Key impacts in Africa ~2020s-2050s

- Between 75 and 250 million people will experience greater water stress by 2020
- Rain-fed agricultural yields could be reduced by up to 50% by 2020 in some countries
- 10-30% reduction in average river runoff and water availability by mid-century
- Drought affected areas will increase in extent
- Increased flood risk in high rainfall areas
- Changes in ecosystem structure and loss of biodiversity if temp increase >1.5-2.5ºC
- Human health – possible changes in malaria transmission potential

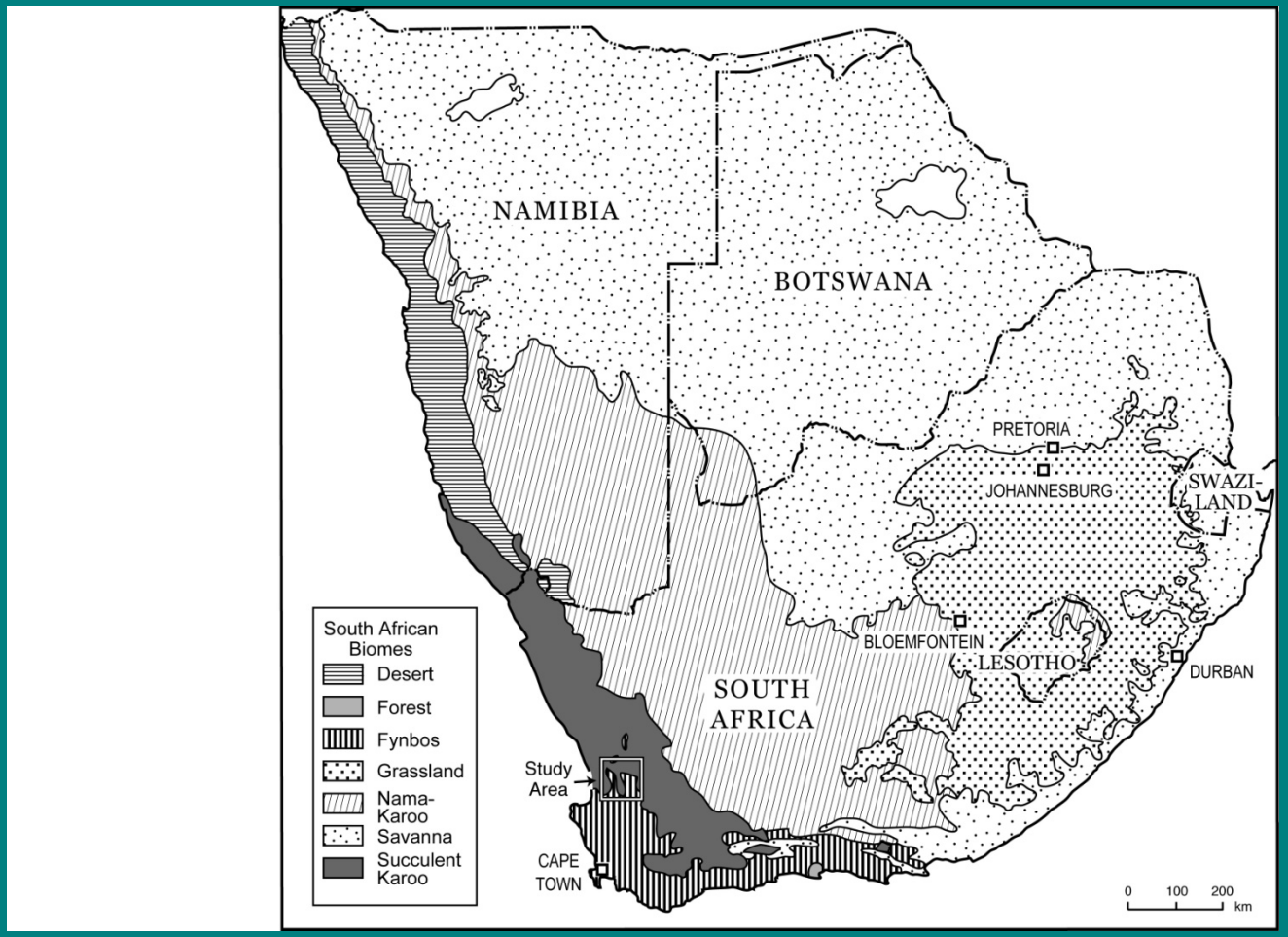
Adaptation to climate change amongst small-scale rooibos farmers

