

Ecosystem-based Adaptation to climate change in the Namaqualand, South Africa

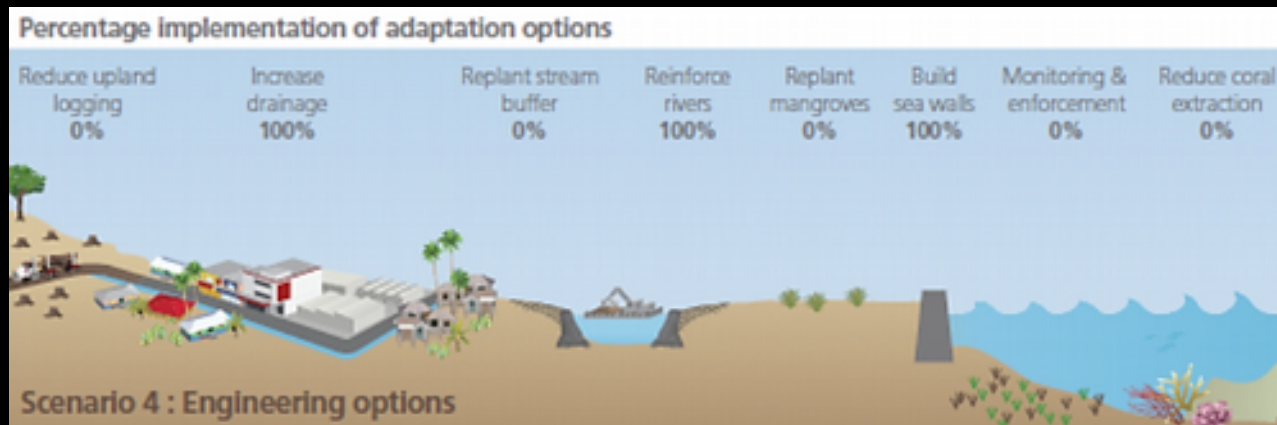
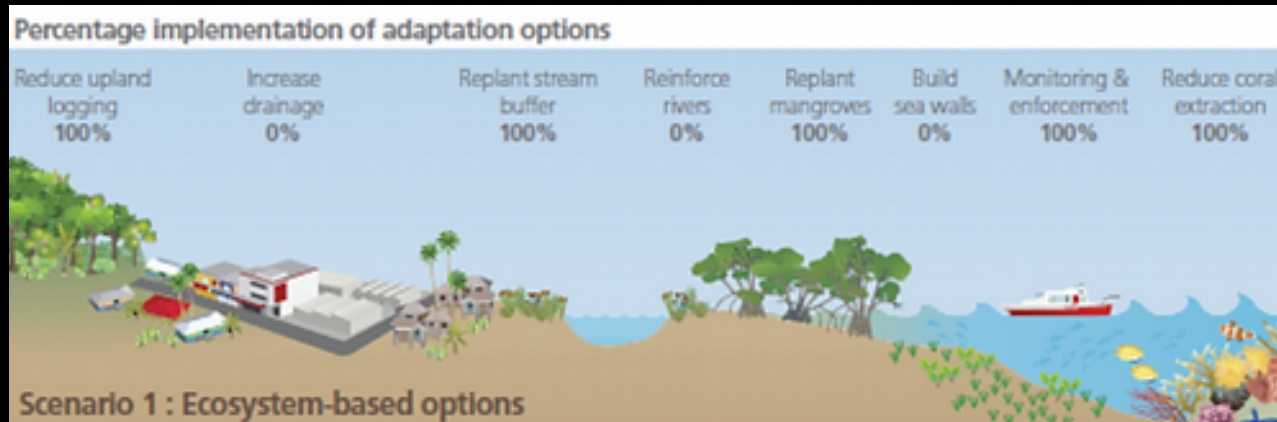
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Ecosystem-based Adaptation (EbA)

“EbA integrates biodiversity and ecosystem conservation, socioeconomic benefits and climate change adaptation outcomes, within the context of Sustainable Development” (Midgley et al 2011)

