

# Key Challenges Facing Water Resource Management in South Africa

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# Outline

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- 1. Our geographic reality - water availability and water security**
- 2. Challenges and opportunities facing water resource managers**
- 3. The importance of good governance**
- 4. Concluding remarks**

**1.**

**Our Geographic Reality:  
Water Availability and  
Water Security**

# Water in South Africa

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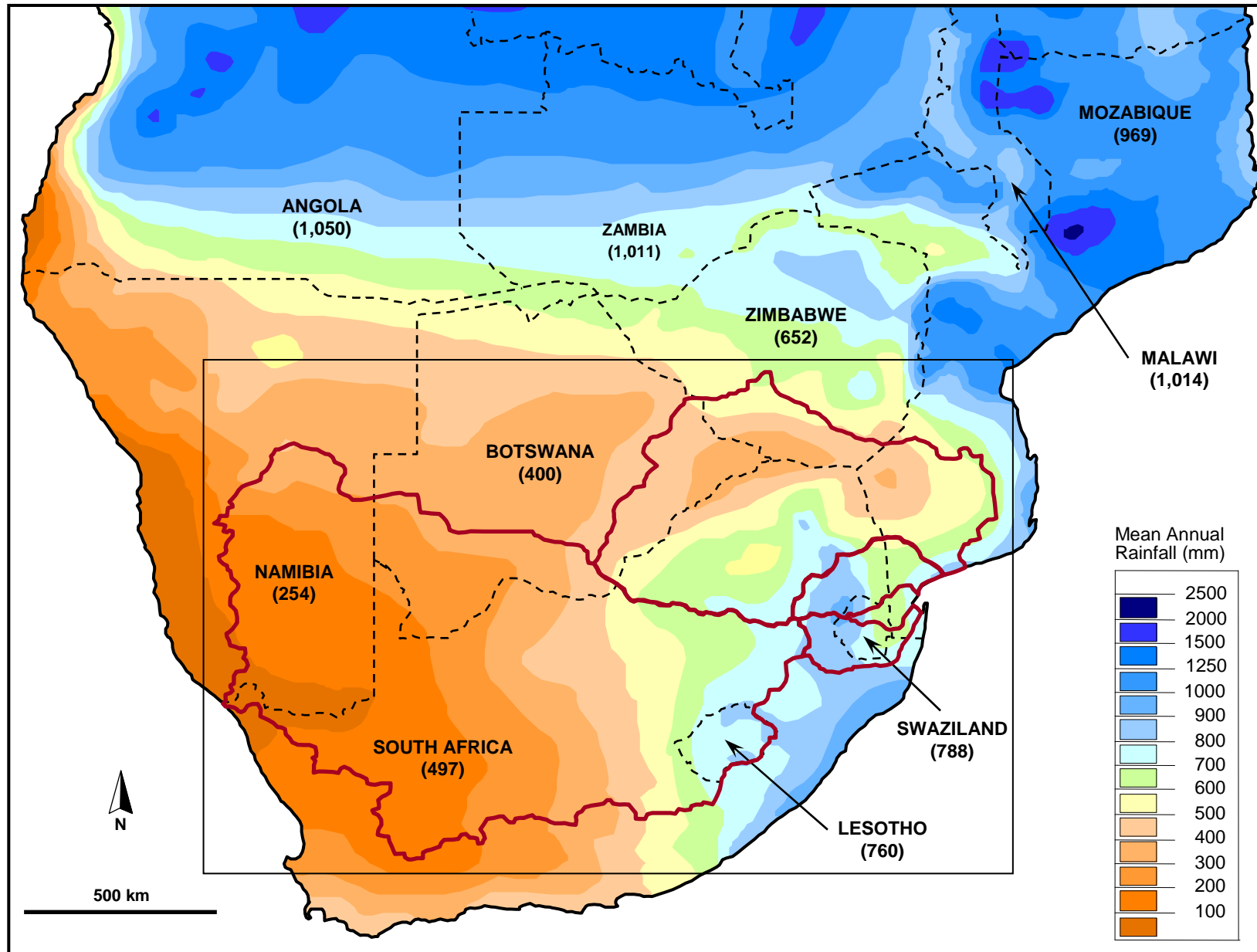
***“In South Africa, water is usually found in one of three forms:***

- There is either too much,***
- Or there is too little,***
- Or it is too dirty”***

