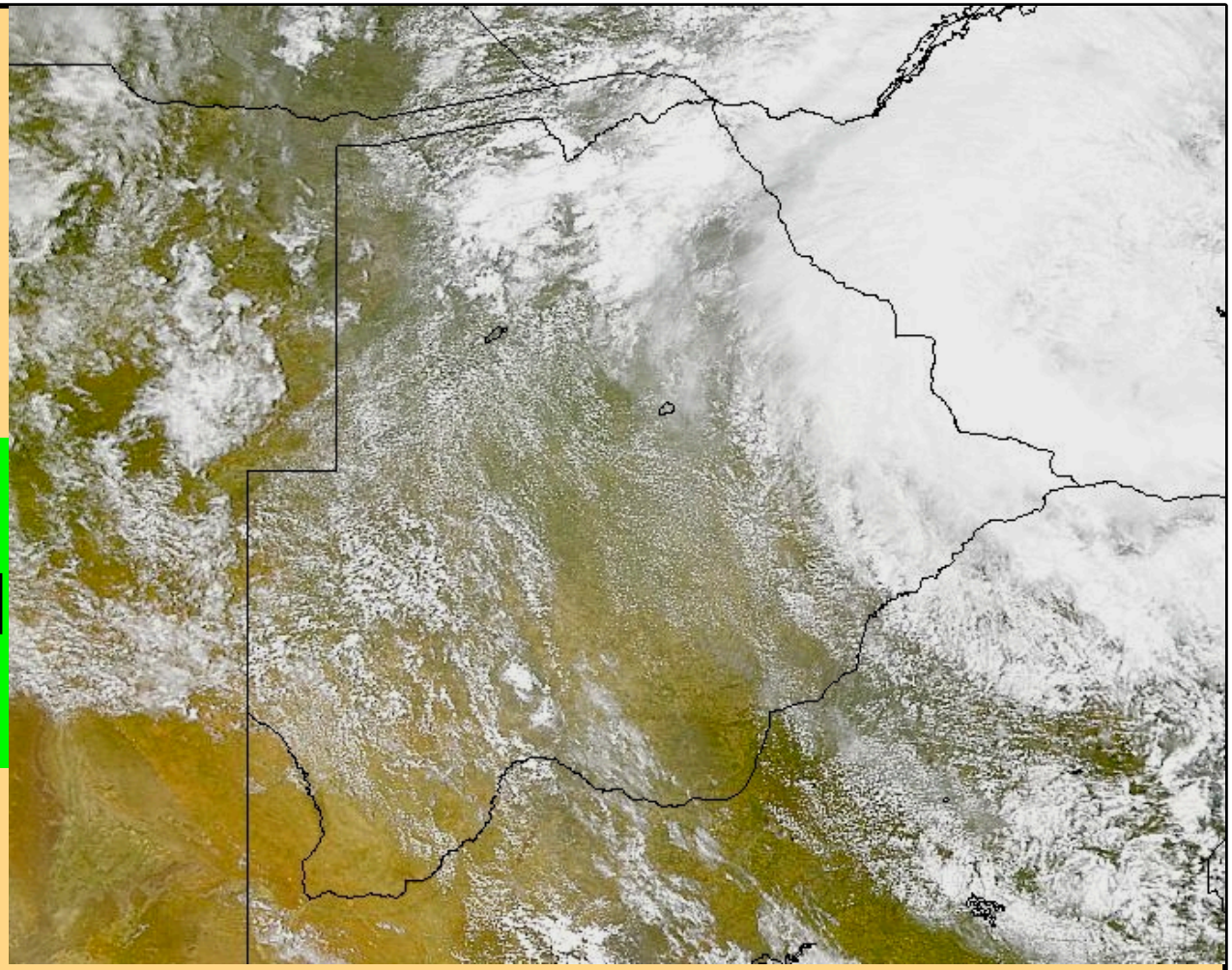
Session : Adaptation and Development



Climate Change and Sustainable Development in Botswana

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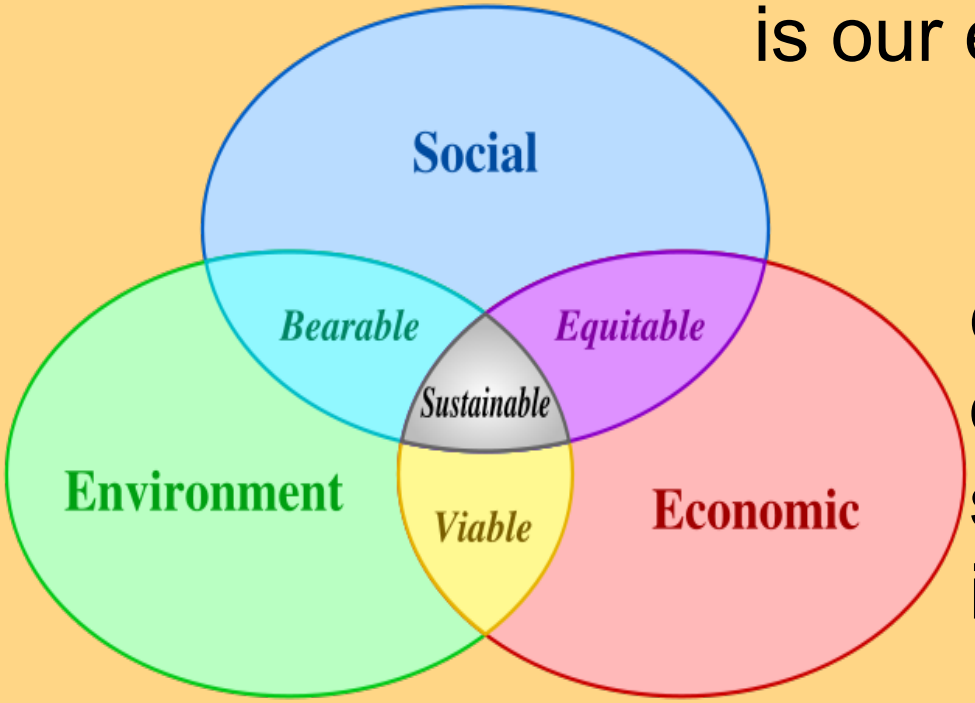
- Climate change is the strongest signal ever that the global economic growth experienced since the 19th century has not been based on the principle of sustainable development.