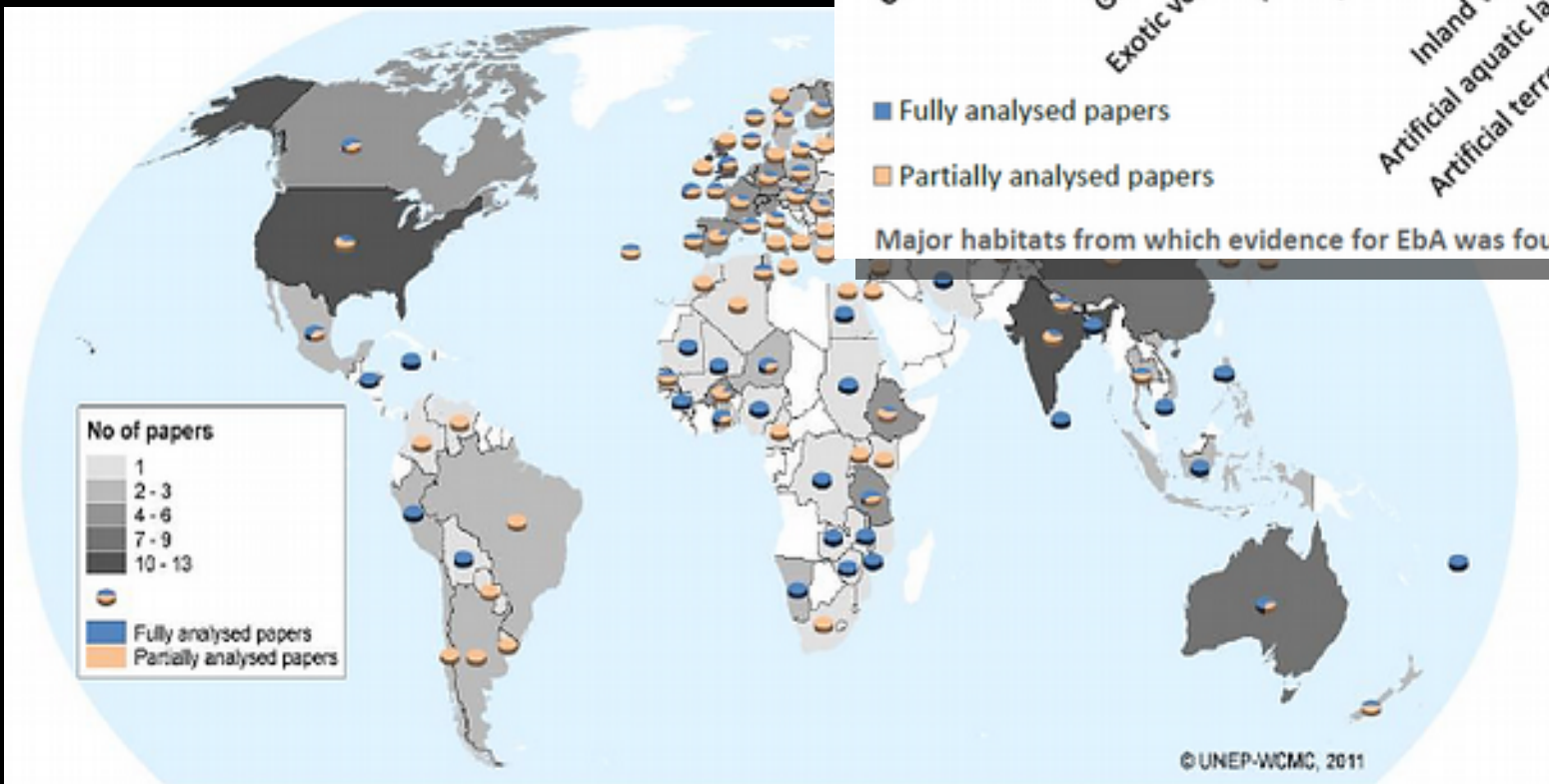
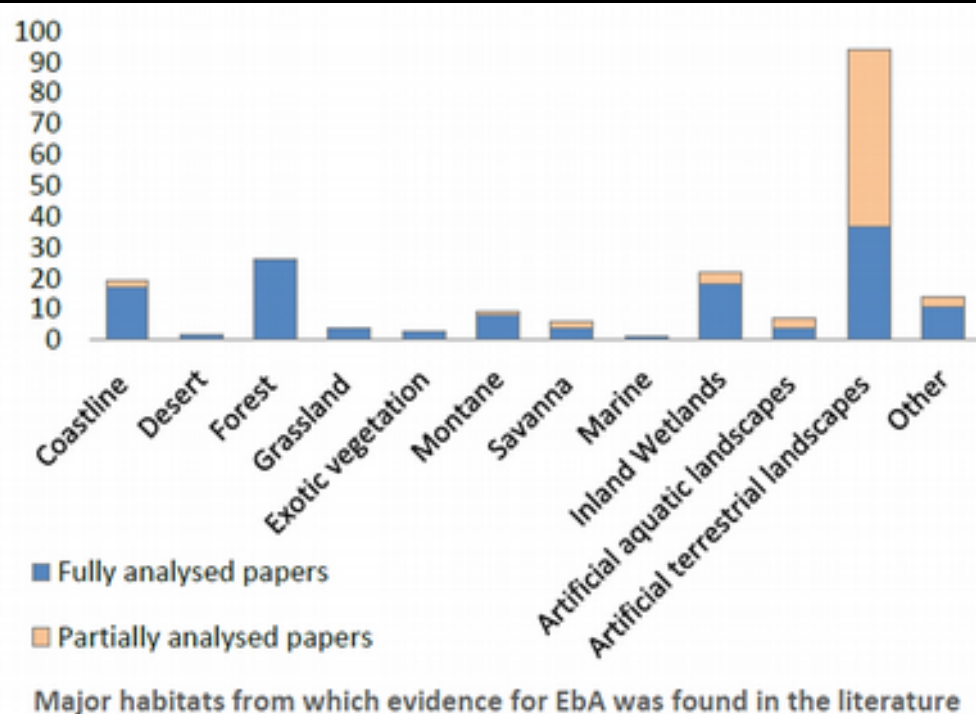


(Rao et al. 2012)

“EbA is a cost-effective, robust and flexible strategy that can cope with the magnitude, speed and uncertainty of climate change.” (Munang et al. 2013)

EbA: Evidence?

(Munroe et al. 2011)



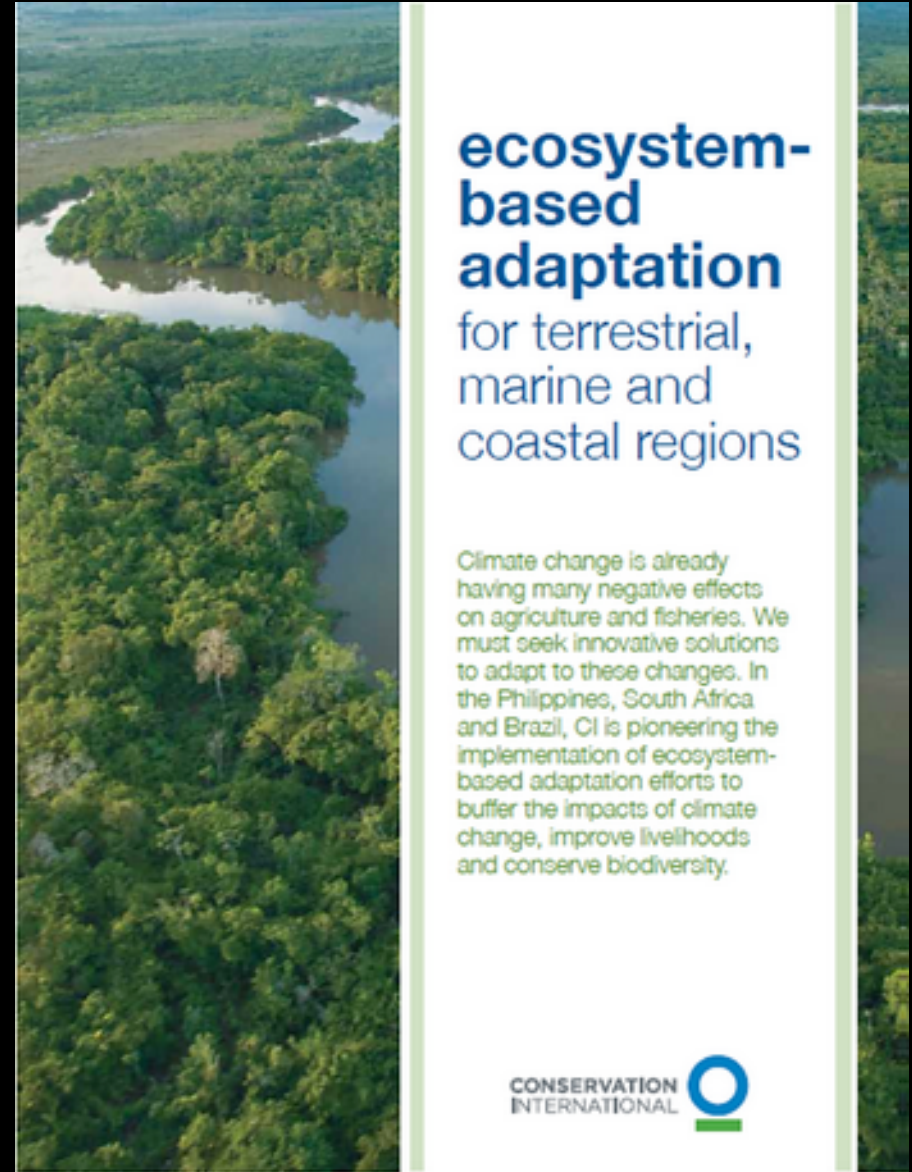
The boundaries and names shown and the designations used on maps do not imply official endorsement or acceptance by the United Nations Environment Programme or contributory organisations.