- WWF funded study in the Suid Bokkeveld

('Farming on the Edge' in arid western South Africa: climate change and agriculture in marginal environments. Archer, E.R.M., Oettlé, N.M., Louw, R., Tadross, M.A. 2008. Geography)

- Background of severe drought & less rooibos yields in 2003
- Working with the Heiveld co-operative (EMG, Indigo Devt Consulting, UCT)
- What made this study special?
  - Multiple synergies ……multiple benefits
  - Incentives for conservation
  - Incentives for adaptation (often similar strategies)
  - Farmer participation & monitoring

Study area


NAMIBIA
BOTSWANA
PRETORIA
JOHANNESBURG
SWAZI-
LAND
BLOEMFONTEIN
LESOTHO
DURBAN
SOUTH
AFRICA
Study
Area
CAPE
TOWN
South African
Biomes
Desert
Forest
Fynbos
Grassland
Nama-
Karoo
Savanna
Succulent
Karoo
0 100 200
km

Example of 2003 farmer climatic calendar

2003												
	Jan	Feb	Mar	April	May	June	July	Aug	September	Oct	Nov	Dec
What do you remember about the weather conditions for this period?	Dry & windy			First rain, but insufficient. Thunderstorms		Small amount of rain; below average – insufficient to plough			Good rain; intense rain event one day. Hail & snow; intense cold. Beginning of windy season			Small amount of rain
What were the impacts of the weather conditions for this period?	Water shortages for people & livestock; tea production low; forage shortage; poor road conditions as result of drought (potholes); livestock mortality			Pest infestation: ticks affecting livestock		Unable to plough; reduced work opportunities						Stock condition poorly affected
How did you respond to these conditions?				Reduced stock; dipping		Land preparation & wind erosion prevention measures						Supplemental feed provided to stock
Were there responses you would have liked to have undertaken, but could not?				Would have liked to have ploughed		Would have liked to have prepared more areas of land						
Why were you unable to undertake such a response?				Insufficient soil moisture		Increased fire risk (due to dryness); financial hardship						

Wild rooibos cultivation as multiple benefits strategy

Trait	Wild	Cultivated
Morphology	Prostrate growth form	Erect growth form
Growth	Post-fire sprouting from basal stem	Post-fire mortality
	Slow-growing	Fast-growing
Reproduction	Post-fire seed germination	Post-fire seed germination
	Low seed output	High seed output
Resilience	Resilient against pests, drought and disease	Susceptible to pests, drought and disease
Harvest regime	Generally harvest once every two years	Harvest once every year

Quarterly climate preparedness meetings

Blomfontein farm – farm reportbacks, July 2005

Heiveld climate meeting

Barry aan die woord.

Linking farming communities to larger scale global changes: climate change and commercial agribusiness in the arid Sandveld, western South Africa.

Archer, E. ; Tadross, M. ; Opperman, D ; Conrad, J. , Venter, J. & Münch, Z.

CSAG
CLIMATE SYSTEM ANALYSIS GROUP

GEOHYDROLOGICAL AND SPATIAL SOLUTIONS INTERNATIONAL (PTY) LTD
GEOSS

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

GCBC | GREATER CEDERBERG BIODIVERSITY CORRIDOR
people in partnership

Proudly implemented by CapeNature under the auspices of C.A.P.E.
CapeNature
C·A·P·E