→ Market forces, globalization - led mostly by the private sector has been the main driver of this **(unsustainable)** economic growth

A well known global challenge is: How to come up with development pathways that address the three pillars of sustainable development

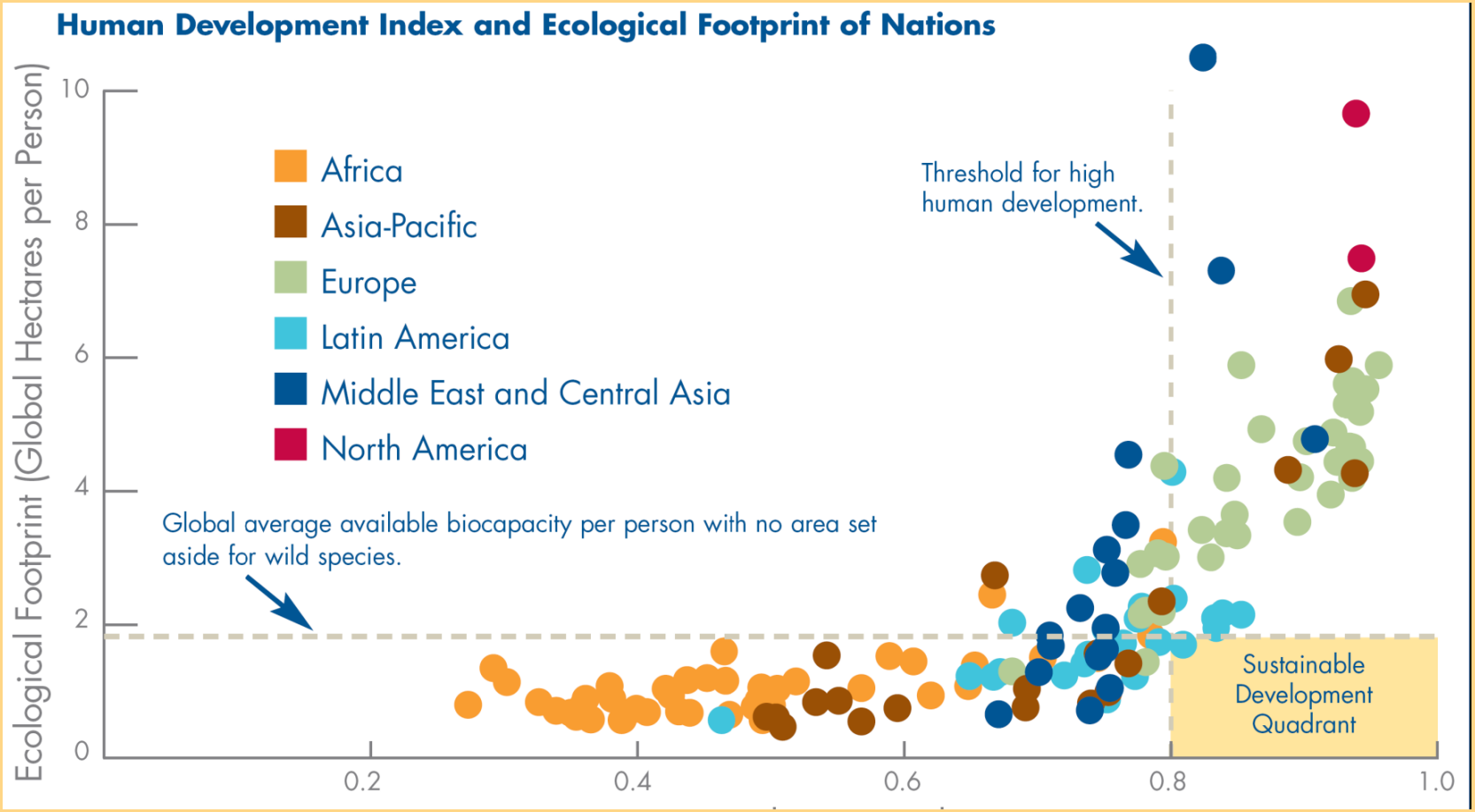
Within this - Environment is our economic opportunity