Source: UN boundary base data

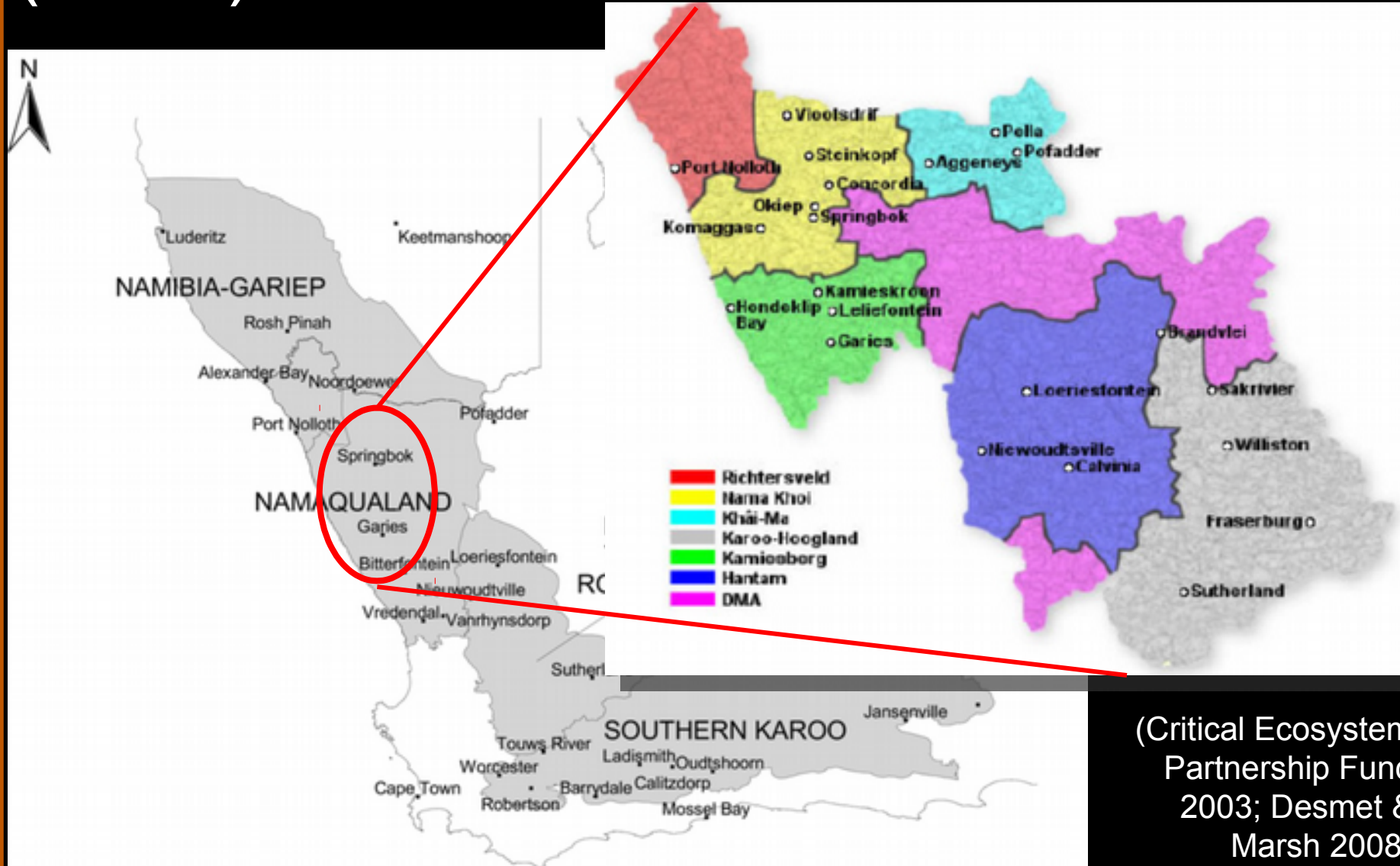
Geographic distribution and concentration of studies providing evidence for EbA

EbA Pilot Projects

- Vulnerability Assessment
- Pilot Projects
- Monitoring
- National Policy
- International Policy








Namakwa District Municipality (NDM)



(Critical Ecosystem Partnership Fund 2003; Desmet & Marsh 2008)

NDM Vulnerability Analysis

NAMAKWA DISTRICT MUNICIPALITY: HAZARD IDENTIFICATION USING INDIGENOUS KNOWLEDGE						
Hazard	Local Municipality					
	Karoo Hoogland	Hantam	Kamiesberg	Nama Khoi	Richtersveld	Khai-Ma
Drought	Red	Red	Red	Red	Red	Red
Water Availability	Yellow	Red	Red	Red	Red	Red
Flood	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Soil Erosion	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Coastal Storms	Green	Green	Red	Red	Red	Green
Rising sea level	Green	Green	Yellow	Yellow	Yellow	Green
Rising ocean temperature	Green	Green	Red	Red	Red	Green
Road Infrastructure	Red	Red	Red	Red	Red	Red
Health Services	Red	Red	Red	Red	Red	Red
Poverty	Red	Red	Red	Red	Red	Red
Mine activities	Green	Yellow	Yellow	Red	Yellow	Light Green