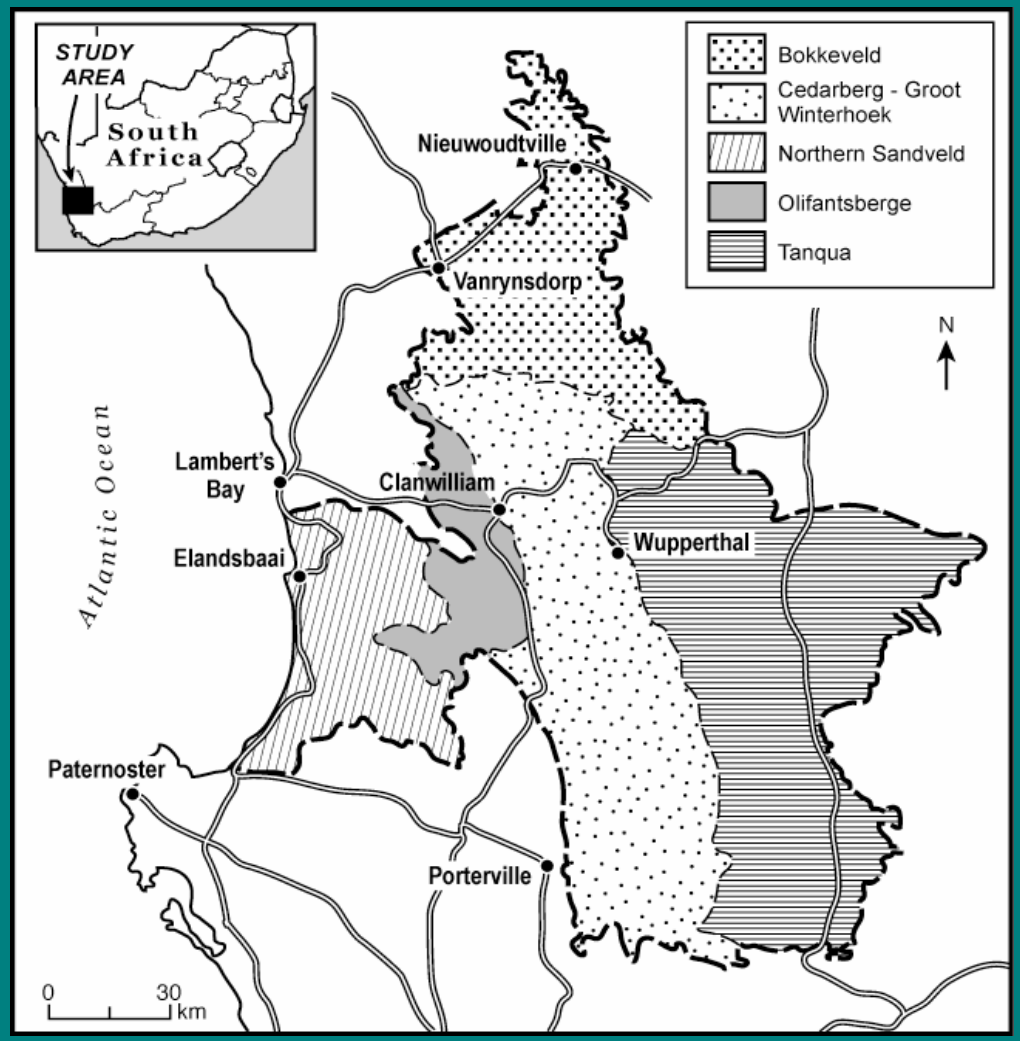
Background

- Project commissioned by Cape Nature Greater Cederberg Biodiversity Corridor (GCBC project); Potato SA & Rooibos Council – establishing best practice guidelines (biodiversity-business) for intensive commercial farming in a sensitive and biodiverse environment

- **Understanding climate change projections and implications for potato & rooibos farming in the Sandveld**

- Climate change may challenge best practice in the region.

