National Water Resources

Stakeholder workshop June 17th 2009

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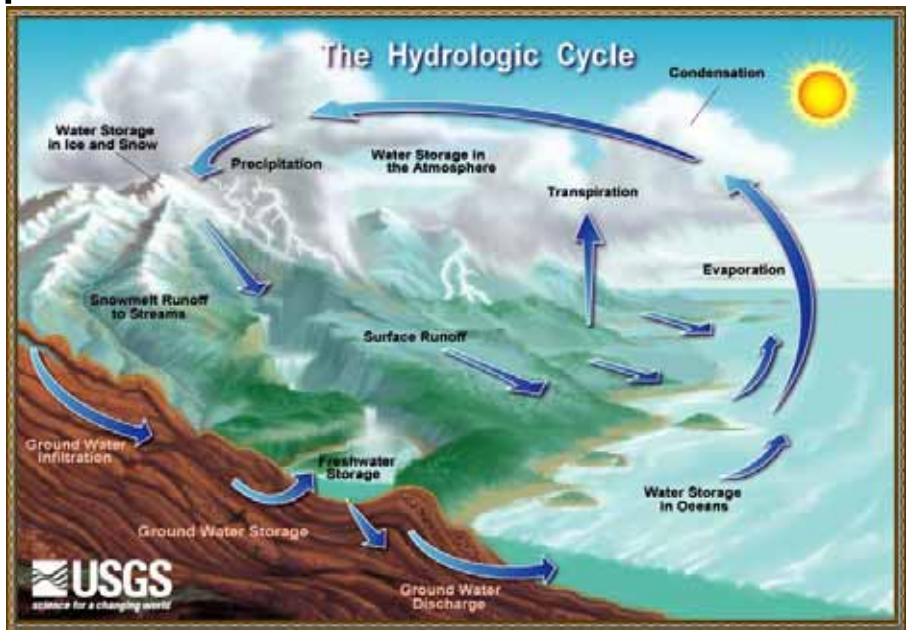
CSIR

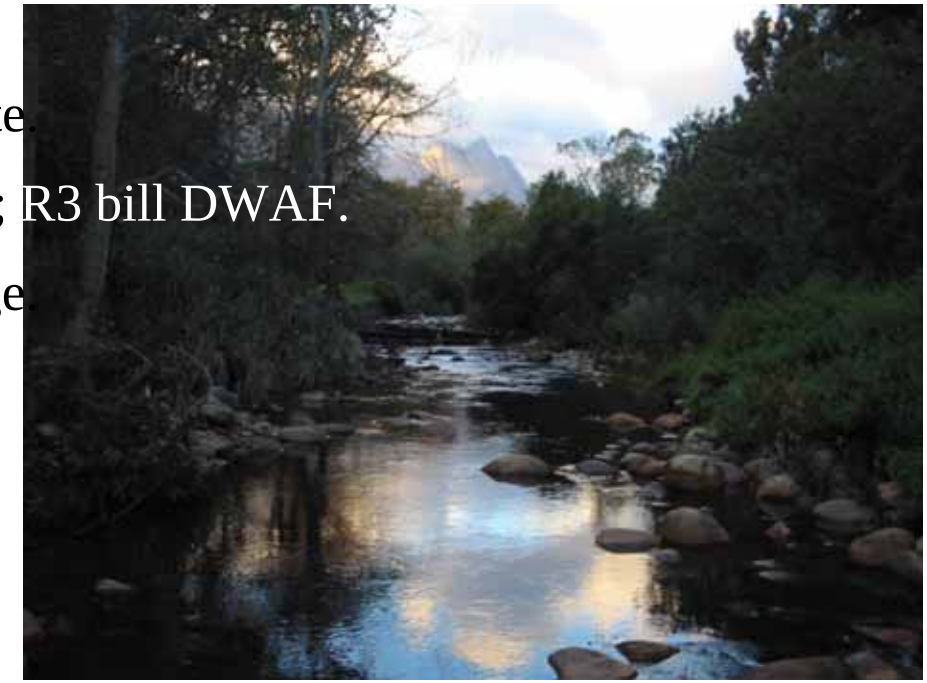
Water resources - Overview

- National scale review
- Current situation
- What is predicted – climate change drivers
- What has been modelled – water systems responses
- What needs more information
- Key vulnerabilities:
  - Water supply storage
  - Water pollution
  - Adaptive ability



Current water situation

- Semi-arid country – water limited environment.
- Water stress – surface water resources almost fully allocated.
  - Sources: 77% surface water; 9% groundwater - supply.
  - Uses: 62% irrigation; 10% domestic
- Water quality problems – water borne diseases; Acid mine drainage; eutrophication.
- Institutional transformation incomplete.
  - 2003 – R11 billion municipalities; R3 bill DWAF.
- Reasonable monitoring and knowledge.
- Climate change is one more layer of uncertainty.



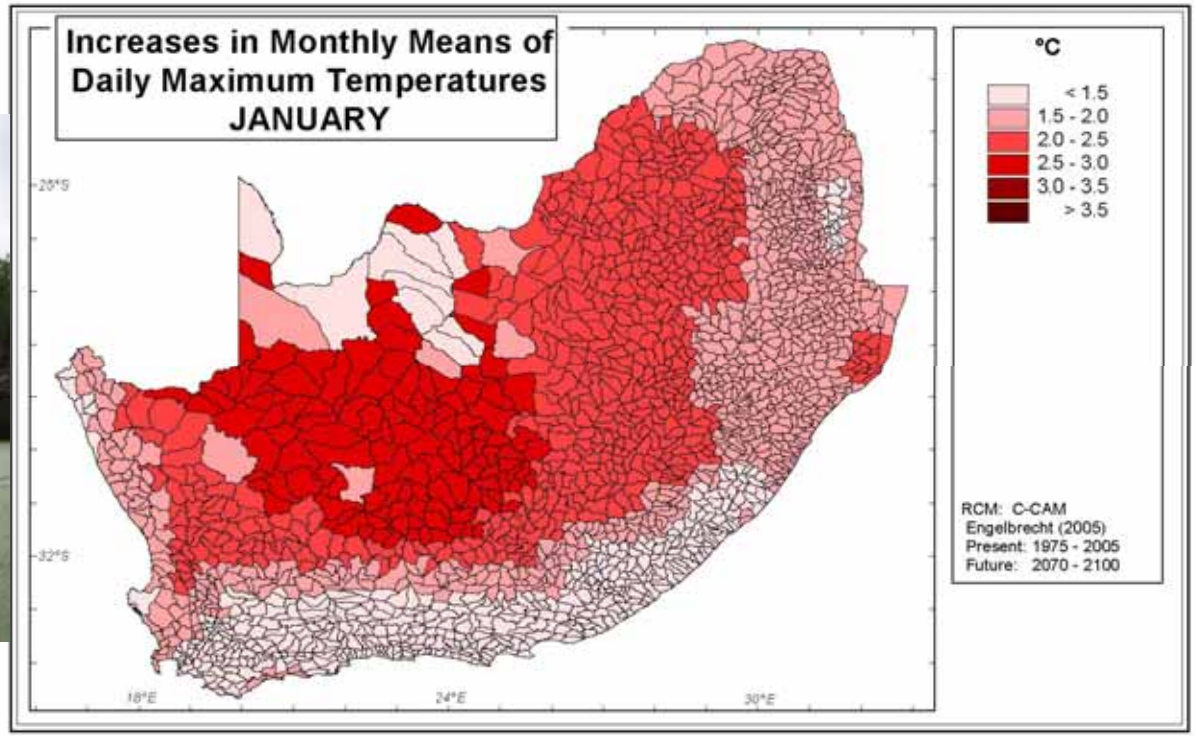
CO_2 impacts

- Increasing CO_2

- Changes in land-cover - CO_2 fertilization more trees – changing nature of soil zone and water use.
- Better plant water-use efficiency.