How might climate change challenges and opportunities influence sustainable development in Botswana?

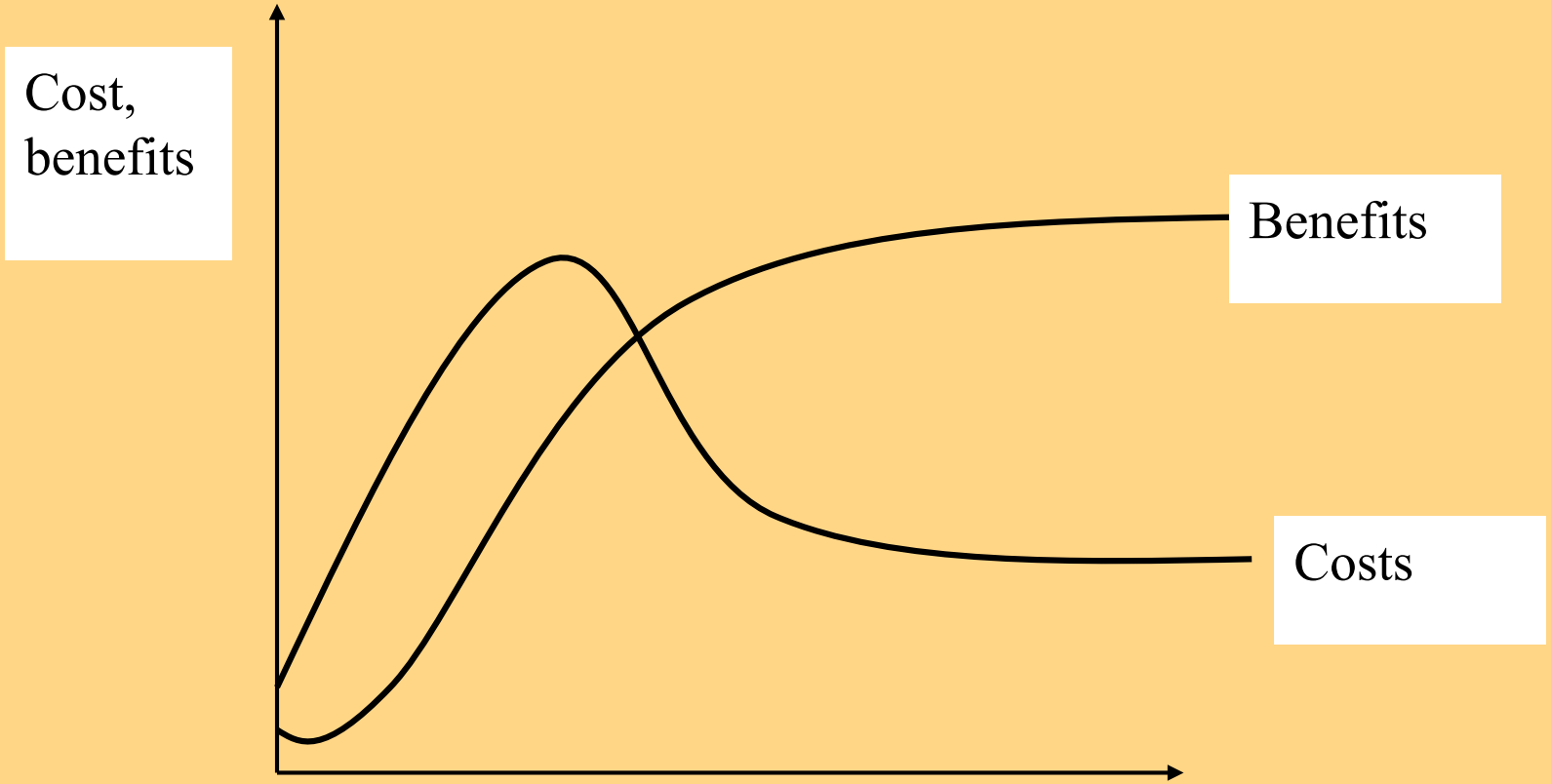
UN 2005 World Summit

Level of development: Using the Human Development Index & Ecological Footprint of Nations (2002 data): The lower right quadrant is where the minimum requirements for sustainability occurs



From Africa's Ecological Footprint FactBook – **So far No country meets the sustainability requirements**

The cost of adaptation and mitigation will be high at the beginning but have long term benefits to mneeting sustainable development



Botswana

- Botswana – a middle income country – with aspirations for high income bracket
- Population of roughly 1.7m
- **It has been recently ranked the most secure country in Africa – using the global security index!**
- The challenge of dealing with adverse effects to HIV/AIDs epidemic is leading to more aggressive resilience building policies e.g. Poverty eradication instead of poverty alleviation; youth empowerment; aggressive agriculture production focus to reduce unemployment

- Botswana – is vulnerability to climate change due to a multiple factors including high exposure to climate hazards

-Limited capacity to generate information for better understanding climate change risk

-An economy dependent on mining with limited diversification

-Limited human resource capacity - constrain effective governance

-Adverse effects to HIV/AIDs epidemic, poverty & unemployment.