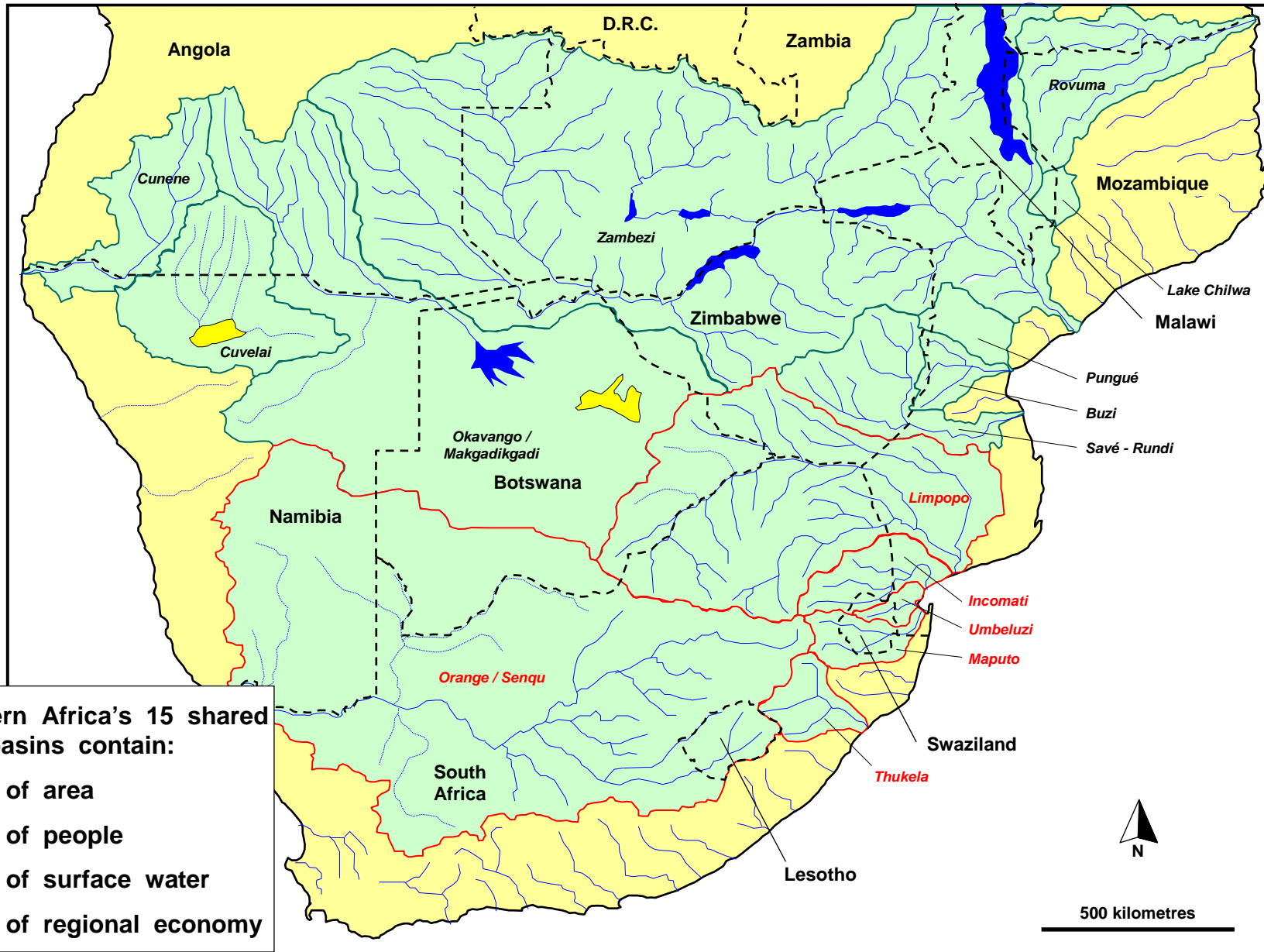
**We could also add that water is often:**

- Out of sight (underground), or**
- On someone else’s property**

# Mean Annual Rainfall



# Shared River Systems



# Rainfall and Runoff

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Basin	Rainfall (MAP - mm)	Runoff (MAR - mm)	MAR : MAP (%)
Orange-Senqu	332	17	5.1
Limpopo	567	29	5.1
Incomati	763	99	13.0
Maputo	770	109	14.1
Rest of RSA	626	76	12.1
RSA + Lesotho	474	40	8.5