Temperature impacts

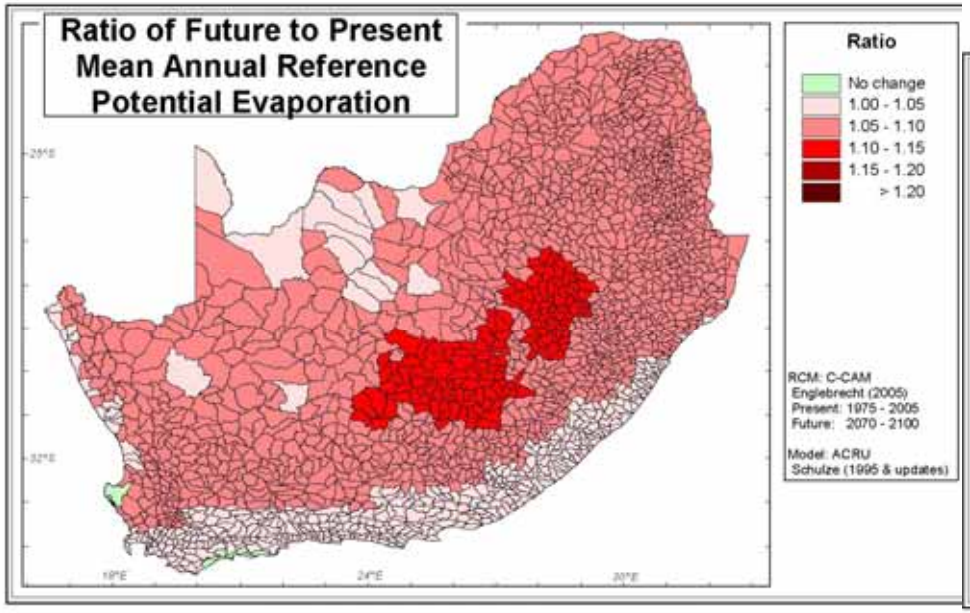
- Down-scaled regional model shows temperature increases greatest inland.
- Blue-green algae blooms – pollution.
- Higher evaporation rates.

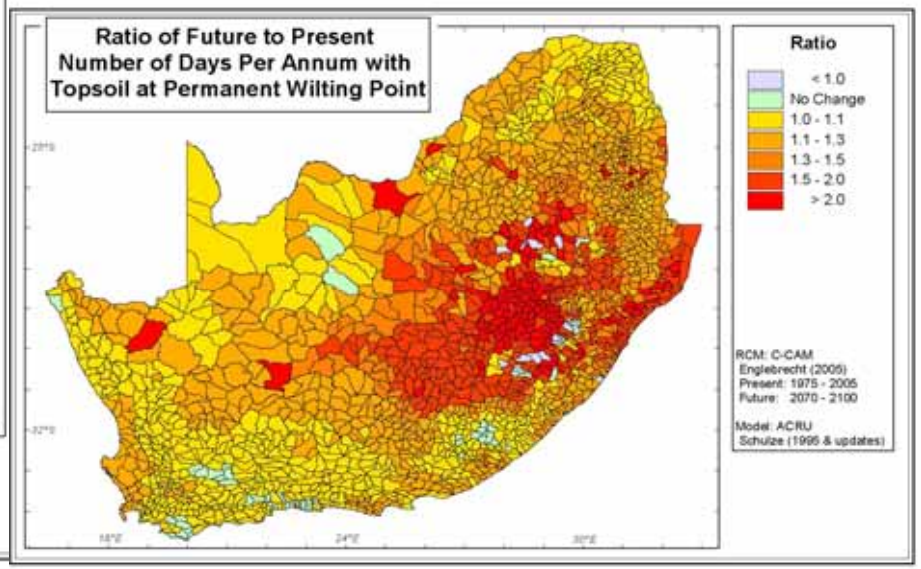


Schulze et al. ***Climate Change and Water Resources in Southern Africa. WRC 2005:***

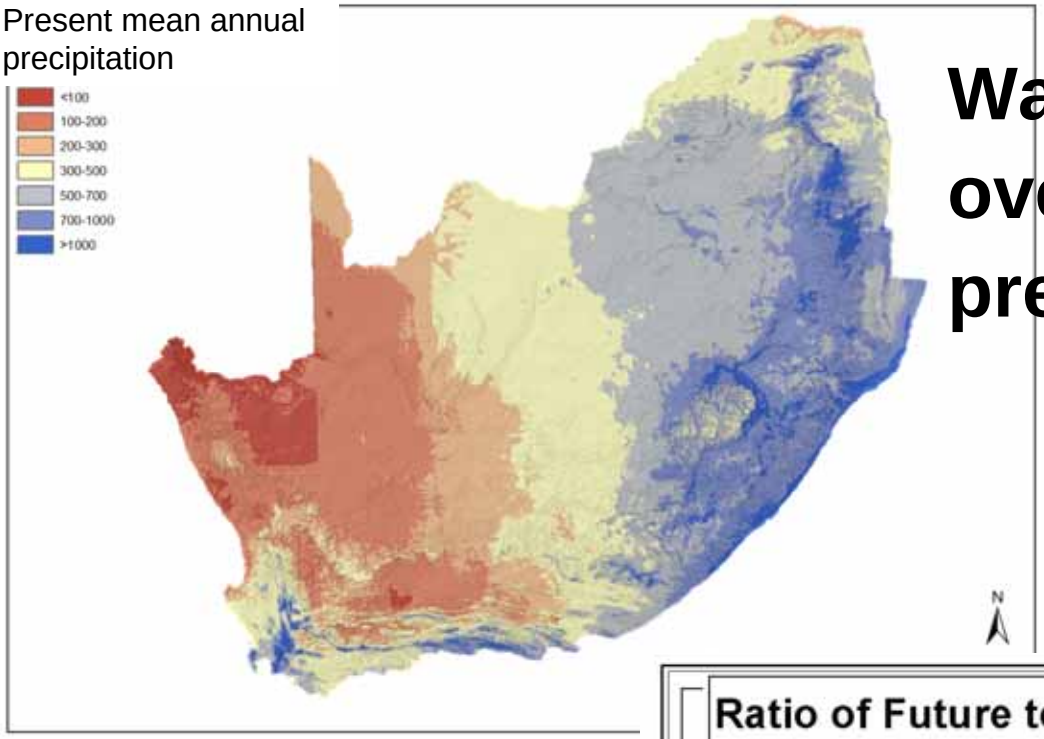
Temperature impacts

- Higher evaporation rates > losses from dams, lakes and wetlands.
- Higher transpiration rates by plants with ‘free’ water
- Lower soil moisture available in dry season.
- More wilting of shallow rooted plants and crops.