	Most Vulnerable
	
	Somewhat Vulnerable
	
	Not Vulnerable/Not affected

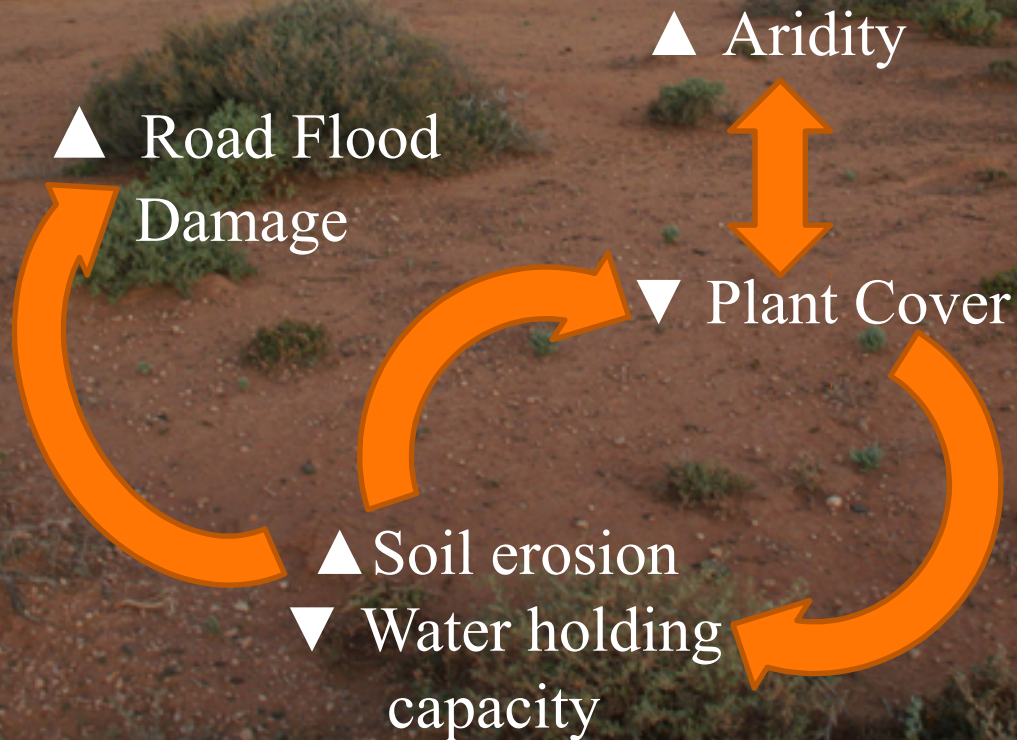
A landscape photograph showing a wetland rehabilitation project. The foreground is dominated by a large, weathered log and several tree stumps, suggesting recent logging or clearing. The ground is covered with green grass and some small shrubs. In the background, there are rolling hills and mountains under a clear blue sky.

Wetland Rehabilitation

A landscape photograph showing a rangelands rehabilitation project. The foreground is a dry, reddish-brown soil with sparse, low-lying green shrubs. The middle ground shows a vast, flat expanse of land with scattered vegetation. In the background, there are mountains under a cloudy sky.

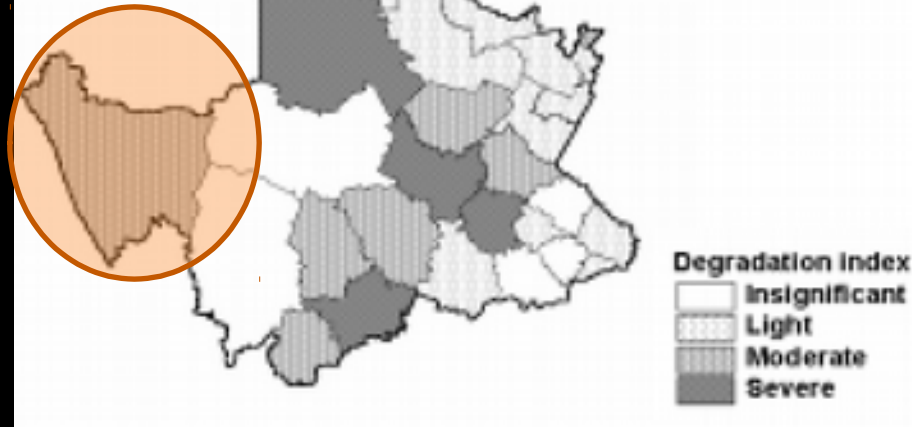
Rangelands Rehabilitation

Rangelands Rehabilitation



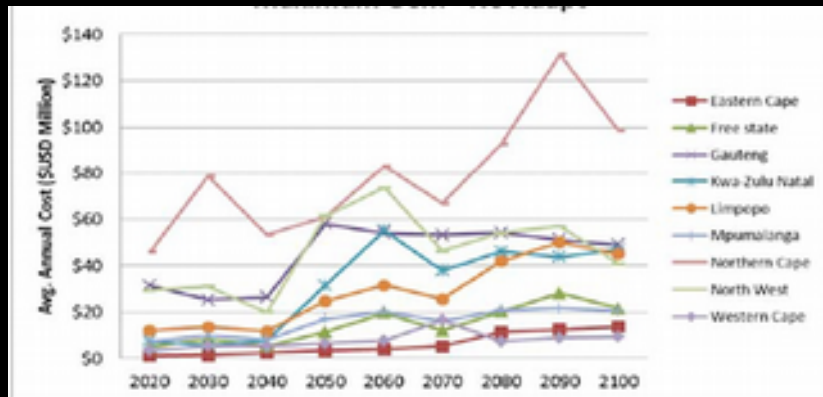
Degree of Degradation

Moderate Degradation
(assumed 25%)



(Hoffman et al. 1999; Hoffman & Ashwell 2001)

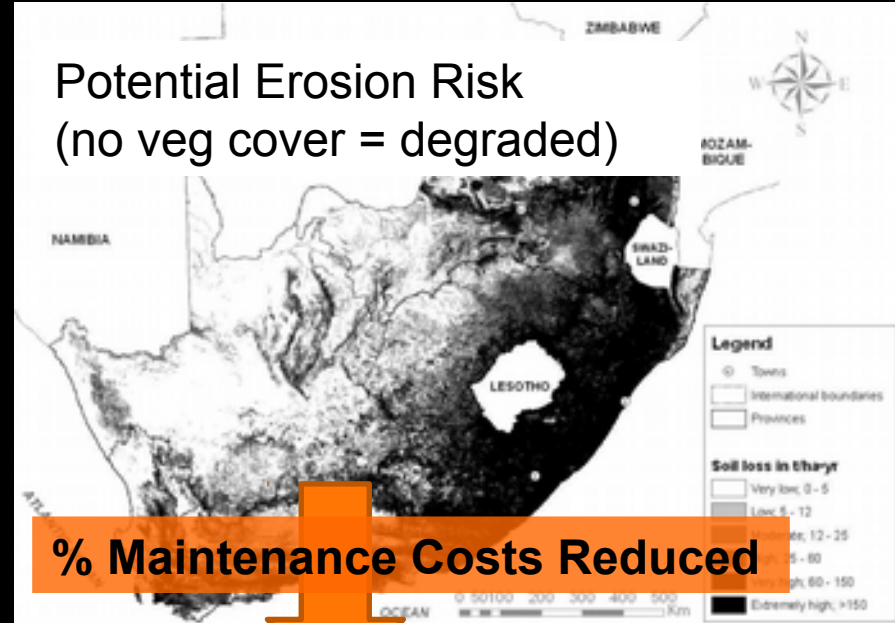
Impact of Climate Change on Road Maintenance Costs