Highly variable rainfalls; unequally distributed

1. Exceptionally low conversion of rainfall to runoff

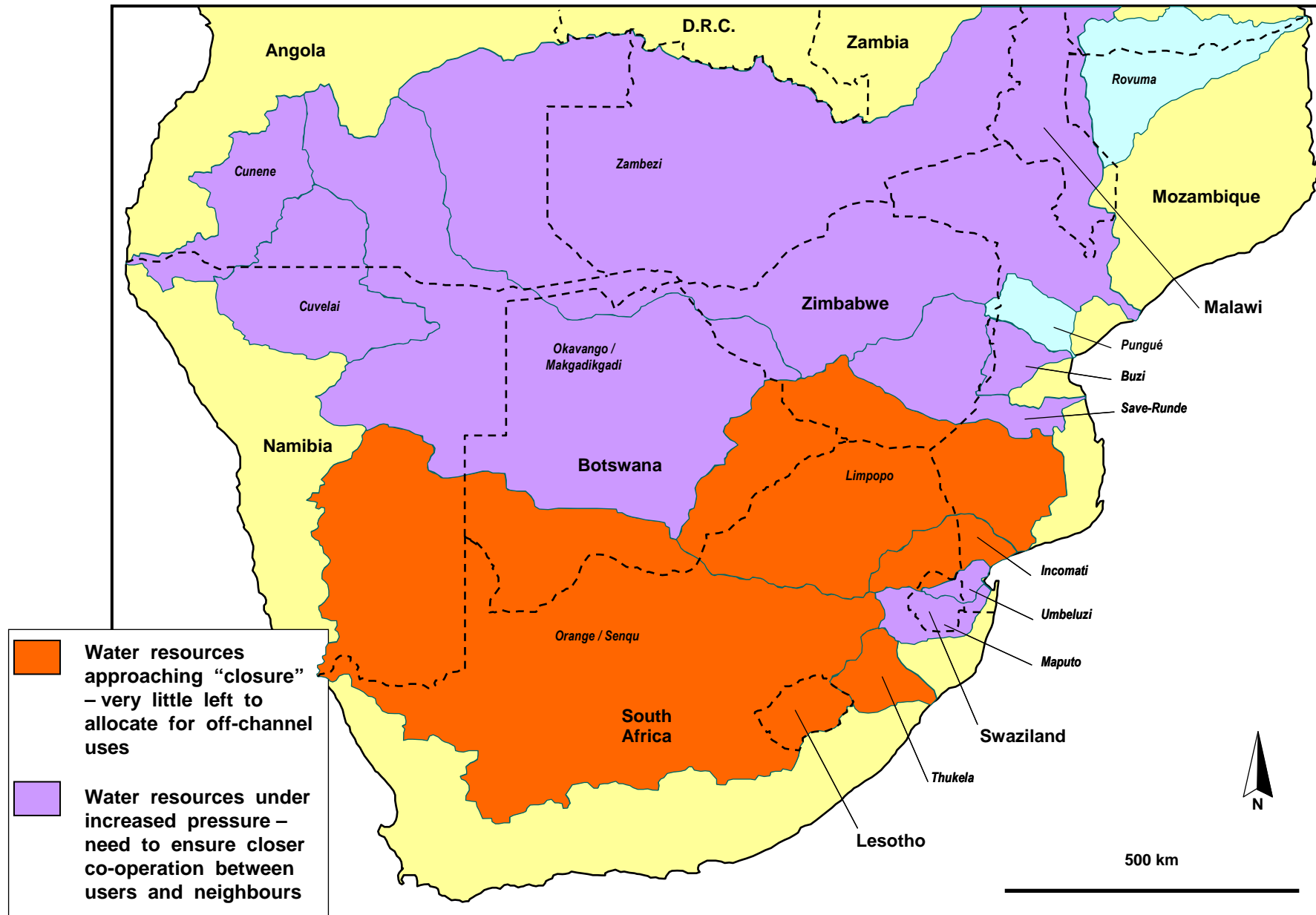
# **Key Characteristics of Water**

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- **Rainfall and river flows highly variable**
- **Seasonal and inter-annual extremes of flow (floods and droughts)**
- **Flows difficult to predict reliably**
- **Extensive areas depend on groundwater**
- **Countries see water as ‘national property’ - but dependent on inflows**
- **Water often contaminated with waste products**
- **Reliable water supplies ‘problematic’**



# Southern African Situation



# “Water Crowding”

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Water Crowding Index (WCI) = Number of people per million cubic metres of water

River Basin	2000		2025	
	Population	WCI	Population	WCI
Orange-Senqu	11 319	1 183	19 502	1 803
Limpopo	11 906	4 219	18 790	4 974
Incomati	1 122	1 552	1 933	2 310
Maputo	1 165	1 376	2 009	2 366

WCI values: 0 – 100 = Water security

100 – 500 = Water sufficiency

500 – 1 000 = Occasional, seasonal water stress

1 000 – 2 000 = Frequent water stress; seasonally severe

> 2 000 = “Beyond the water barrier” - chronic water stress

**2.**

# **Challenges and Opportunities Facing Water Resource Managers**

# The Dichotomy of Water

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## Source of destruction, dispute and poverty

- Drought and desertification
- Flooding and erosion
- Salinization
- Malnutrition and starvation
- Contamination
- Epidemics and diseases
- Dispute and conflict
- Degraded infrastructure
- Instability and vulnerability

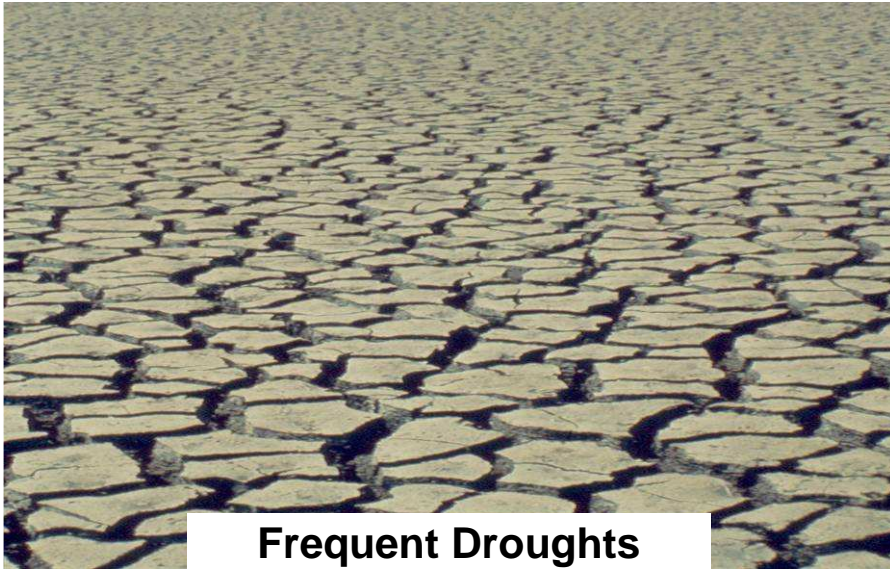
## Source of production, growth and co-operation

