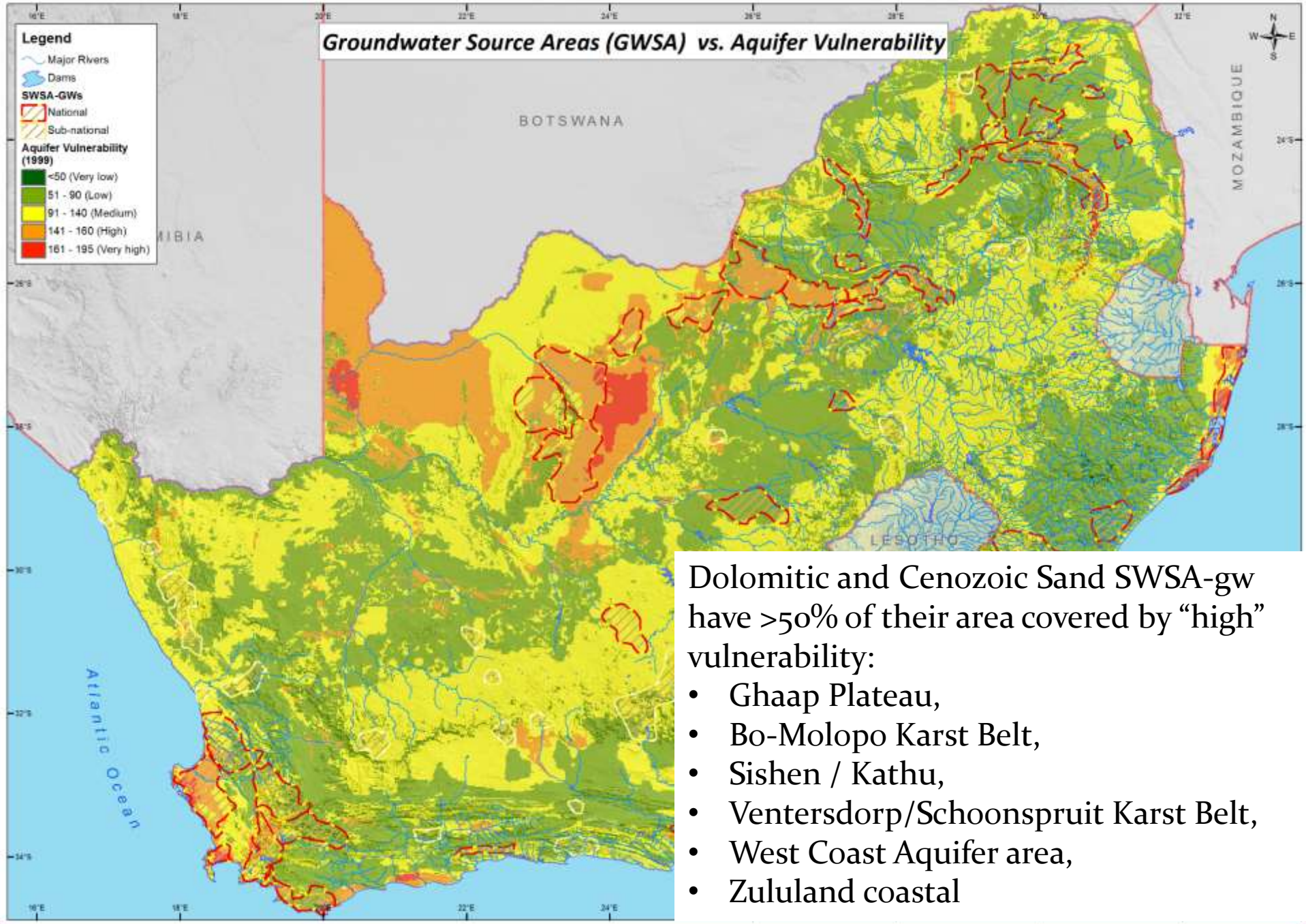


Highest groundwater overlap with coal reserves:

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

Highest surface water overlap:

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



Dolomitic and Cenozoic Sand SWSA-gw have >50% of their area covered by "high" vulnerability:

- Ghaap Plateau,
- Bo-Molopo Karst Belt,
- Sishen / Kathu,
- Ventersdorp/Schoonspruit Karst Belt,
- West Coast Aquifer area,
- Zululand coastal