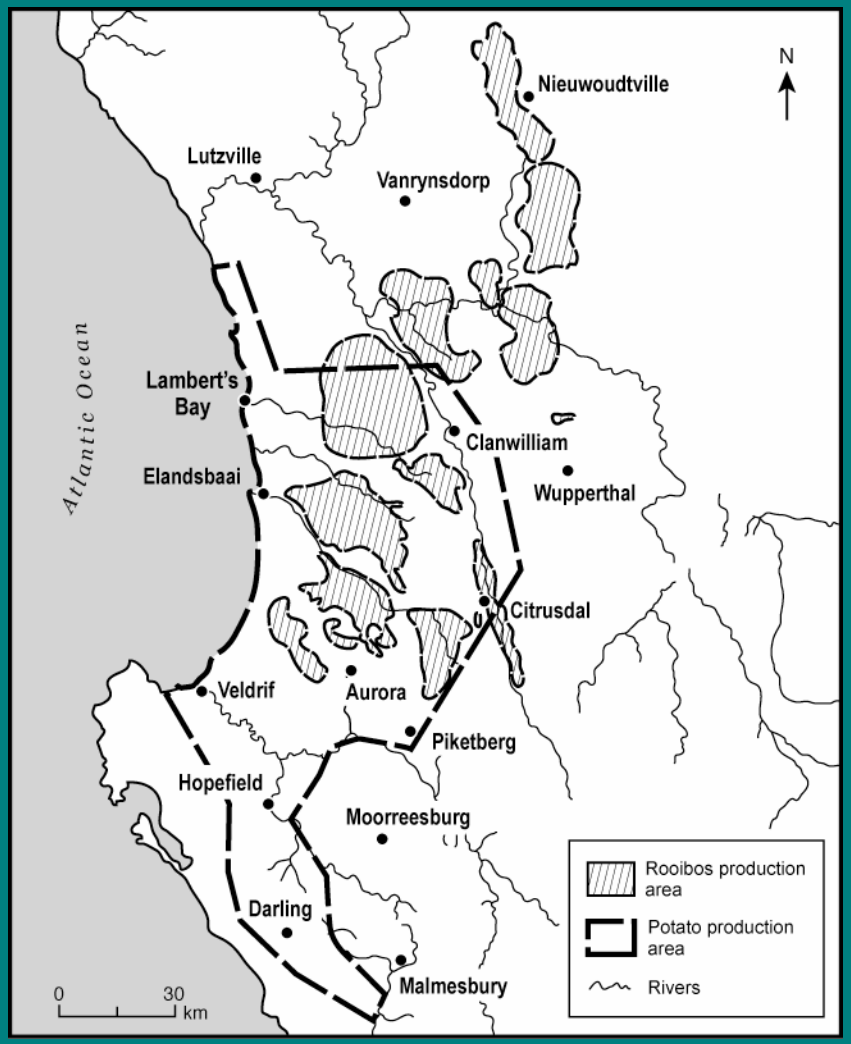
The Greater Cedarberg Biodiversity Corridor (Cape Nature)



- At transition zone between Fynbos & Succulent Karoo
- Northern Sandveld a key lowland biodiversity area

Yet…

An area of intensive commercial agriculture



Host to intensive potato & rooibos production – key economic activities in this area

Cape Nature:

-over past 15 years, ave 2.7 ha of Sandveld cleared for agriculture per day

i.e. > 50% natural Sandveld habitat already transformed

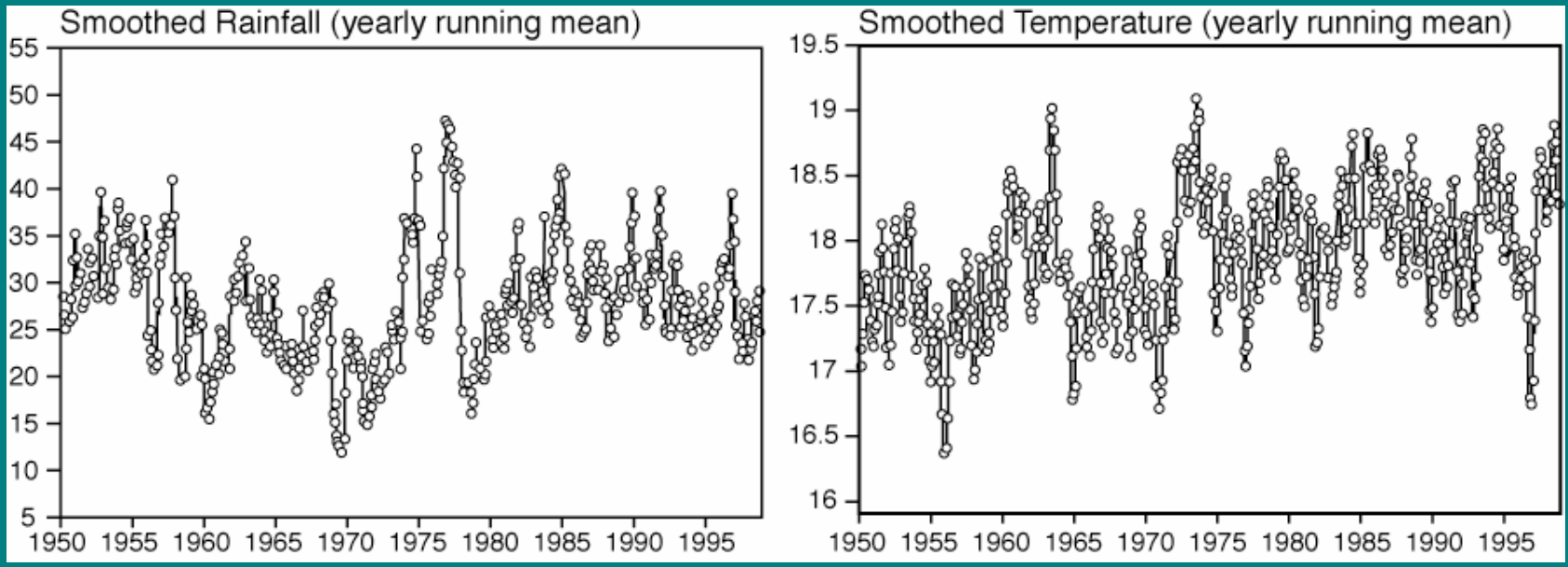
Low rainfall & nutrient poor soils;