- Healthy people
- Healthy ecosystems
- Fisheries / food production
- Energy production
- Cultural values
- Transport and navigation
- Collaboration and peace
- Effective infrastructure
- Security and safety

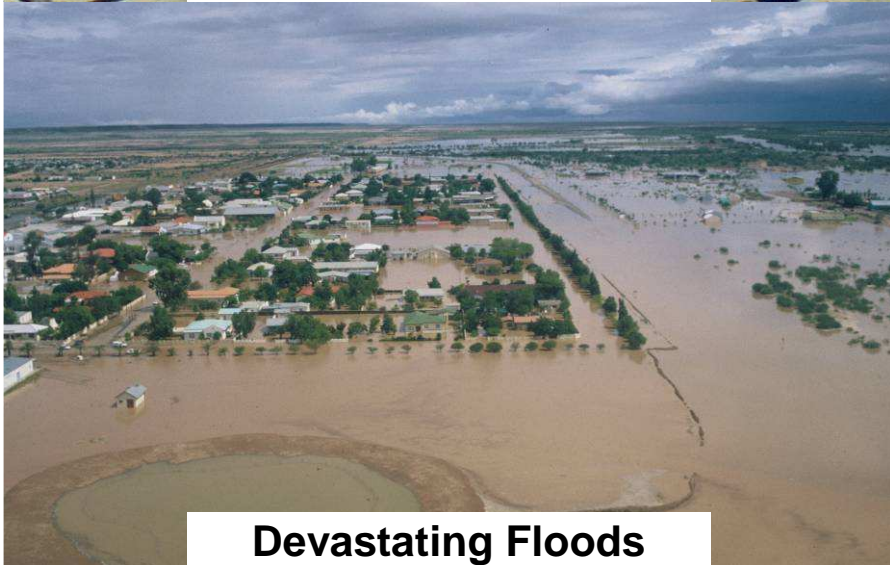
# Understanding the Implications

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## Destructive



**Frequent Droughts**

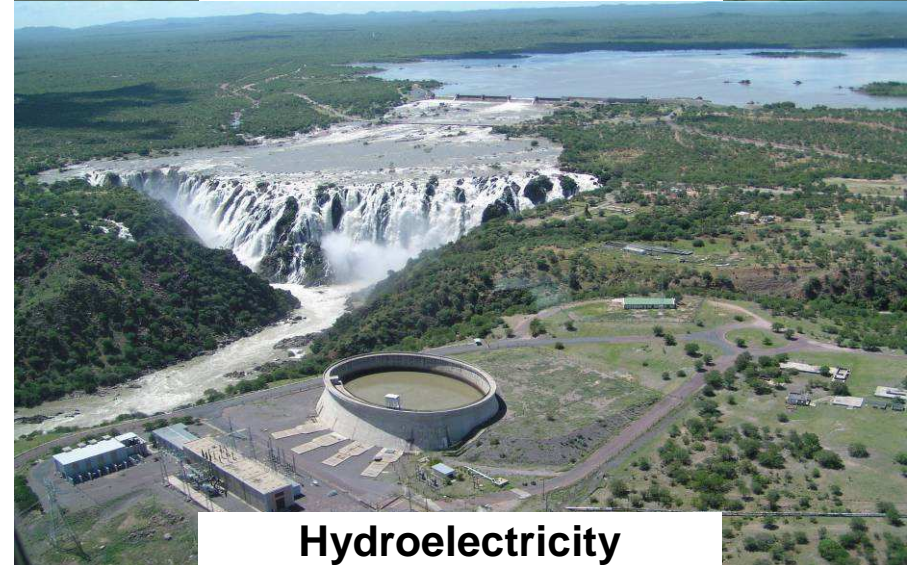


**Devastating Floods**

## Productive



**National Food Security**



**Hydroelectricity**

# Key Challenges

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- **Water for growing populations and expanding economies – quality of life**
- **Eliminate disparities in service delivery between rich and poor**
- **Food security – regional / national level**
- **Energy supplies (hydropower) / key industries**
- **Cyclical patterns of floods and droughts**
- **Conflict prevention / resolution**
- **Ability of aquatic ecosystems to deliver ecosystem goods and services**
- **Pollution prevention and control**