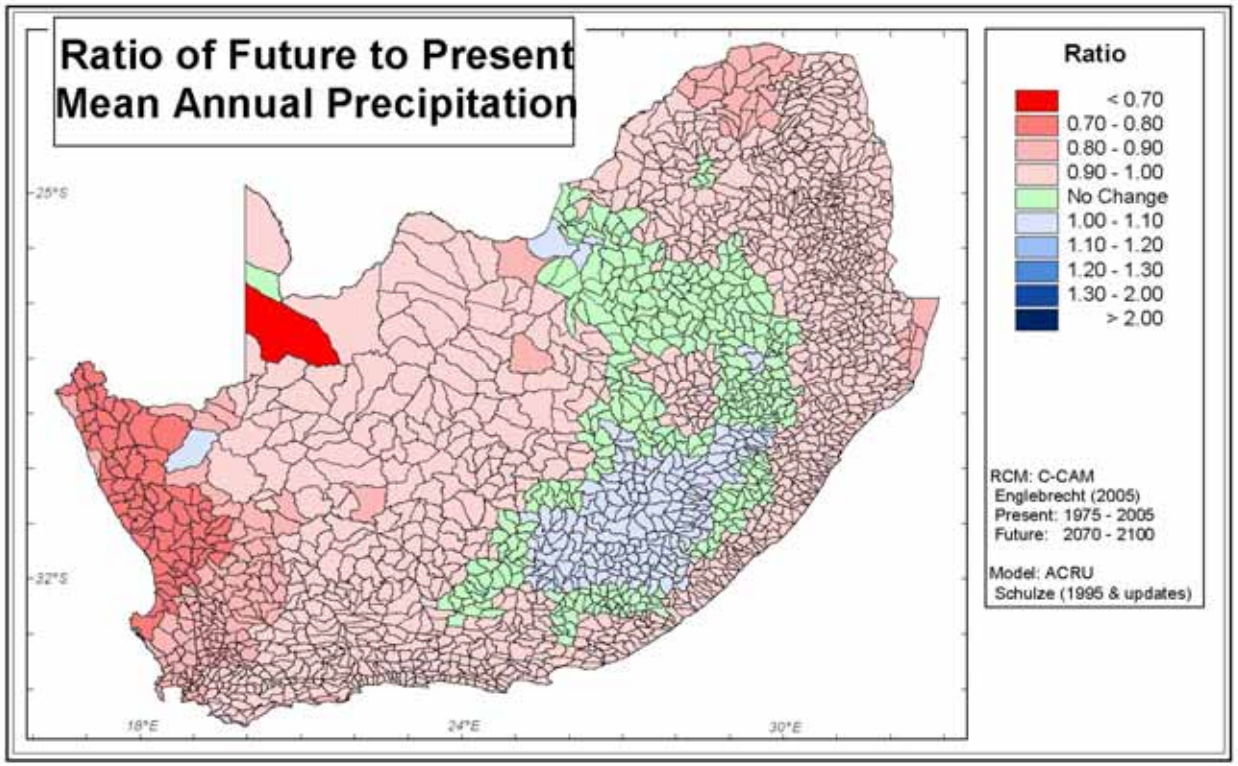




Present mean annual precipitation

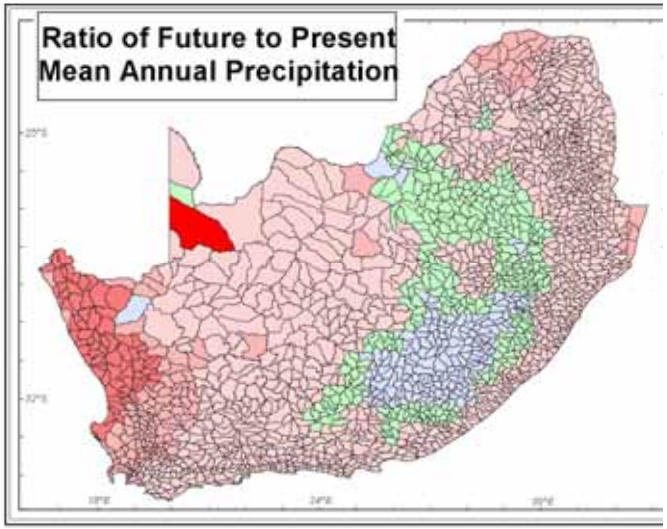


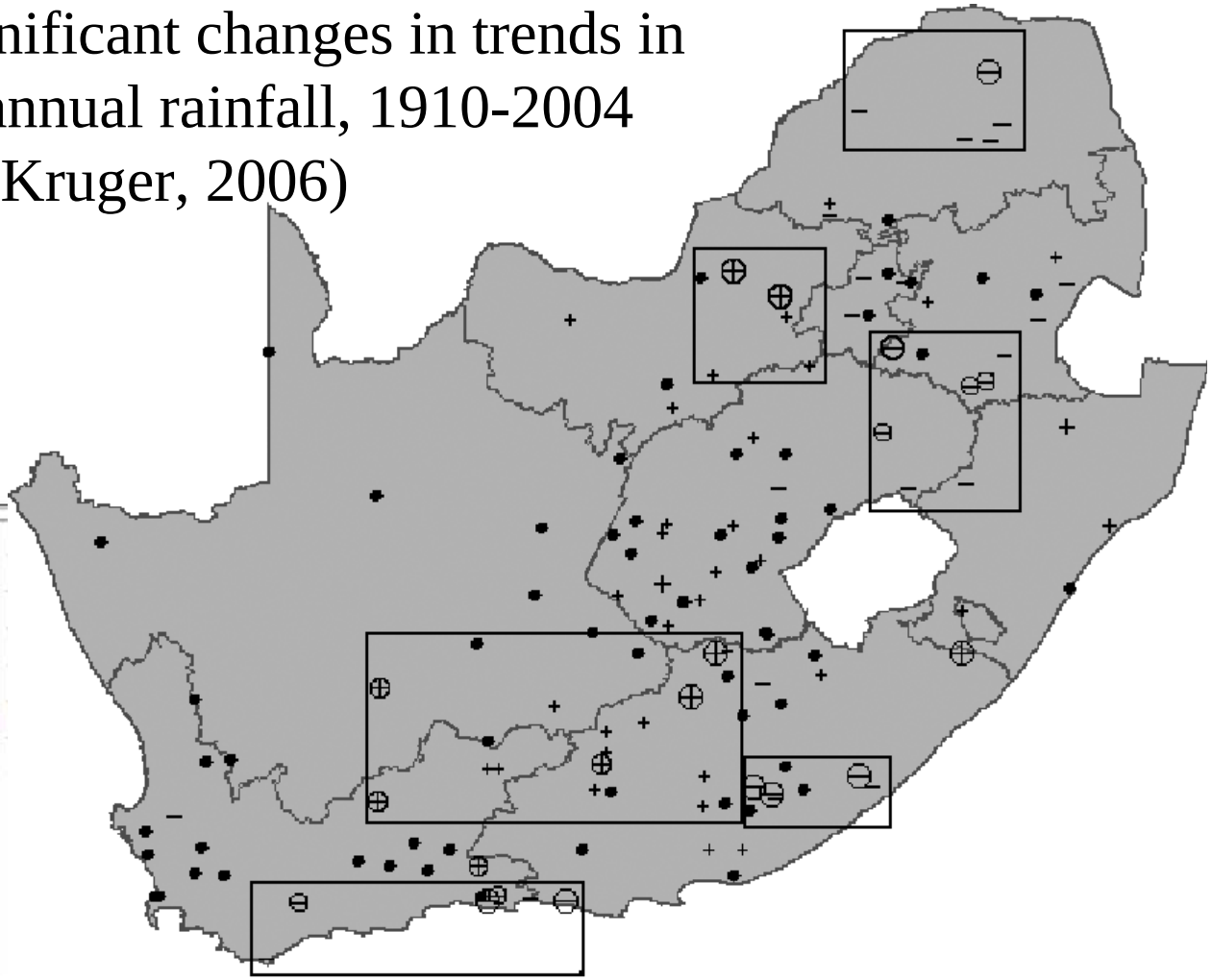
Water Resource Impacts – overall less rainfall predicted in models