-Relies on food imports to meet food security

**Impacts of climate change permeate across all geographical & socio-economic scales but

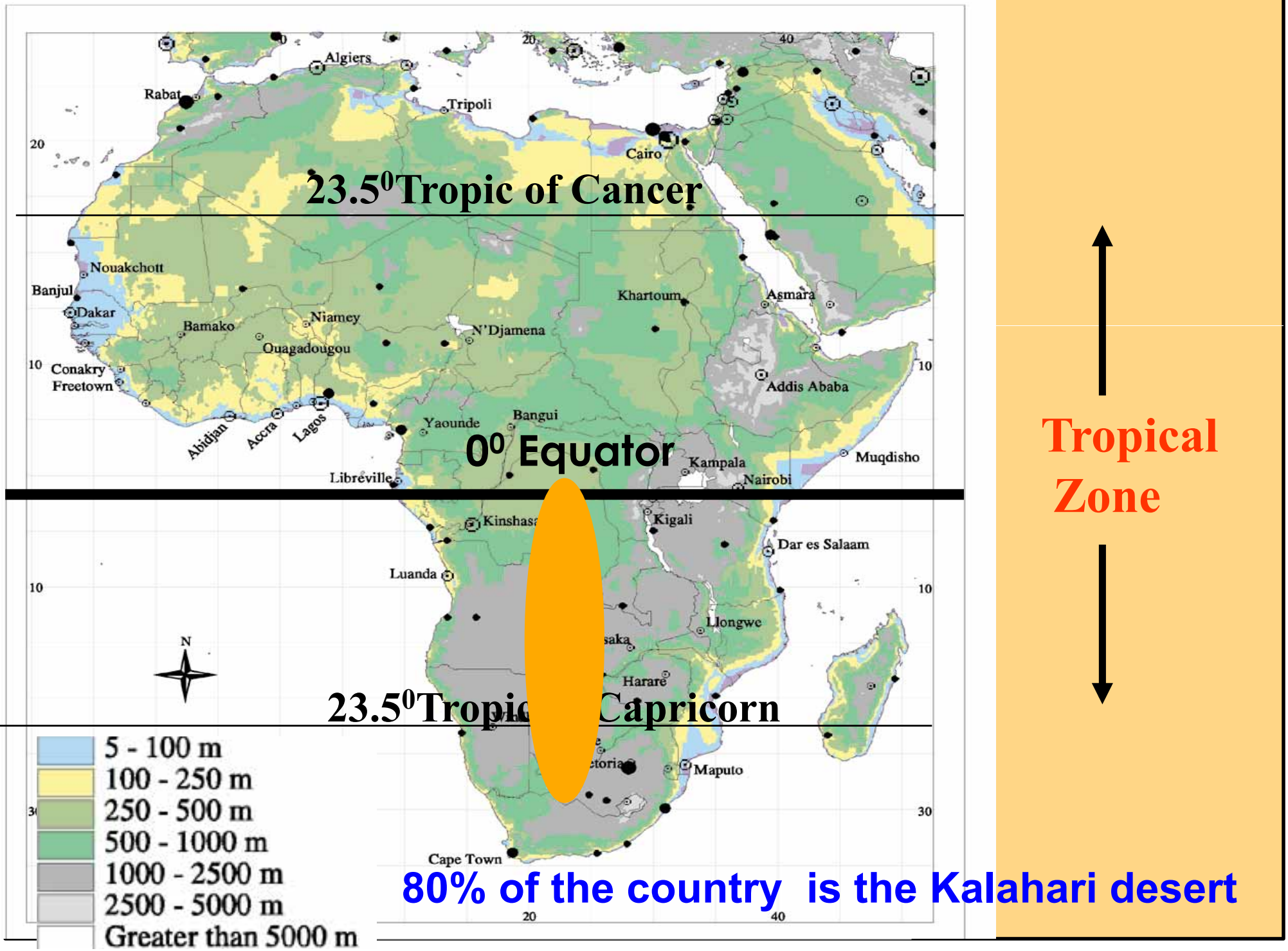
- ***Botswana is yet to draw its adaptation strategy***