Thus commercial agriculture requires

- high groundwater abstraction
- high amts fertilizers

Sandveld climate history

In an already sensitive and pressured environment …



What of the future?

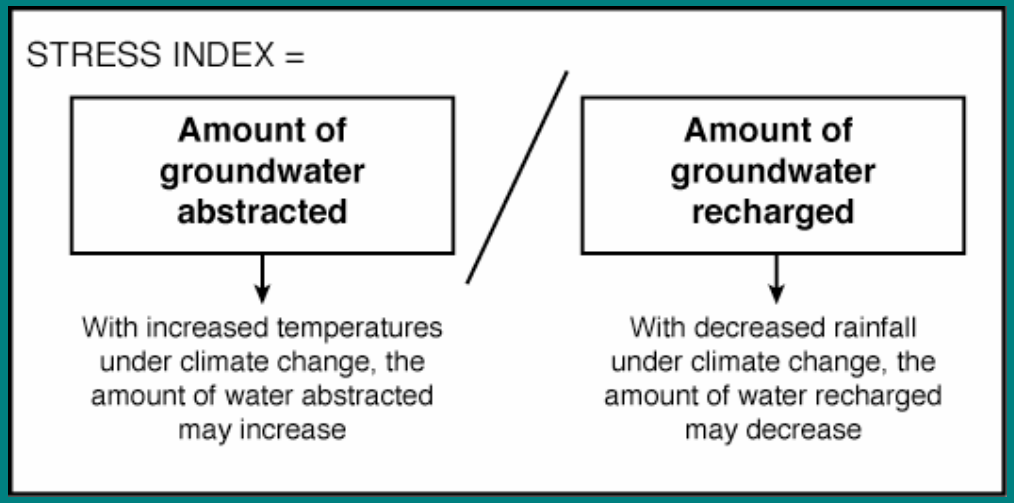
Background to available climate change data

- Typical experience when requesting information on climate change
- Value of bringing the projections data into GIS
- South African Environmental Observation Network (SAEON) project + AWhere/SEI/CSAG/UNEP work (Climate Change Explorer)

- Basic idea – GIS data on climate change ultimately available and downloadable (e.g. for user such as Potato SA – groundwater implications for Sandveld?)
  - More detail →

Information required by users – Potato South Africa

- Initial idea to link yields and climate
- Data not robust enough; alternative →
- Driving a groundwater stress model with climate change



Focus on right hand side in partnership with GEOSS;

Hope to focus on left hand side in future (relative humidity, T & wind speed anomalies)