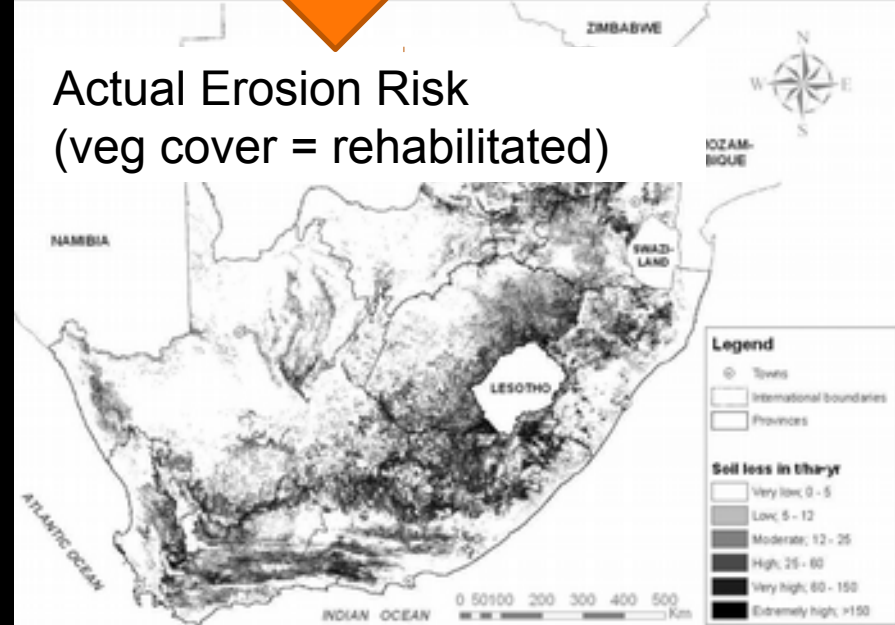
(Chinowsky et al. 2012)

Erosion Risk (t/ha/yr)

Potential Erosion Risk
(no veg cover = degraded)



Actual Erosion Risk
(veg cover = rehabilitated)



(Le Roux et al. 2008)

Kamiesberg

(Foster et al. 2012; Herling et al. 2009)



†



†



†Le Maitre et al. (2009) and O'Farrell et al. (2011)

Nama Khoi

(Foster et al. 2012; Herling et al. 2009)



†



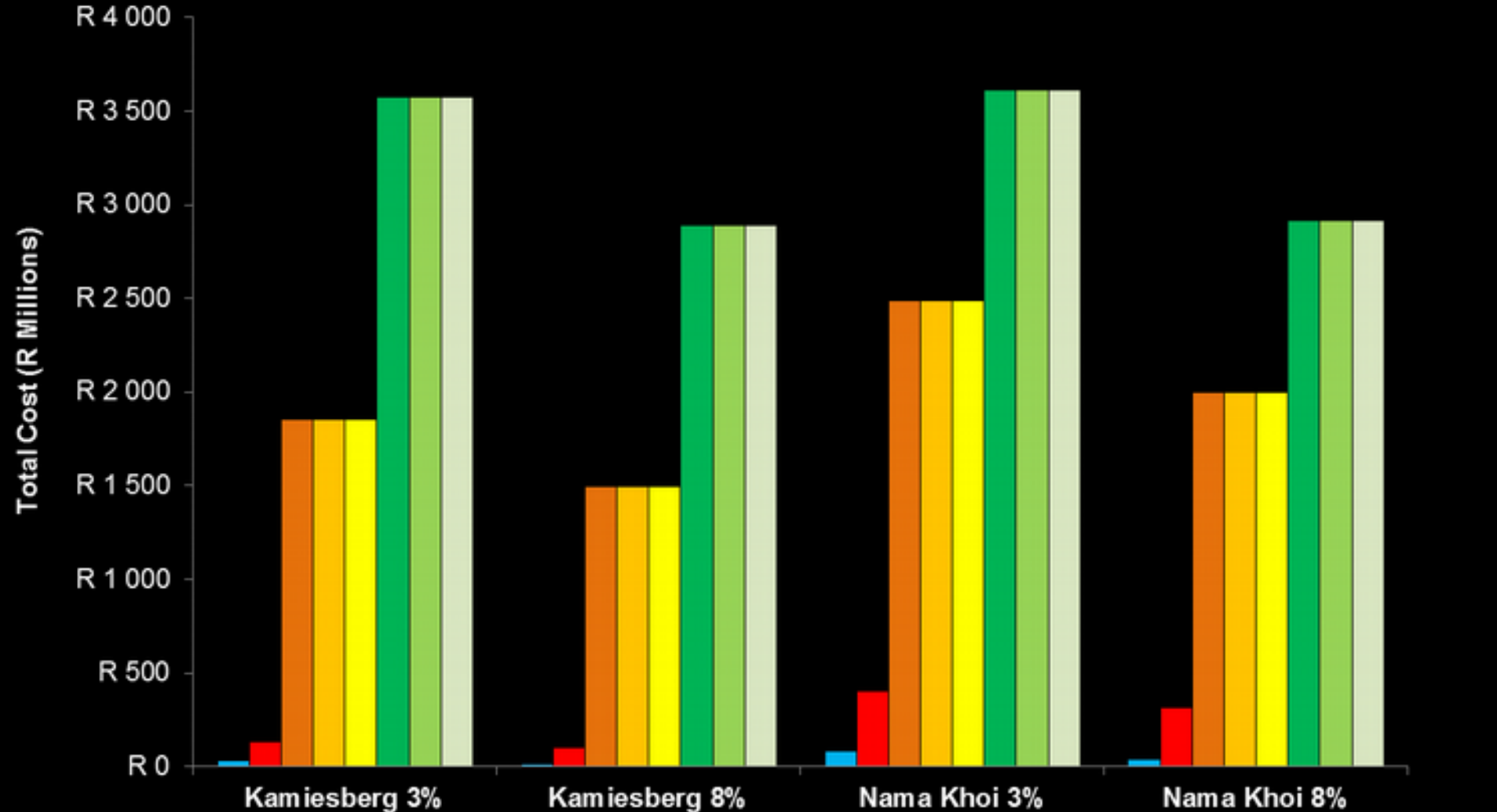
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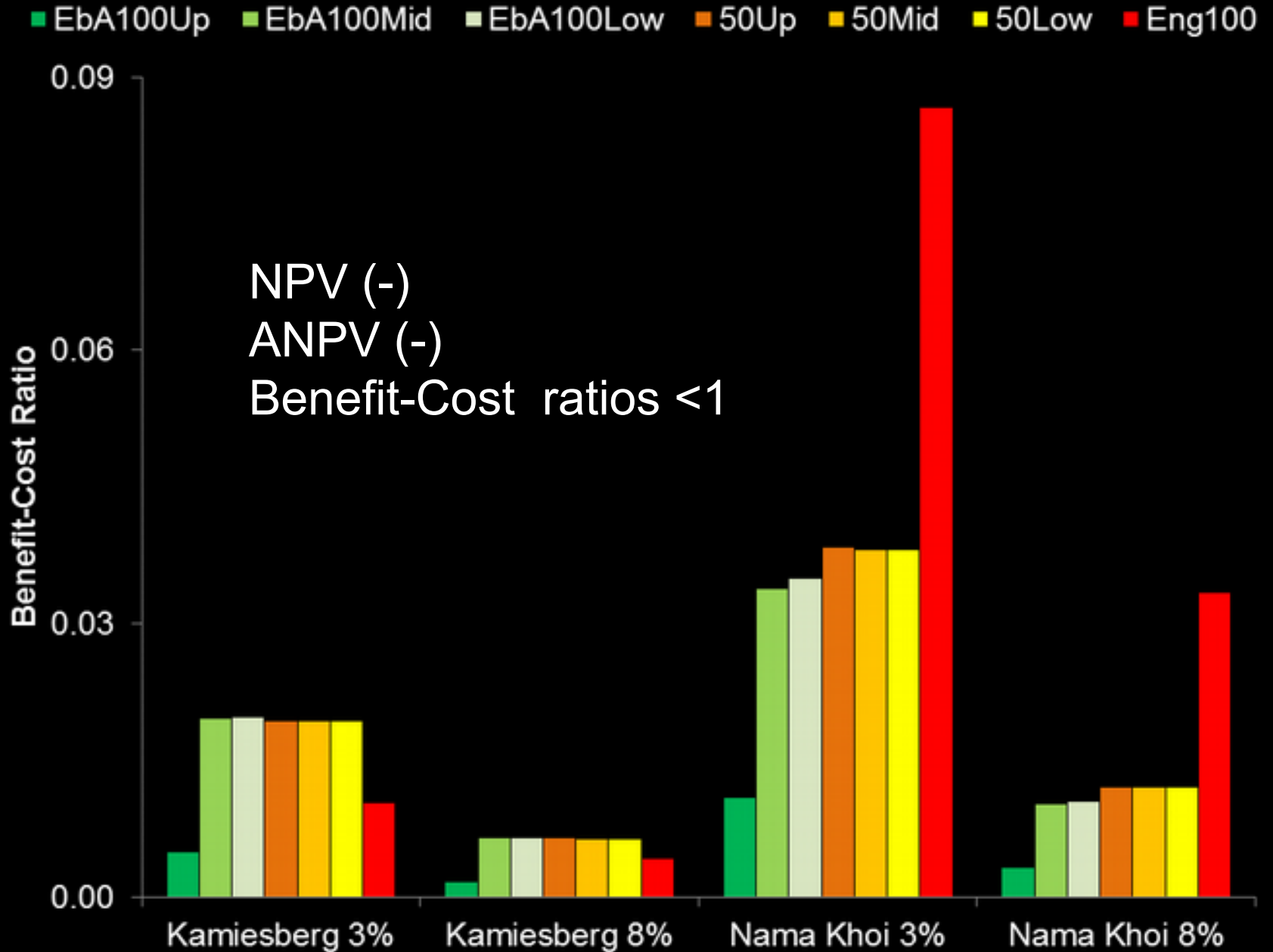
†Le Maitre et al. (2009) and O'Farrell et al. (2011)