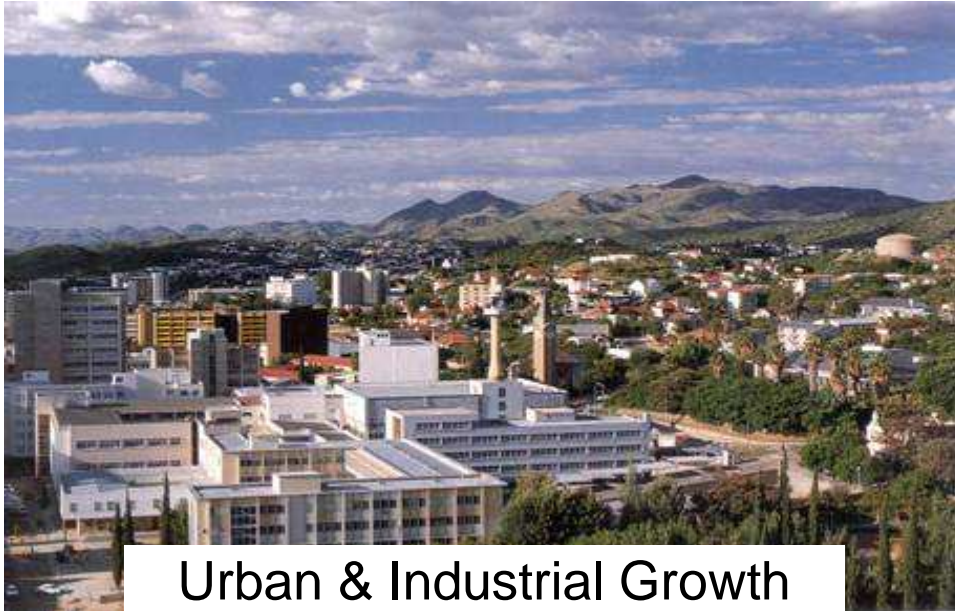
# Water: A Basic Human Need

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- **Availability :**
  - Developing populations need more water; linked to food production & land reform; problems due to urbanization and contamination
- **Accessibility :**
  - Poorest proportion of population have lowest access to clean water
- **Affordability :**
  - Expensive – economic, nutritional and health costs; Heavy opportunity costs for women and children
- **Acceptability :**
  - Clean drinking water essential, but many communities lack safe drinking water

# Development Imperatives

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Urban & Industrial Growth



Rural Development



Assured Water Supplies



Ecosystem Services



# Typical Challenges

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Inadequate Service delivery



Erosion and Sedimentation



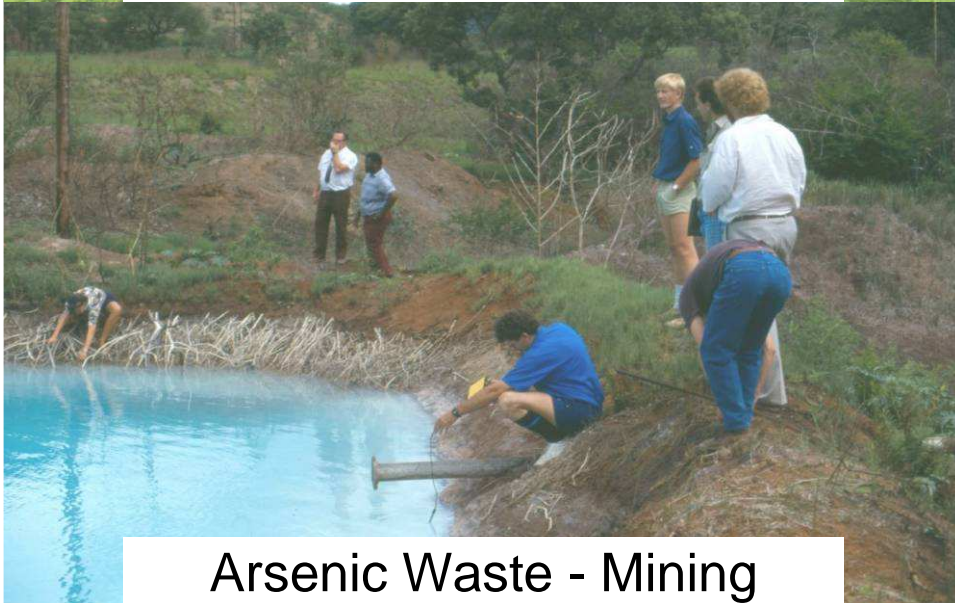
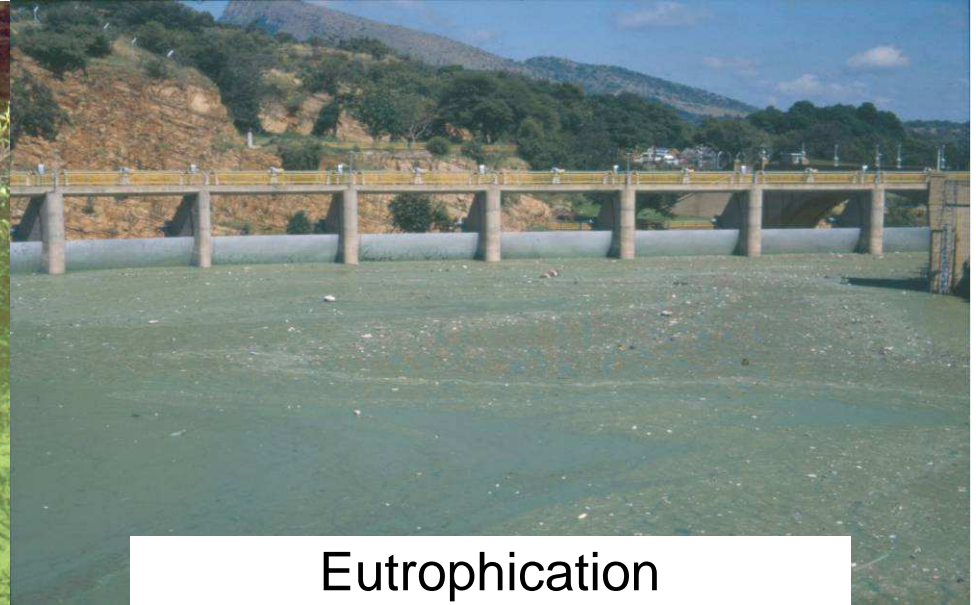
Industrial Effluent