Information required by users – Rooibos

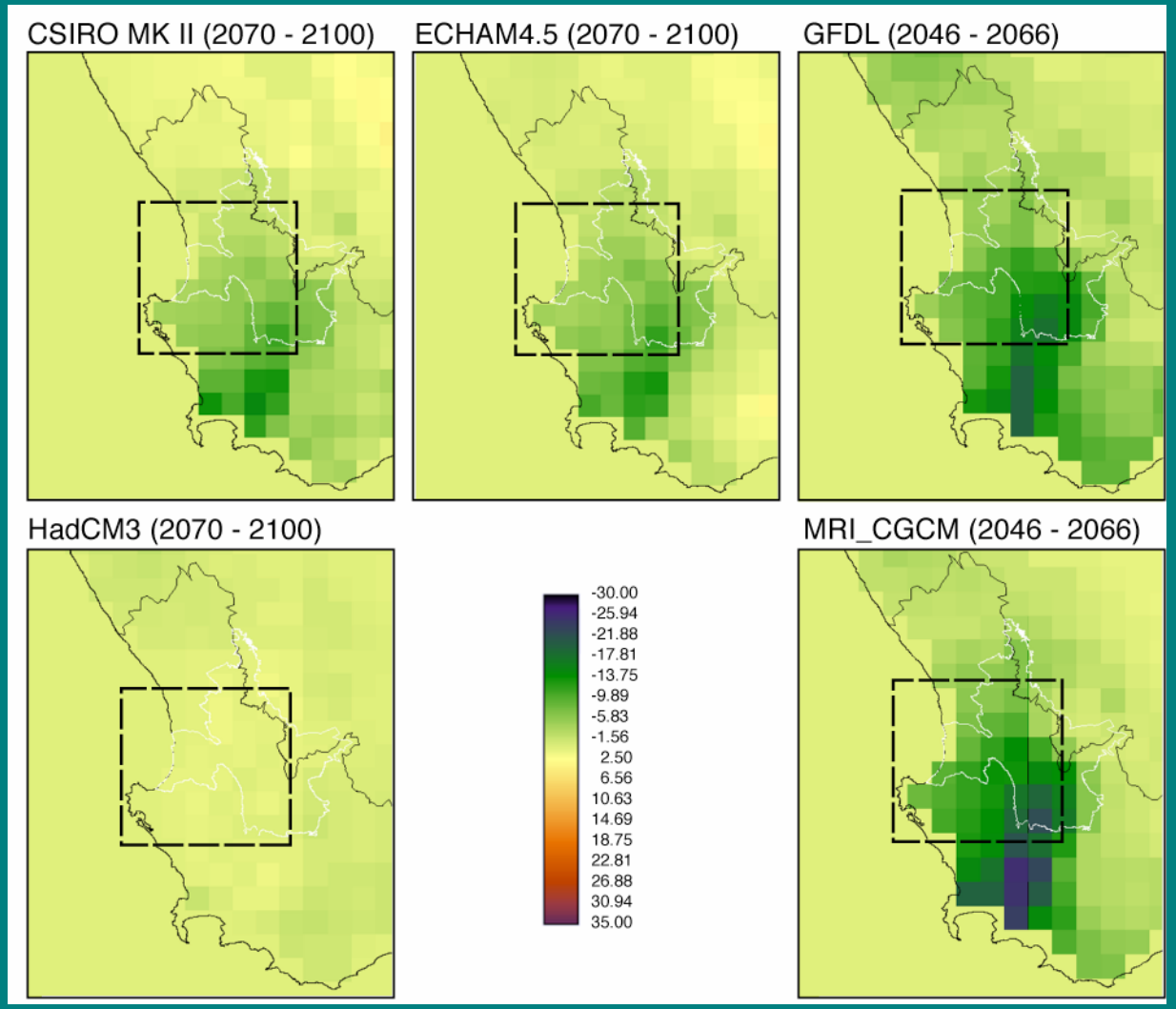
1. Autumn & Winter rainfall (April & Aug - Sep months)
2. Summer rainfall (Dec – Feb)
3. Relative humidity anomalies
4. Wind speed anomalies

- Attempted to drive rooibos area suitability map with scenarios (Elsenburg partnership) – unfeasible
  - » Hope to undertake as part of Volkswagen project 2009