Least-Cost Analysis

Maintenance Eng100 50Up 50Mid 50Low EbA100Up EbA100Mid EbA100Low



Benefit-Cost Ratios



Wetland Rehabilitation



Study Area:

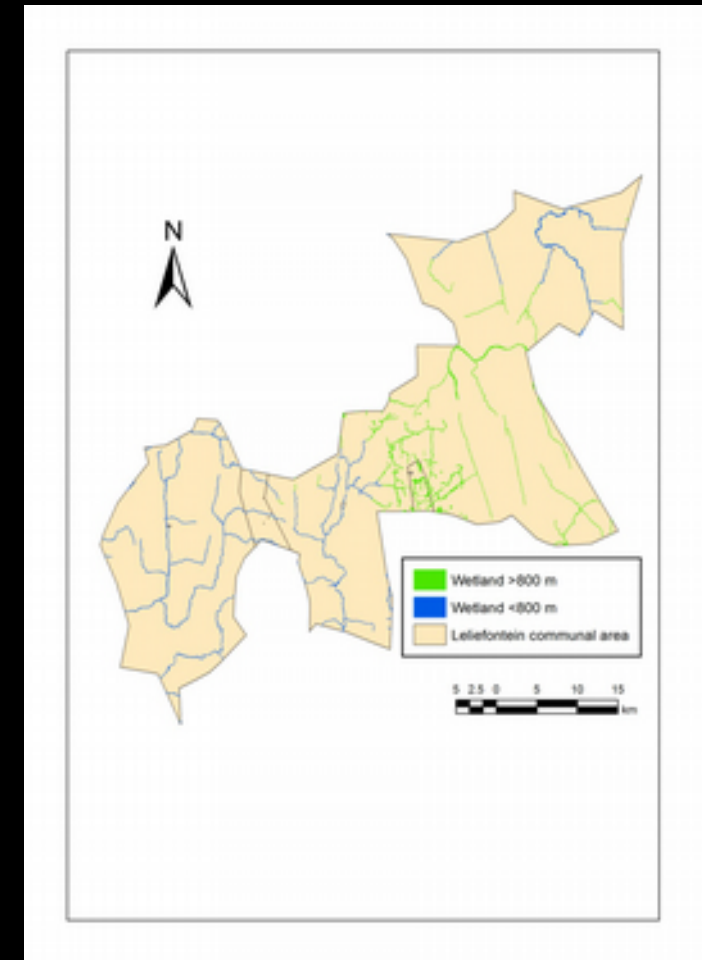
Wetlands of the **Kamiesberg uplands:**

- Within the Leliefontein communal area
- Above 800 amsl



Chief benefits to local communities derived from wetlands:

- Livestock fodder
 - Livestock drinking water
- } Dry summer months



Cost-effectiveness analysis framed by the objective of sustaining livestock stocking rates into the future

Assessed the costs associated with two options:

1) **Ecosystem-based adaptation (EbA)** in the present

(alien clearing; revegetation; installation of gabions; concrete structures; earth structures; and earth works)