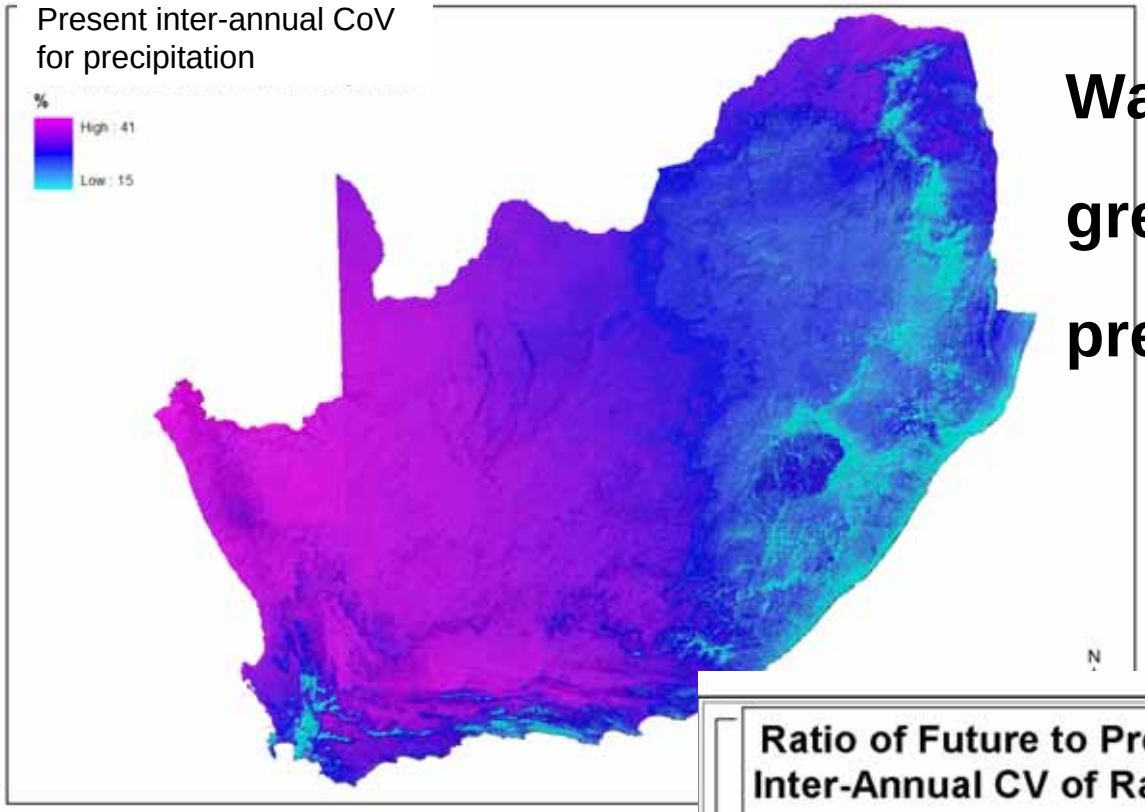
Water resource impacts – observed trends in rainfall

Significant changes in trends in annual rainfall, 1910-2004 (Kruger, 2006)

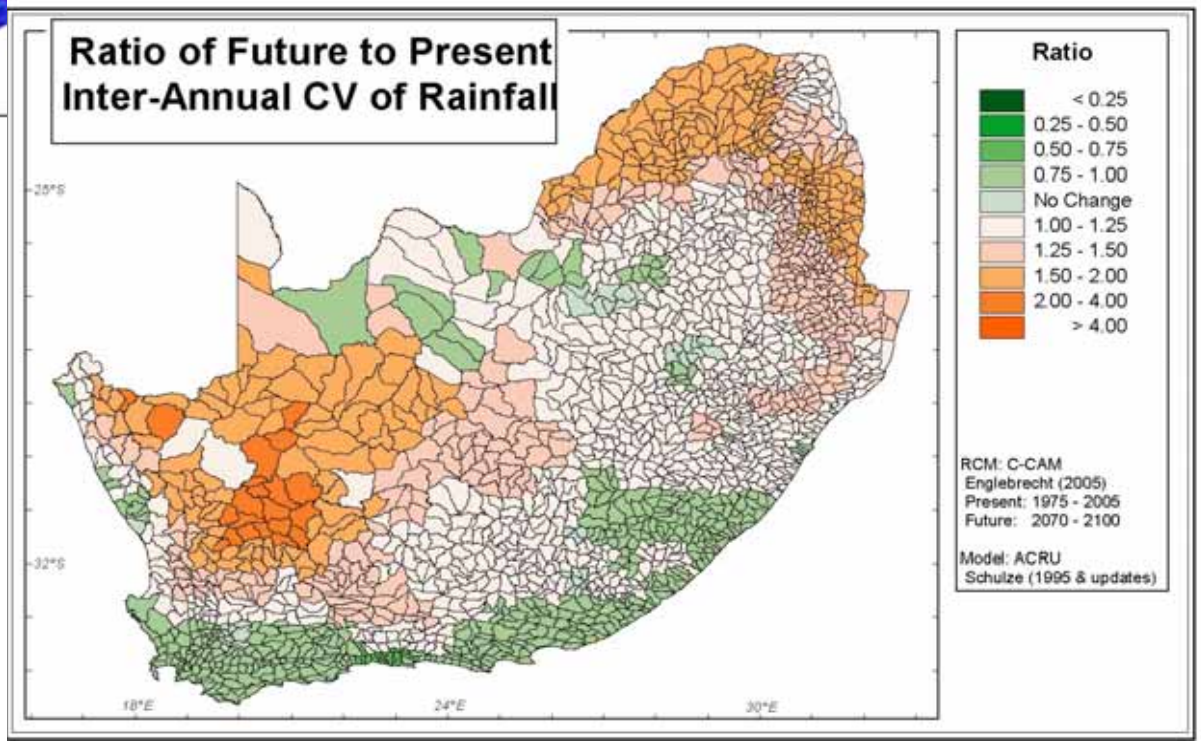




Present inter-annual CoV for precipitation



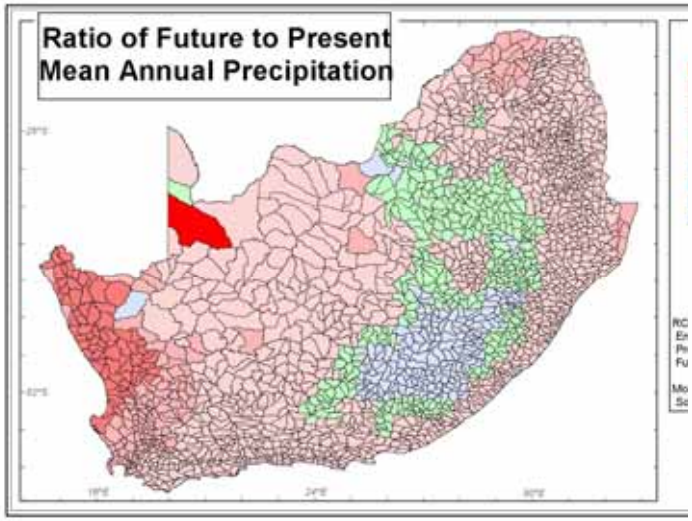
Water Resource Impacts: greater variability in precipitation