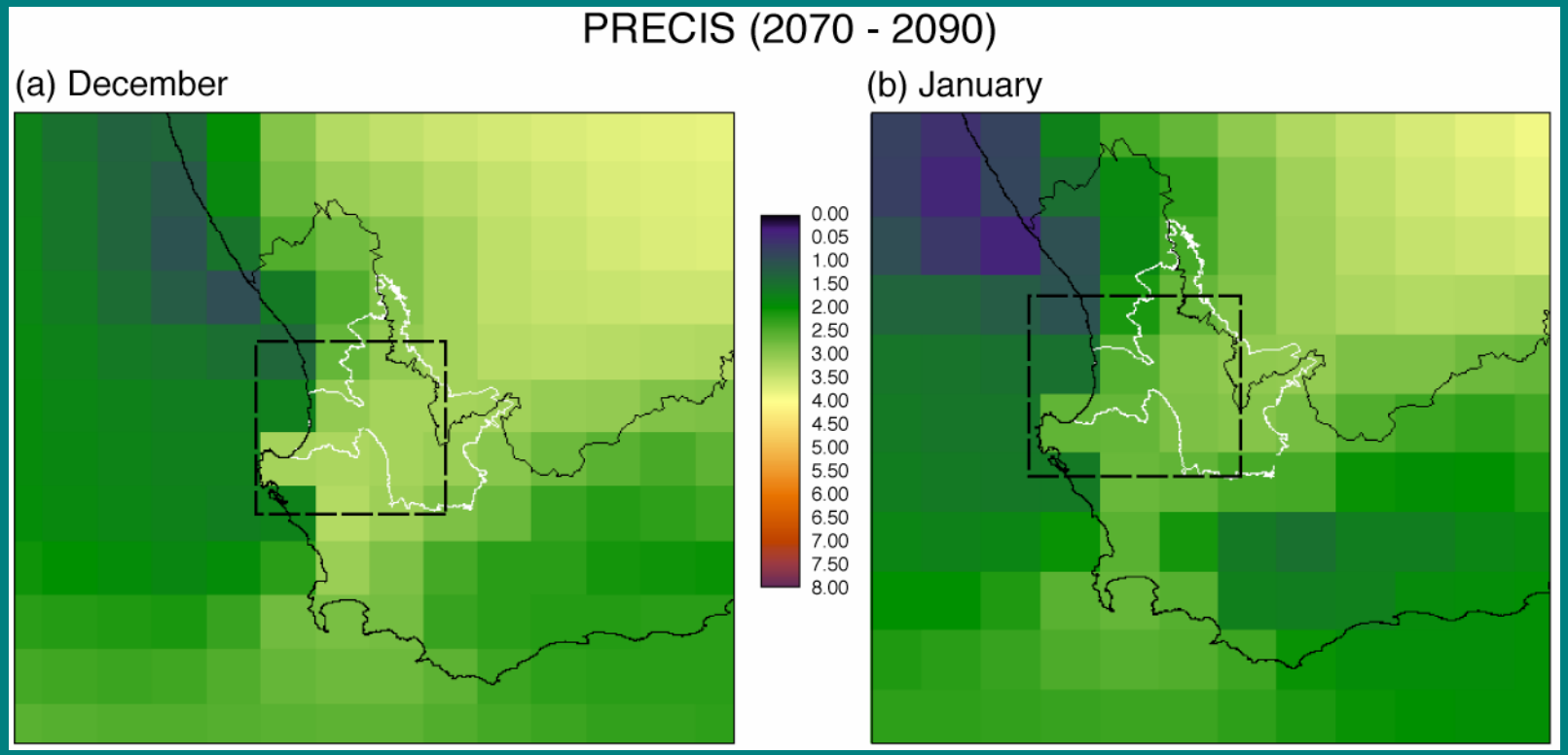
Examples of information provided

- Provided in participatory format; bilingual presentation (always info requested – prev slides);
- GIS data provided + graphics and explanations;
- Limitations (explained to user):
  - Look at change direction, not magnitude
  - Don’t average models
  - Don’t interpret for one single point
  - Some technical tasks remaining