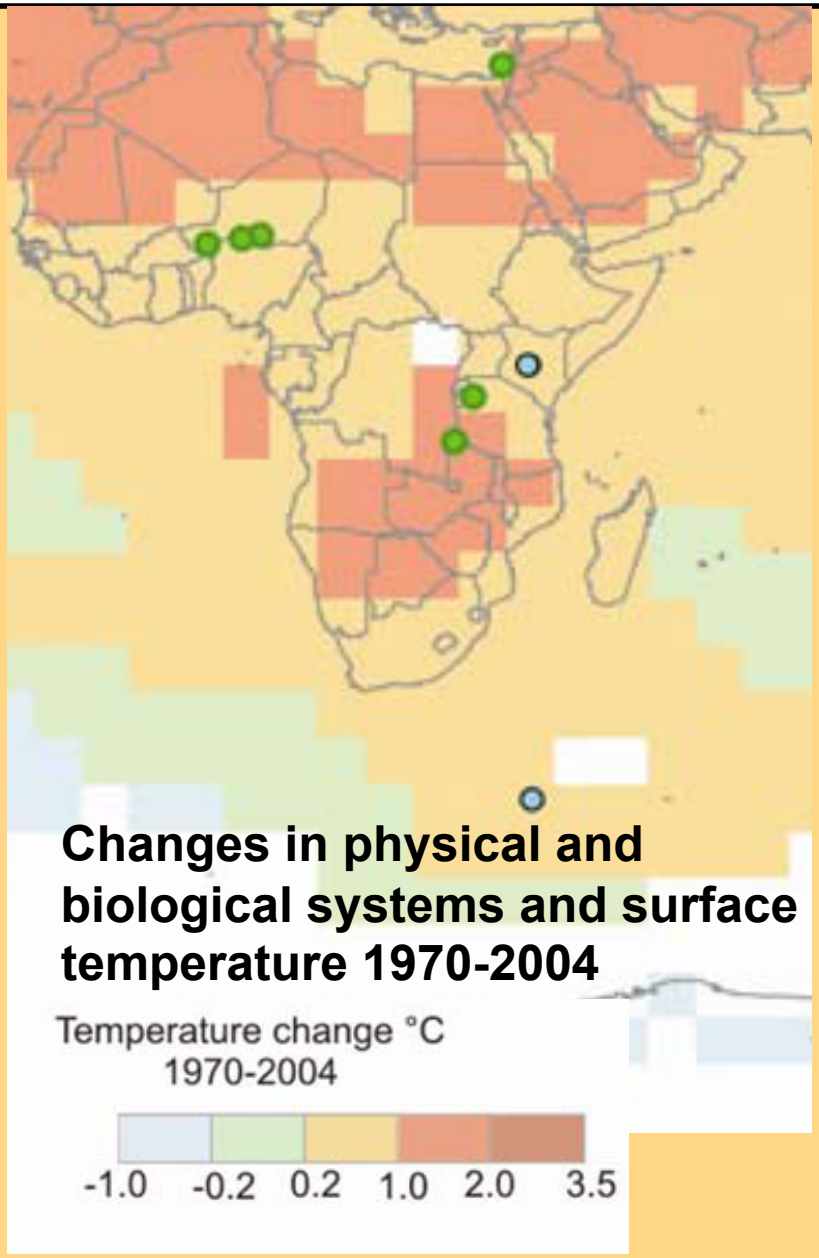
- ***A national climate change policy and strategy are required to guide climate change mitigation and adaptation in line with national development goals.***