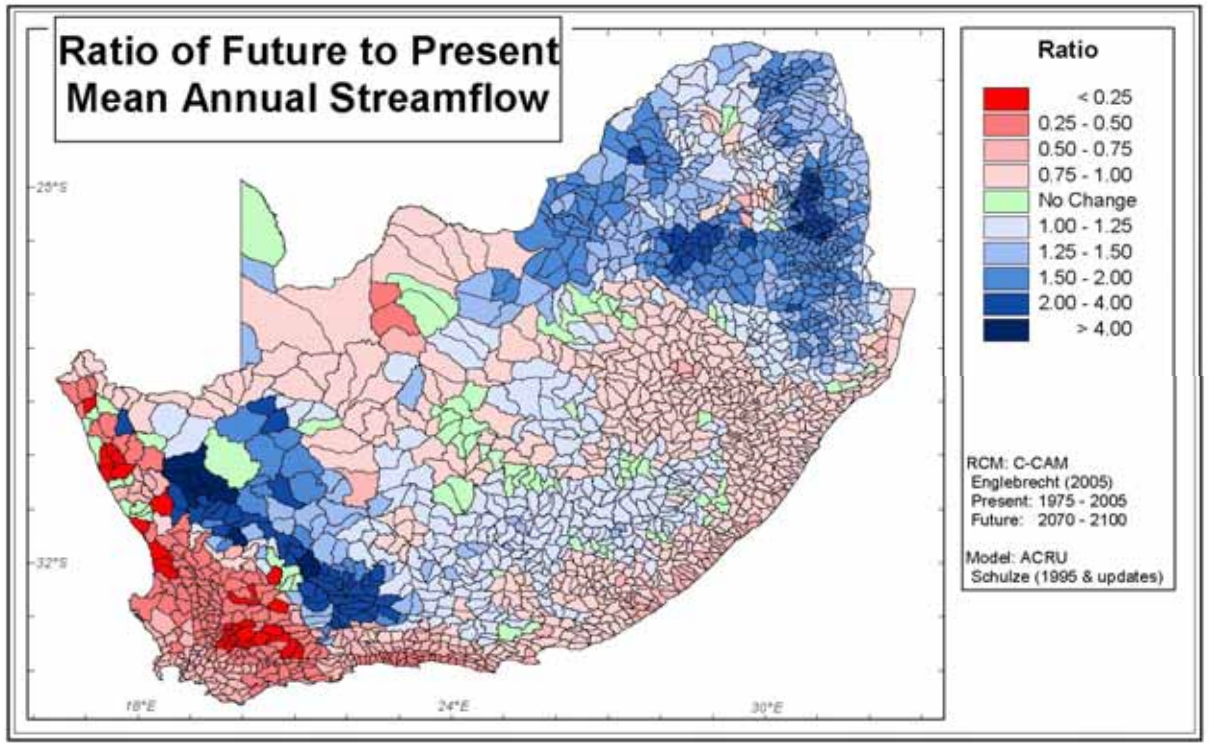


Water Resource Impacts: River flows

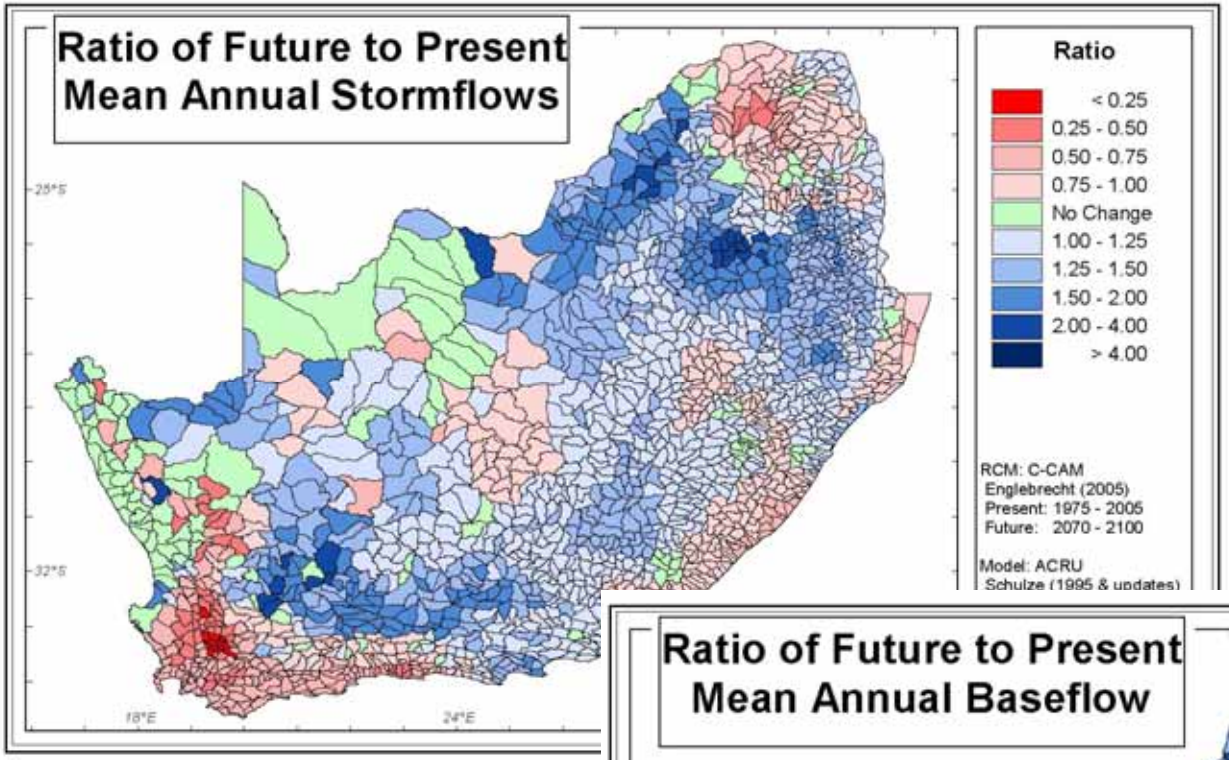
Surface water flows decrease in W.Cape, N.Cape and northern Free State.