AGAINST



2) Implementation of '**Engineering alternatives**' in the future

(additional boreholes and importation of dry feed)

Cost-effectiveness analysis applied in four different approaches:

Approach 1:

Exponential implementation of 'engineering alternatives' up to 2050 against combination of rehab action applied to whole area (Strategy 1 EbA)

Approach 2:

Exponential implementation of 'engineering alternatives' up to 2050 against combination of rehabilitation of rehab applied to Working for Wetlands area; removal of aliens applied to remainder of study area (Strategy 2 EbA)

Approach 3:

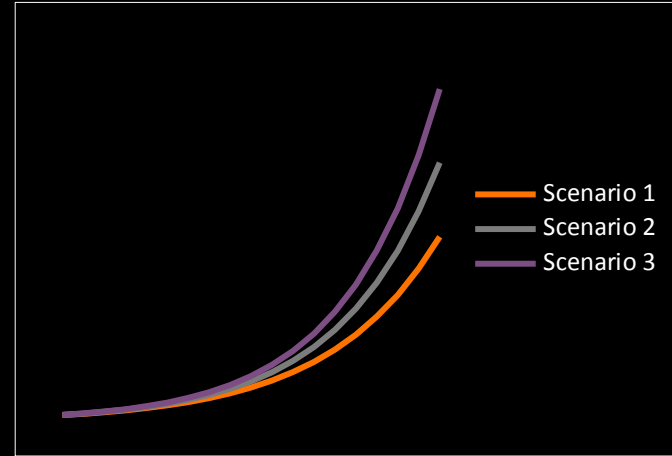
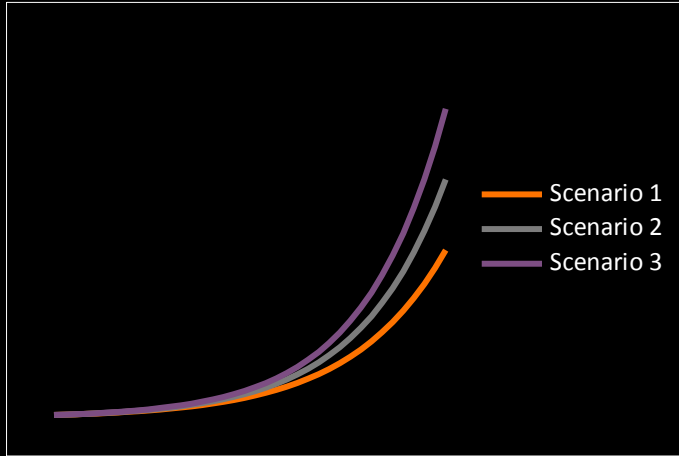
Implementation of 'engineering alternatives' up to 2050 according to projected drought frequencies against combination of rehab action applied to whole area (Strategy 1 EbA)

Approach 4:

Implementation of 'engineering alternatives' up to 2050 according to projected drought frequencies against combination of rehab action applied to Working for Wetlands area, removal of aliens applied to the remained of study area (Strategy 2 EbA)

Engineering Alternatives

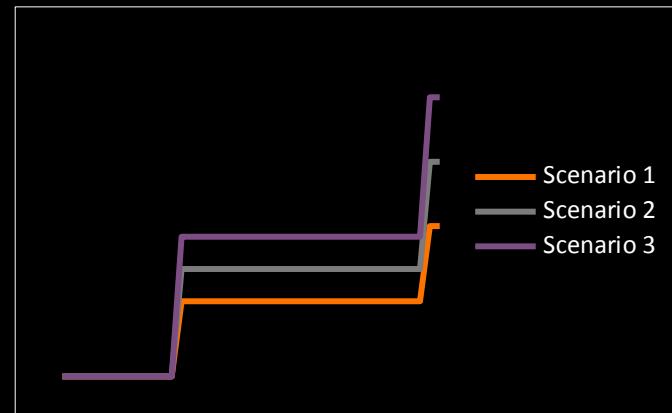
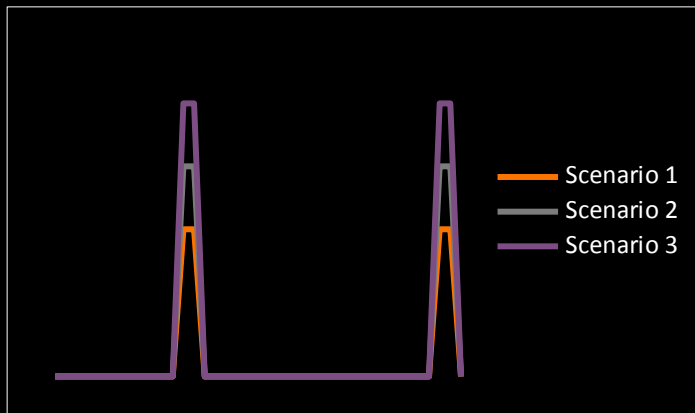
Exponential implementation:



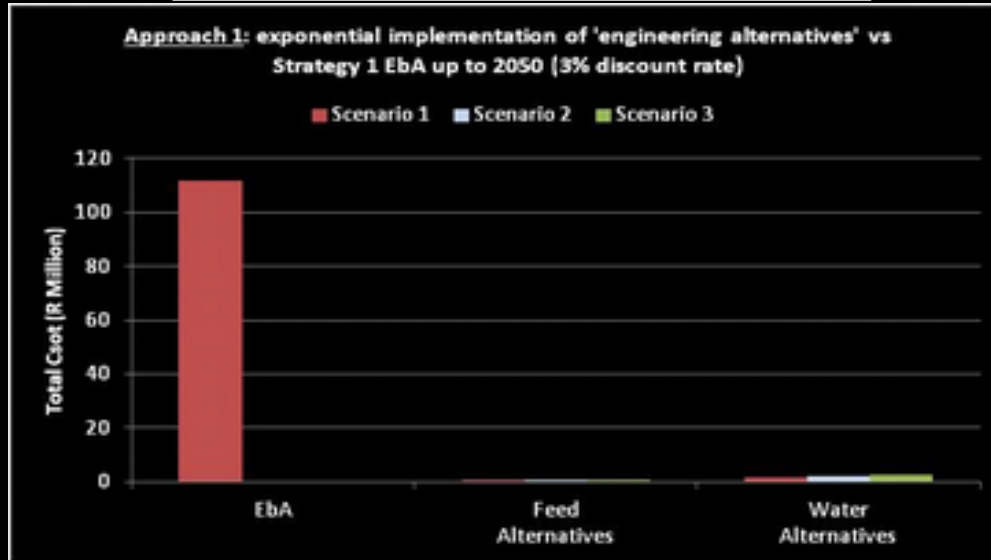
‘Alternatives’