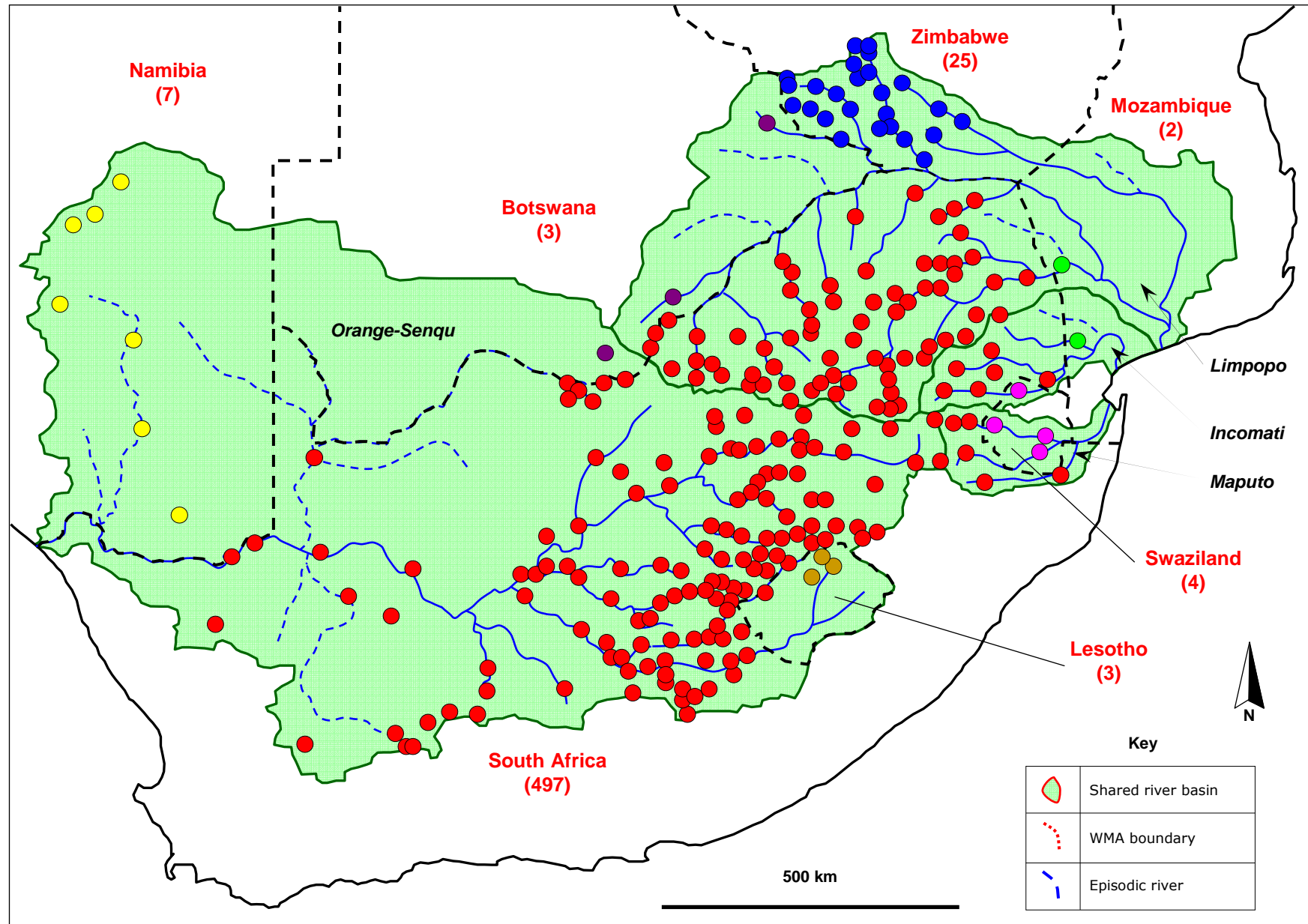
Urban Waste

# Contamination Problems

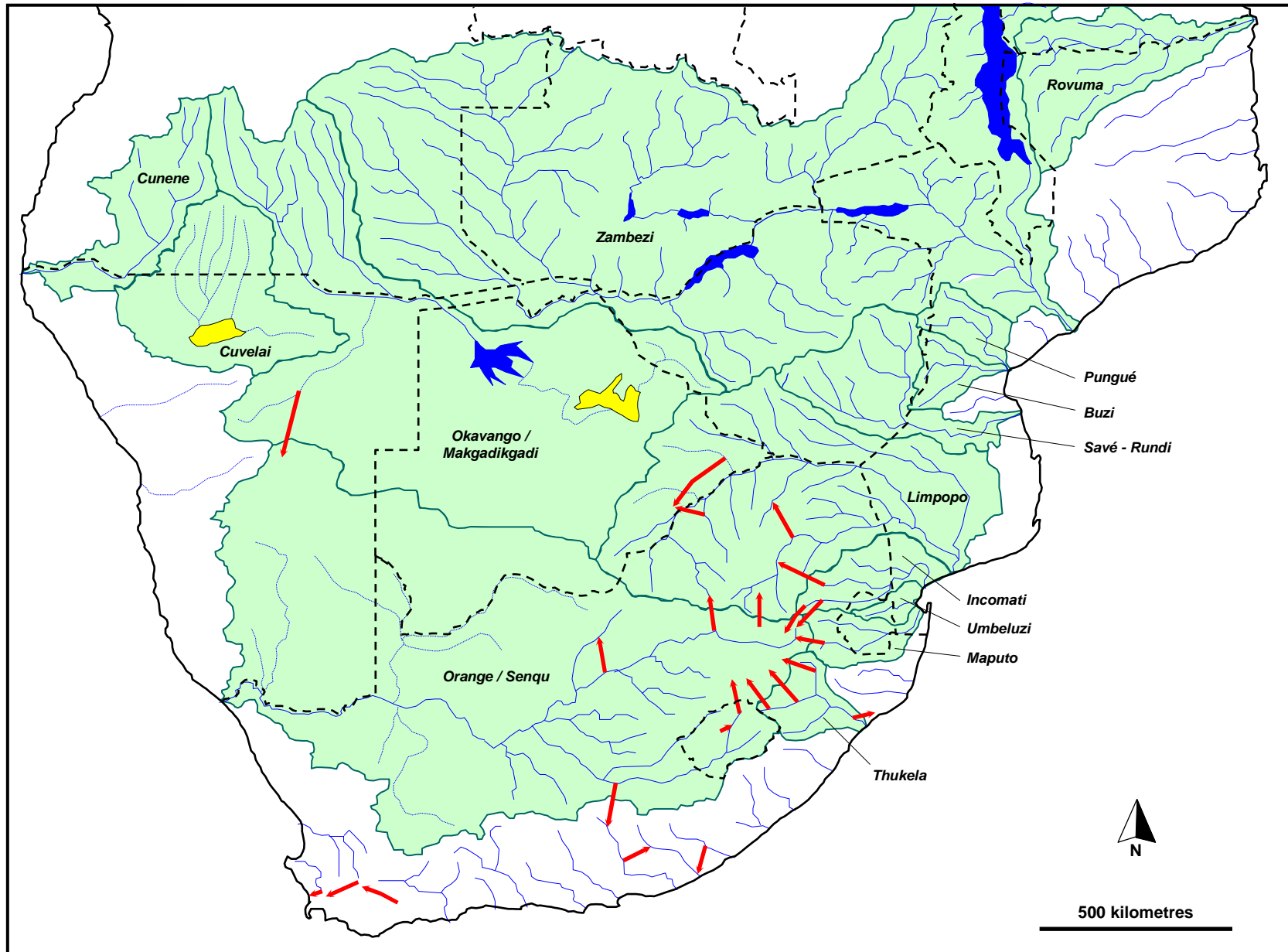
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# Large Dams in Shared Basins