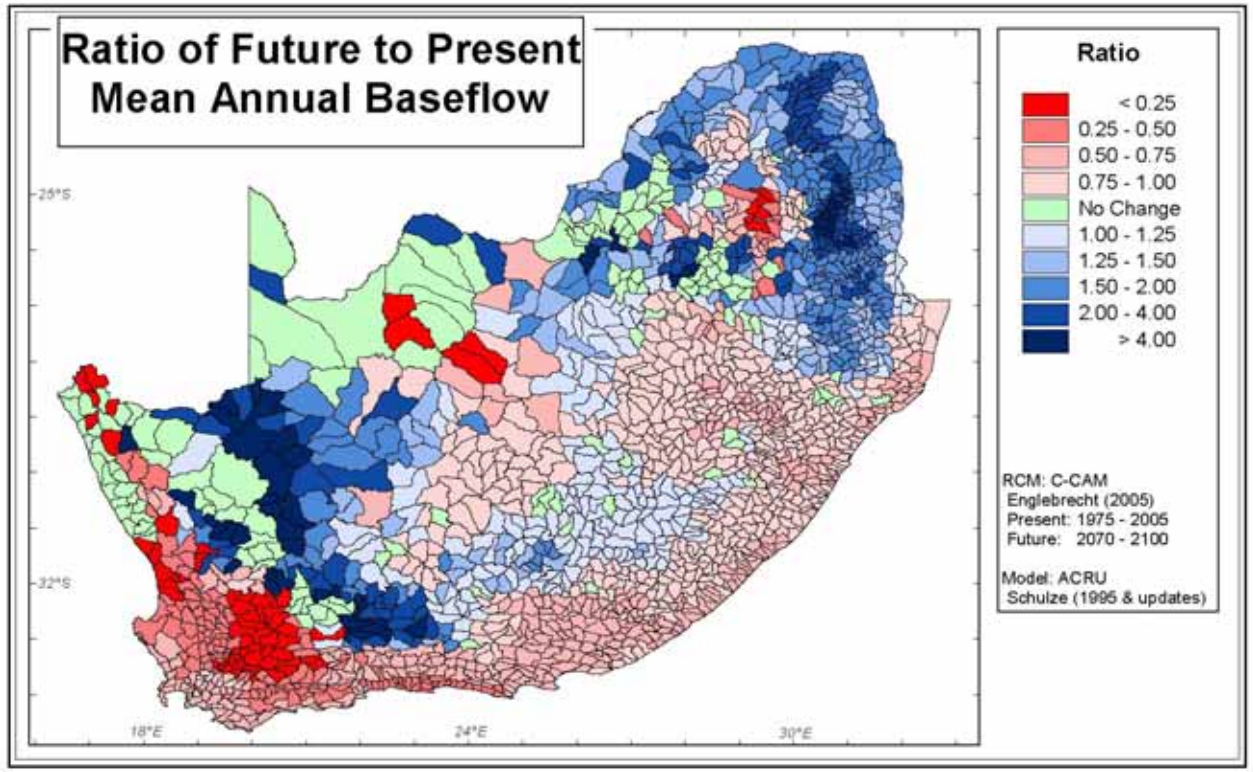
Increase in North West, Mpumalanga, Limpopo, Gauteng.





Water Resource Impacts: River flows



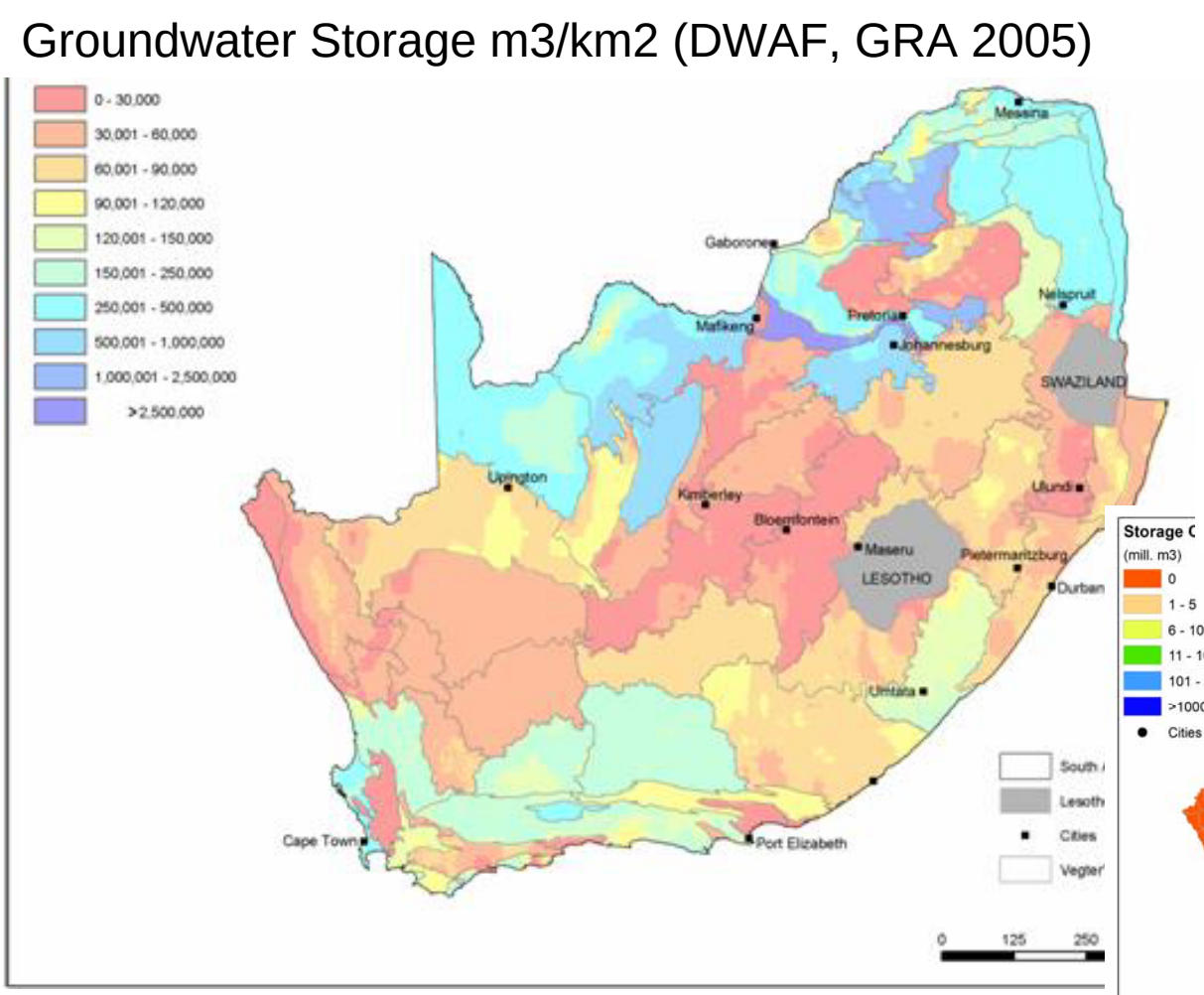


Storm flow increase:
Flood risk

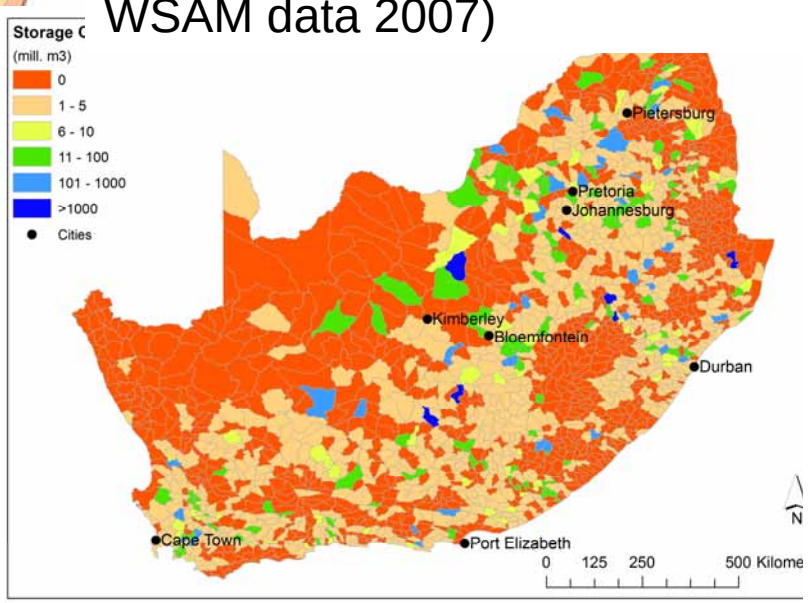
Baseflow decrease:
drought risk

Adaptation Strategies: Water Storage

Groundwater Storage m3/km2 (DWAF, GRA 2005)