Alien plant invasions

- Total condensed invaded area 313 984 ha (55% Wattles)
- Total MAR reduction 485.8 million m^3 (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

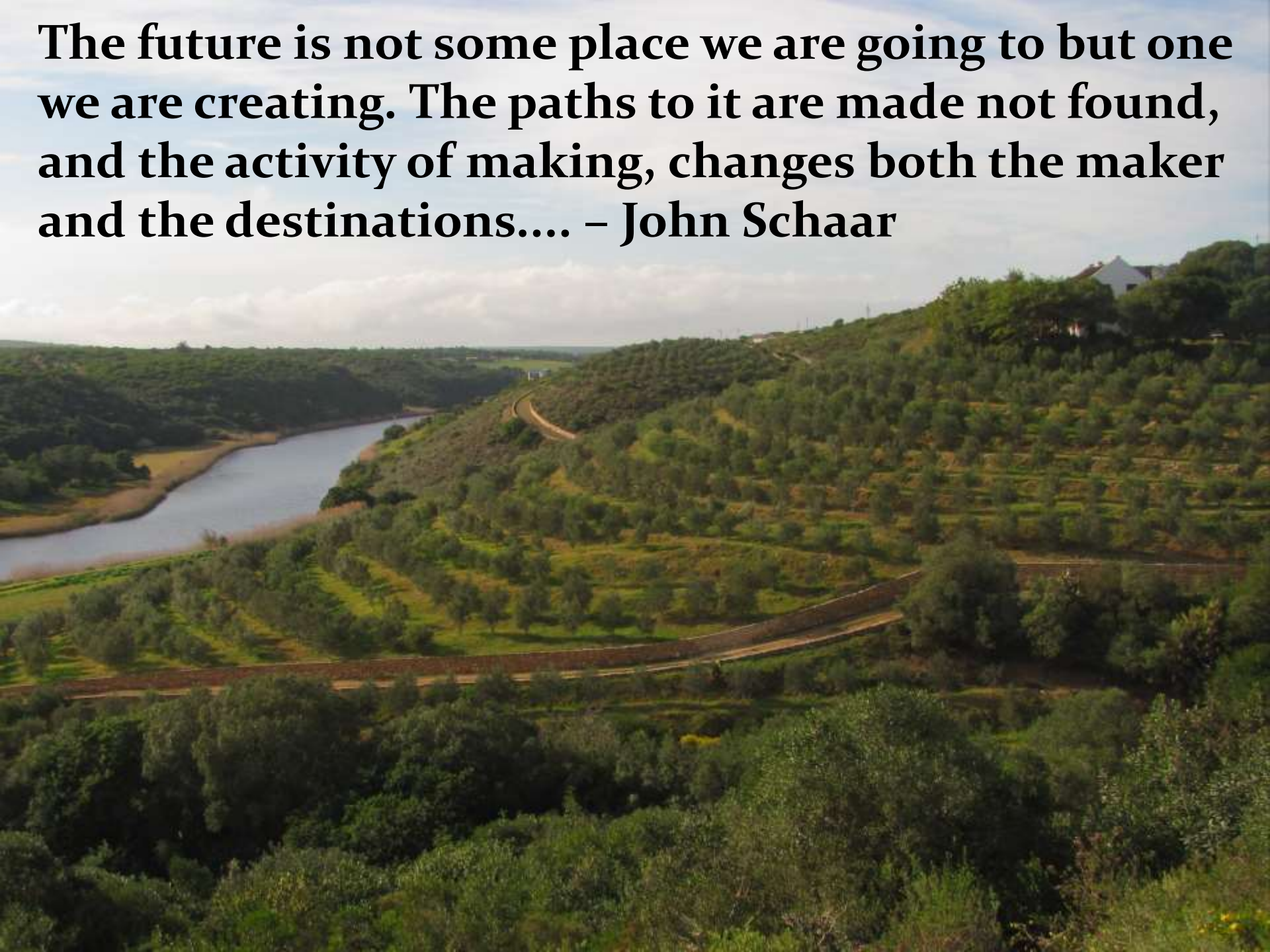
Nelson Mandela

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