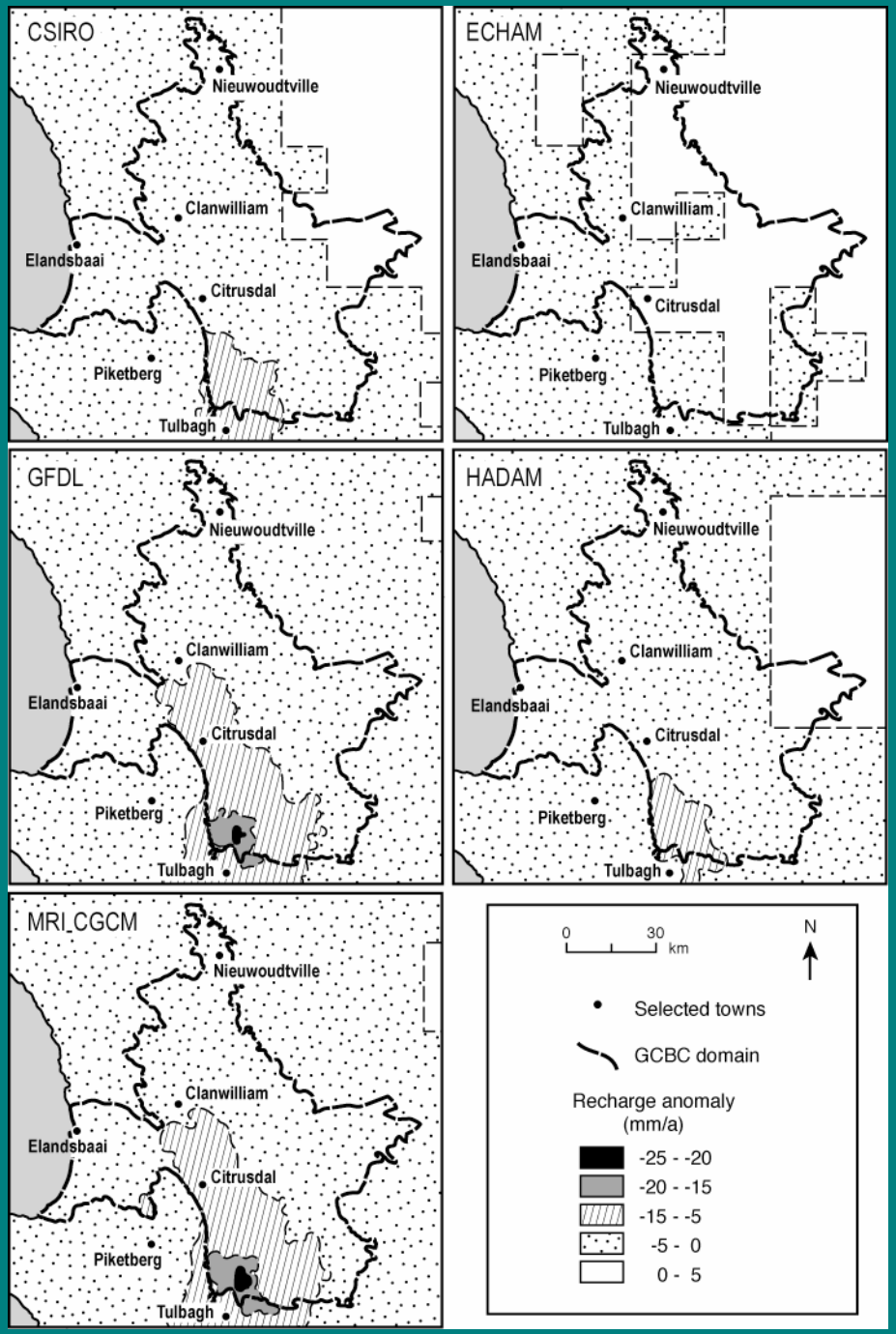
Winter rainfall anomaly



Projected temperature anomalies



One downscaling as an example, but two used.



Groundwater recharge depth anomaly

Groundwater recharge depth calculated based on rainfall anomaly using 5 downscalings

Three later period downscalings (CSIRO, ECHAM & HADCM3) all indicate increased recharge to the east

Possibly due to increases in summer rainfall?

Example of take home messages for the Sandveld

1. 5 out of 6 models show **reduced April rainfall**
2. 5 out of 6 models show **reduced August rainfall**
3. **warmer** monthly average temperatures, minimum temperatures & maximum temperatures – particularly towards the interior
4. All models show **reduced groundwater recharge** under climate change.
5. Thoughts – what might a combination of increased temperatures, lower rainfall and reduced groundwater recharge mean for this area?

Discussion & research challenges

1. Existing stresses may be exacerbated, perhaps critically
2. Heat and water stress likely to increase

Remaining work:

1. Calculate irrigation requirements (wind speed, temperature)
2. A revised suitability model for rooibos?
3. Decentralizing analysis of climate change data →

One way forward in climate change work:

- Ability of stakeholders at Cape Nature, provincial agriculture, city etc to understand data strengths and limitations
- & to undertake own analysis & decision support
- Hugely advantageous
- Allowed study to move beyond a simple generic impact study