# Inter-Basin Water Transfers



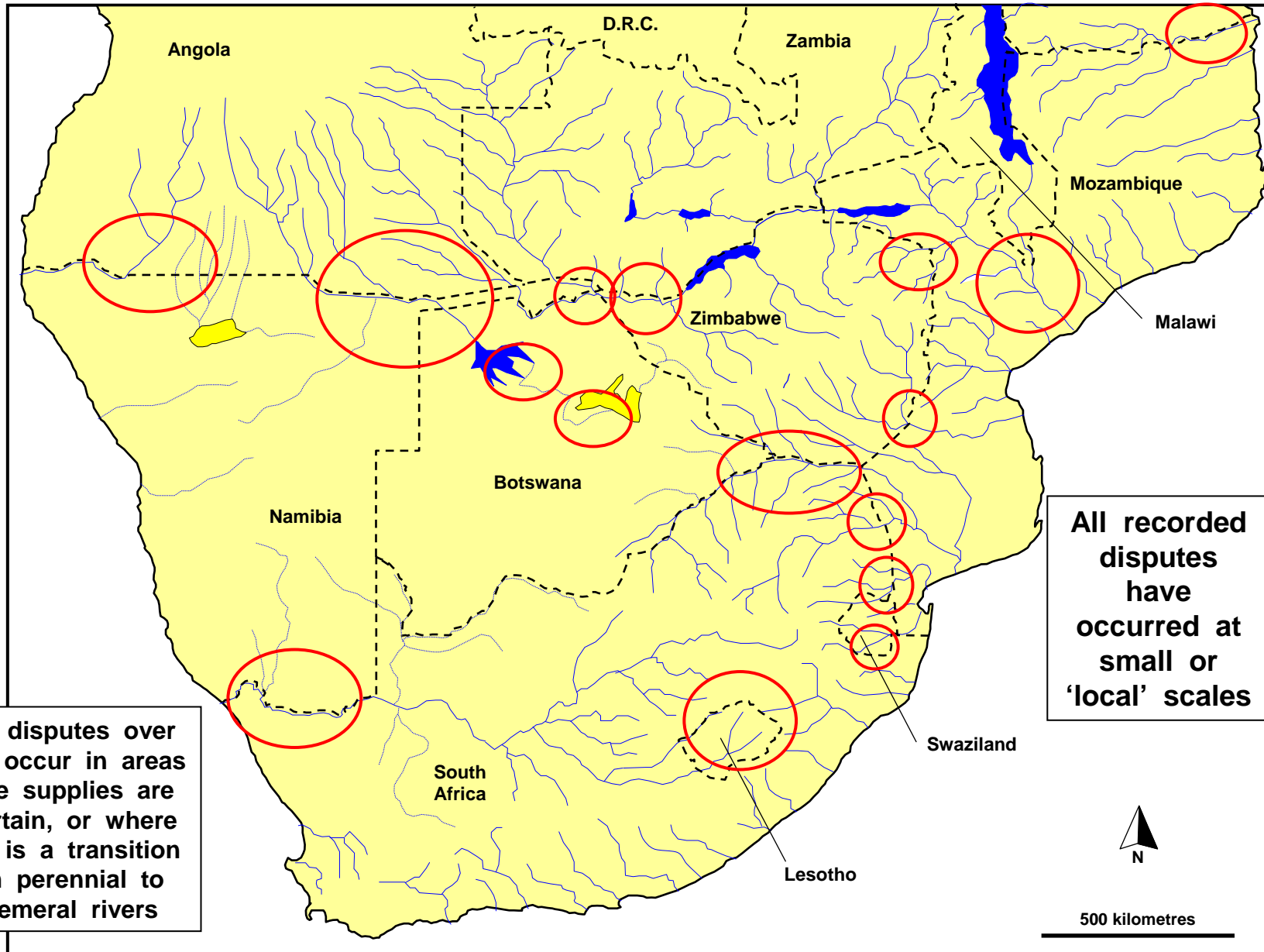
# Runoff and Water Capture

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Basin	Runoff Volume (10 <sup>6</sup> m <sup>3</sup> )	No. of large dams	Dam Volume (10 <sup>6</sup> m <sup>3</sup> )	Dam : Runoff (%)
Orange-Senqu	10 609	138	20 550	193.7
Limpopo	5 295	100	3 060	57.8
Incomati	2 851	27	440	15.4
Maputo	1 888	8	3 068	162.5
Rest of RSA	29 535	227	9 876	33.4
RSA + Lesotho	50 177	500	36 995	73.7

1. Numerous large dams – small dams not included
2. High proportion of runoff is impounded in large dams

# Dealing with Disputes



# **National Responses : Implications**

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- **Many countries adopted internal approaches to resolve water problems**
- **Aligned with broader principles**
- **But, little or no agreement on equitable sharing of water**
- **Difficult to manage co-operatively across country boundaries**
- **Concerns about sovereignty issues**
- **National water security achieved at the expense of regional water security**

**3.**

# **The Importance of Good Governance**



# Key Governance Issues Related to Water Resource Management

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- The context of a governance system is shaped partly by social values and imperatives, and partly by prevailing constraints and opportunities
- The effectiveness of a governance system is determined by extent to which stakeholders engage in decision-making and benefit from the process

# Important Considerations

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- **Decision-making based on imperfect and / or incomplete knowledge**
- **Sharing information / data - key to improved management**
- **Technical ingenuity → generate data**
- **Social ingenuity → legitimize data :**
  - **Reduce uncertainty**
  - **Focus on wider (e.g. regional) benefits**
- **All sectors of society are responsible for participating in decision-making**

# Stakeholder Engagement in Water Resource Management



4.

## Concluding Remarks

# Critical Learning Points

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- Most water decisions made outside the water sector - but must be appropriate
- Water security is essential for sustained economic growth and poverty eradication
- Water security depends on effective and efficient water infrastructure and institutions
- Water is a public good - therefore it is a public responsibility and some public finance is essential to achieve objectives
- Regional co-operation is essential where supplies are scarce, vulnerable or shared

# Inevitable Future Options

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- Extensive additional water supply infrastructure needed throughout RSA, plus improved maintenance of existing systems
- Greater focus on water quality and pollution control throughout the country
- Inaugurate and implement Catchment Management Agencies
- Improve water management processes and efficiencies of use + use of ground water
- Greater application of water conservation and demand management
- Improved interactions with neighbouring states on shared basins

# Potential Future Outcomes of “Business as Usual”

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- Prolonged and severe water shortages in drier regions of RSA
- Difficulty in supplying water for the Ecological Reserve – sacrificial rivers?
- Limited water available for neighbours sharing river basins
- High potential for future conflicts - especially at local scales
- Strategic decisions needed on new technologies / alternative water sources

# **Water Decisions = Ethical Decisions**

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- **Water debates always mirror debates of social ethics:**
  - **Water as a common good**
  - **Water and human dignity**
  - **Water as an economic good**
  - **Water as a facilitator of well-being**
  - **Water and social justice**
  - **Rights and responsibilities of access**
  - **Water as a generator of wealth**
- **Water as a symbol of reconciliation, healing and regeneration**



**South Africa's water resources present us with an enormous range of opportunities, most of which are cunningly disguised as insurmountable problems**