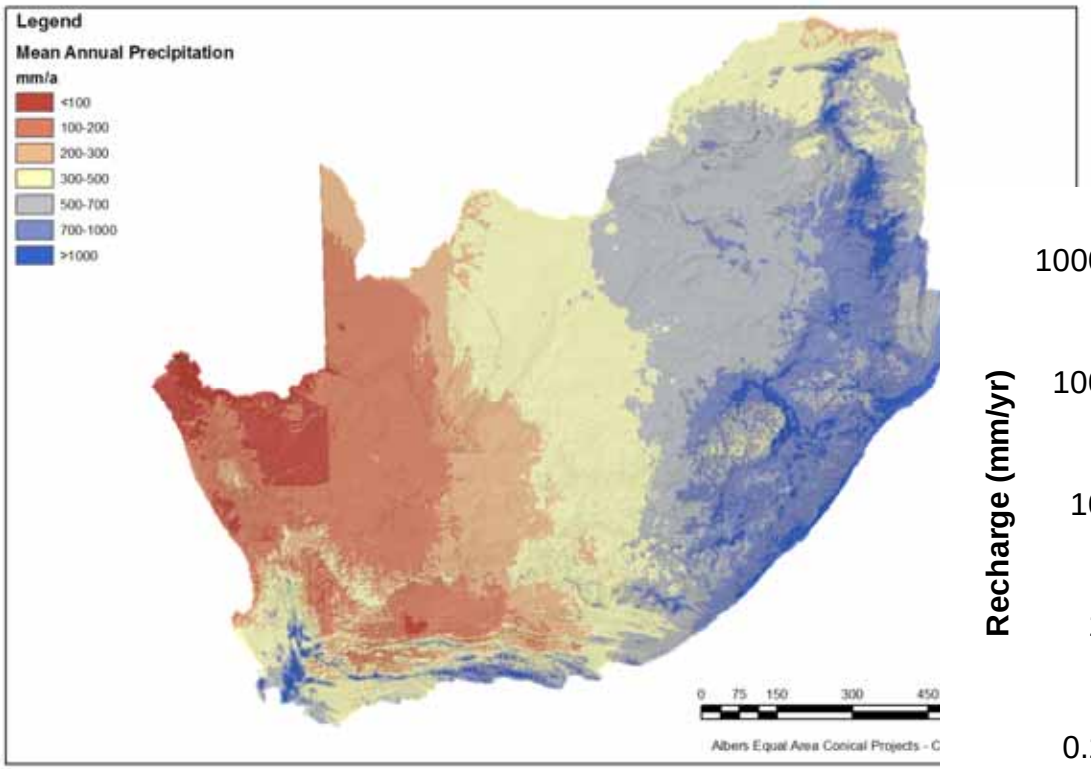


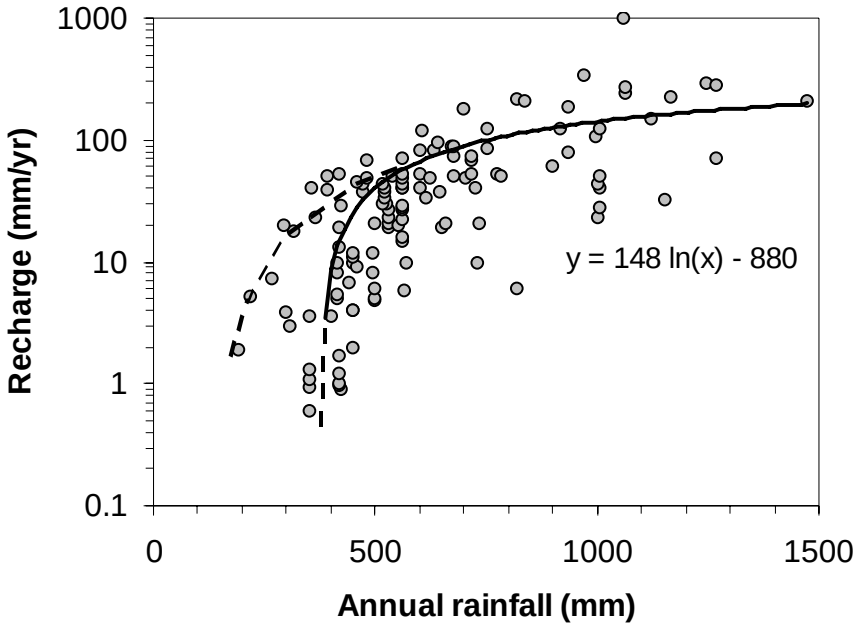
Small and medium dam storage mill m3/ quaternary (DWAF, WSAM data 2007)



Water Resources Impacts: Groundwater Recharge

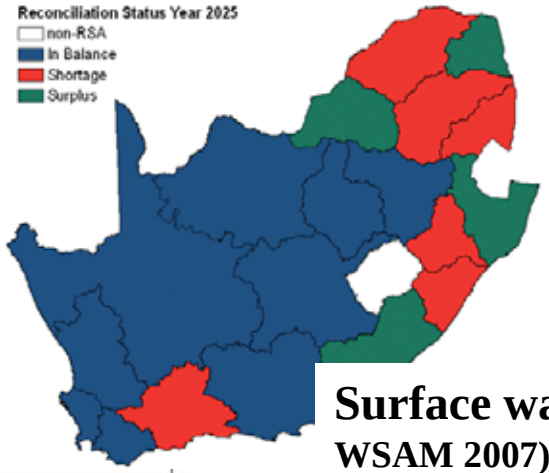
‘Tipping point’ for groundwater below 500mm pa rainfall



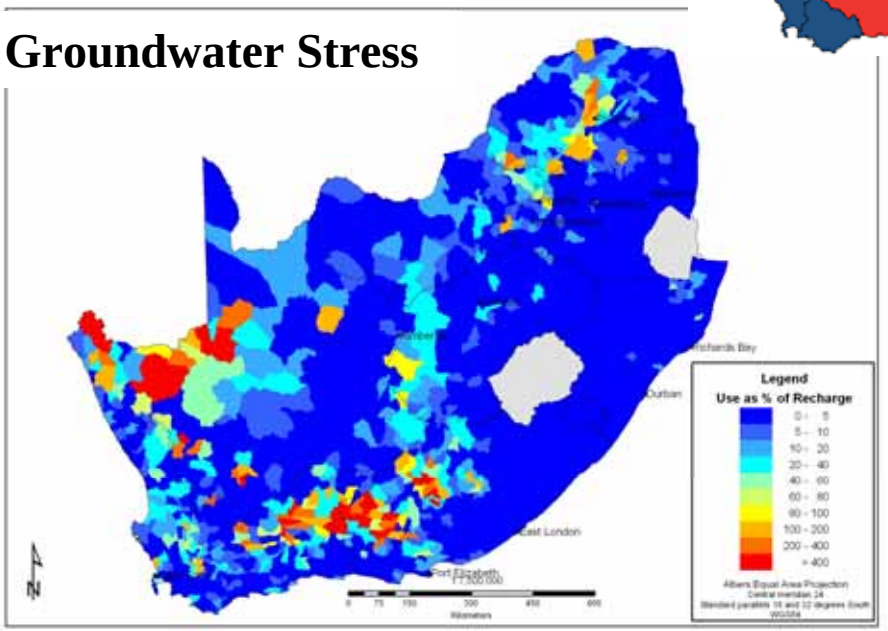


Adaptation strategy: conjunctive use of surface and groundwater.