‘Water Altern

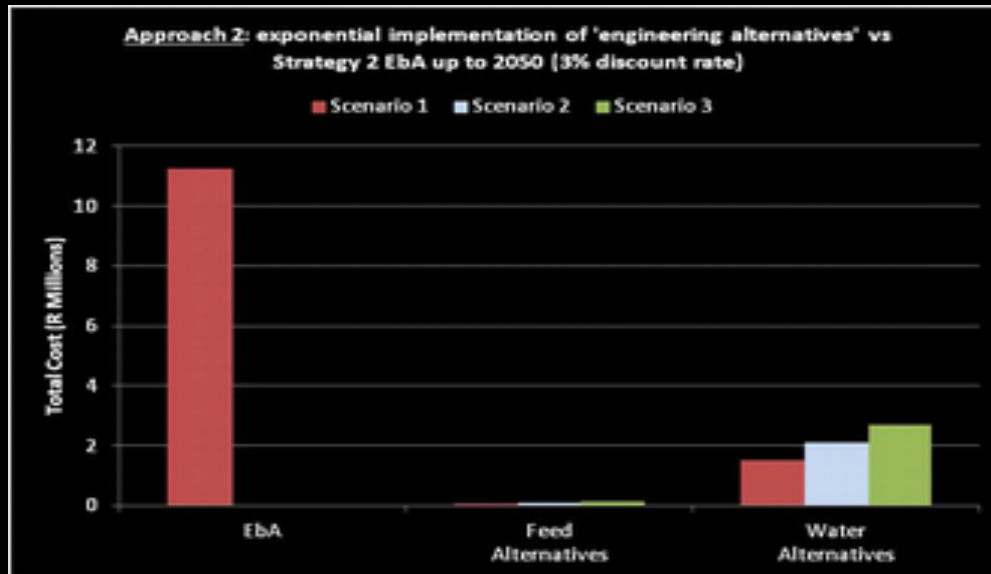
Implementation according to drought frequency:



Cost-effectiveness Results

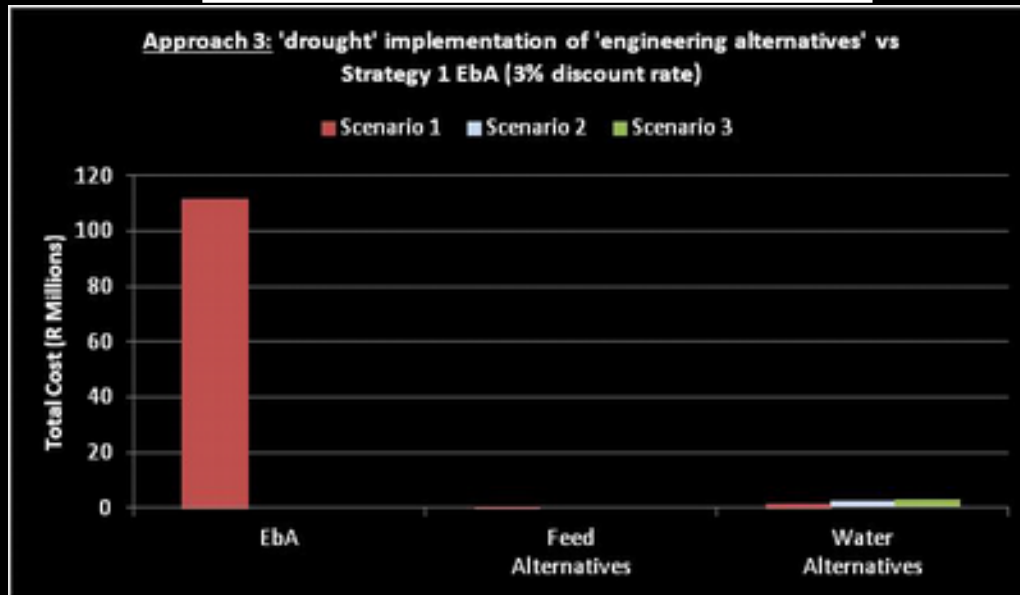


Approach 1

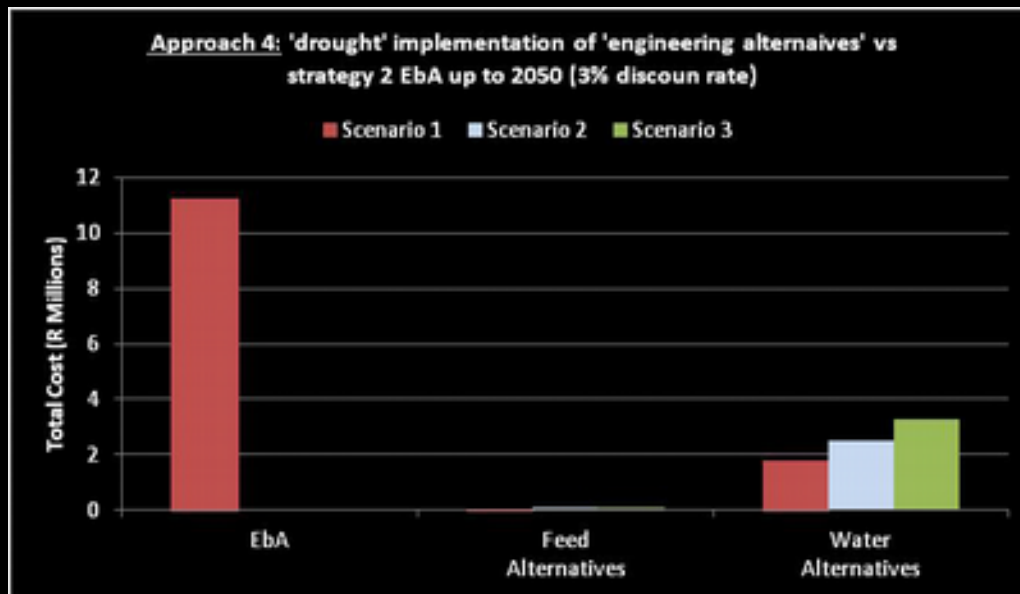


Approach 2

Cost-effectiveness Results



Approach 3



Approach 4

Conclusion

	Status Quo	Eng	EbA	50:50
Rangelands	✓	✗	✗	✗

	Eng	EbA
Wetlands	✓	✗



Important points:

- Local Context
- Prevention > Cure

Recommendations

➤ Focus on 'low hanging fruit' where possible



➤ Detailed surveys of degradation

➤ Monitoring before and after intervention

➤ Analyses should assess more than just the straight financial costs and benefits associated with intervention

➤ Analyses should be approached from more than one angle

Acknowledgements:

- Technical Heads Kamiesberg & Nama Khoi Local Municipality
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