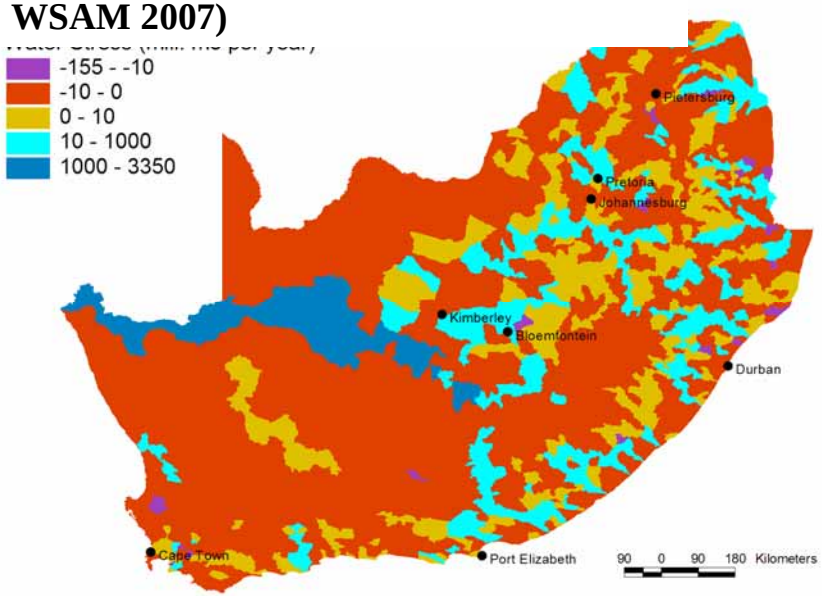
Projected total water stress, 2025 (DWAF, 2009)



Groundwater Stress



Surface water stress (DWAF, WSAM 2007)

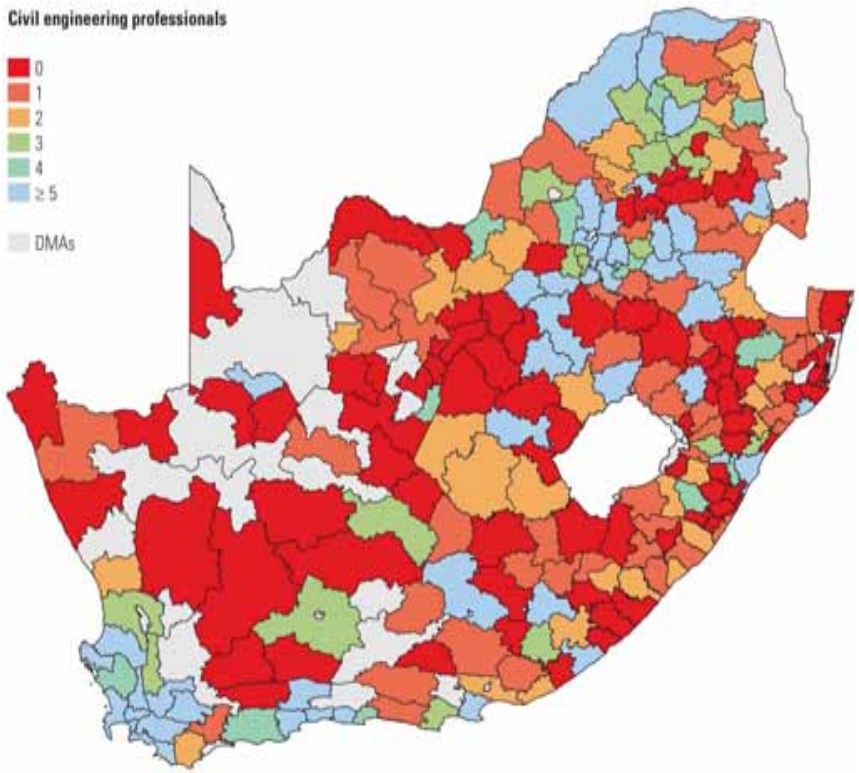


Adaptive Strategy: Monitoring and management

Solutions:

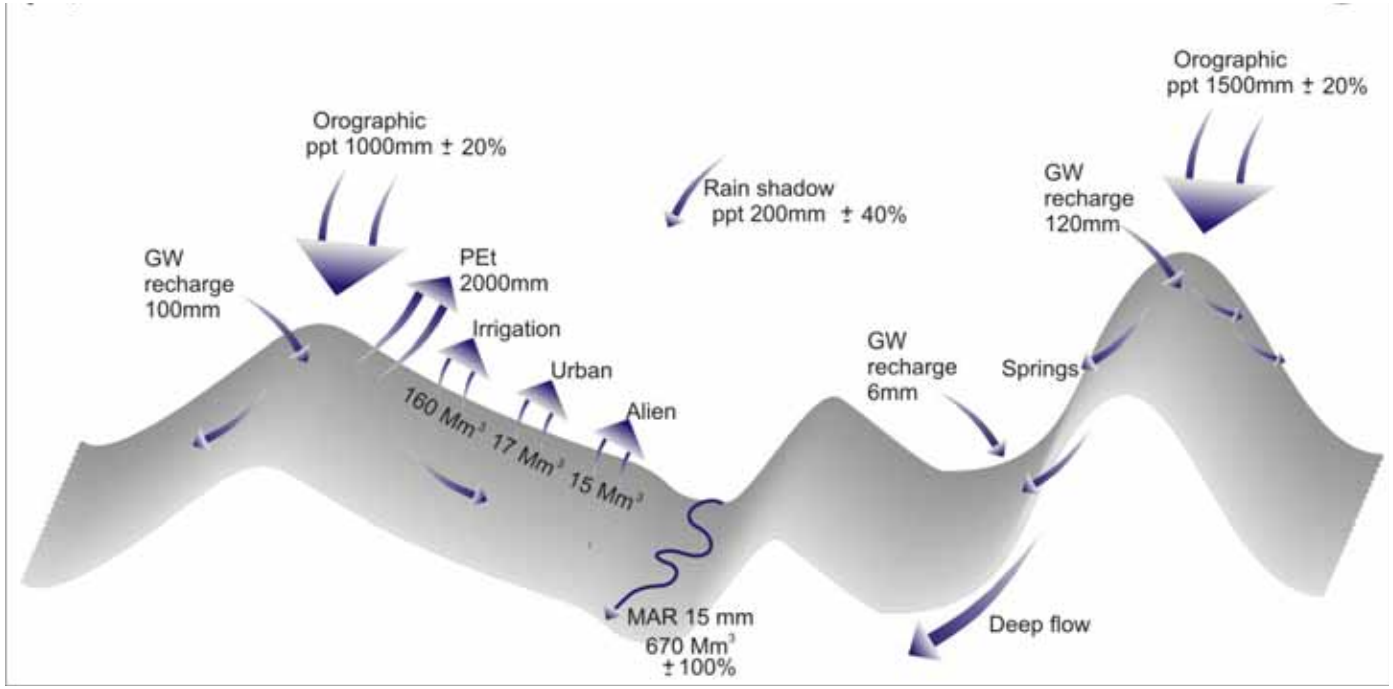
- Increase storage
- Improve management of water quality
- Use different sources of water

All require trained people and effective institutions.



Gaps in knowledge and info

- Knowledge – response and resilience to floods and droughts, algal blooms, groundwater recharge, integrating water into all planning.
- Data – catchment responses, water use, water quality, levels of management.



Conclusion

This case study on national water resources will:

- Highlight vulnerable areas – droughts & floods, temperature change.
- Emphasise natural storage and appropriate technologies (aquifer storage).
- Guide the development of coping capacity in a skills scarce sector.