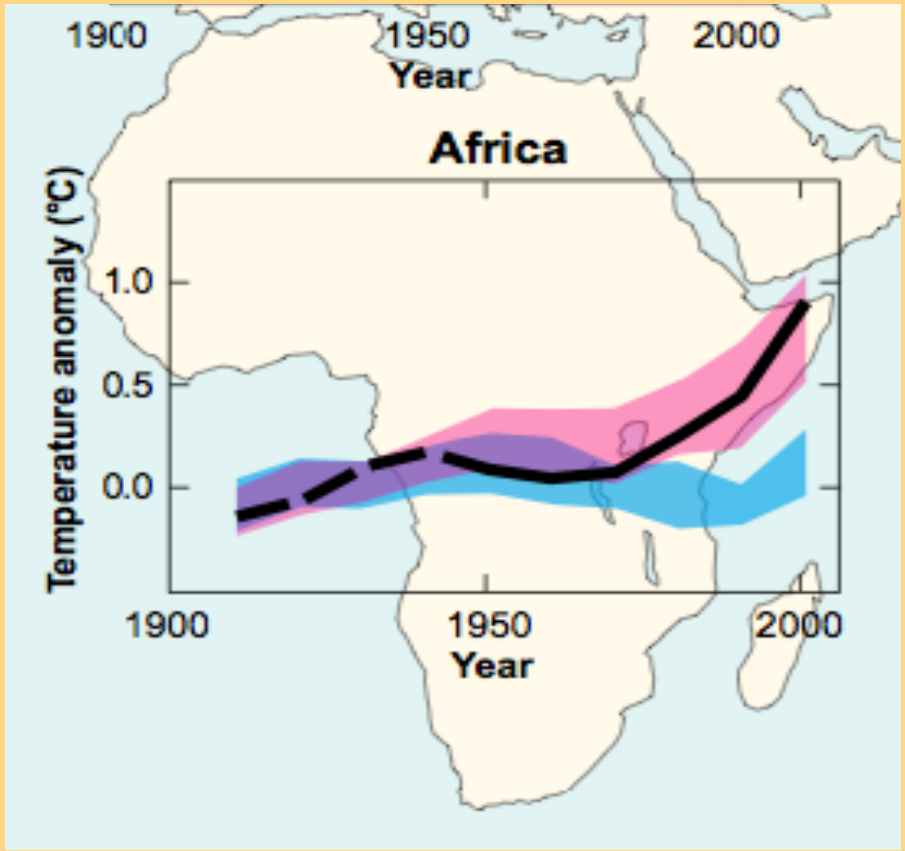
- ***The political pathway for this to happen has recently been made available through Presidential Directive – the manpower to put this in practice is lacking***

Options to use climate change mitigation to address climate change adaptation need to be assessed

- Adaptation to climate change should be part of sustainable economic growth to led the country to a high income bracket
- Being already semi-arid most adaptation measures required will serve current needs e.g. Water conservation, diversification of the agricultural sector in terms of drought resistant crop or livestock breeds etc
- Developing rural industries, build upon past community coping strategies will reduce migration to cities leading to high population concentration & vulnerability etc


23.5⁰Tropic of Cancer
0⁰ Equator
23.5⁰Tropic of Capricorn
Tropical Zone
80% of the country is the Kalahari desert
Algiers
Rabat
Tripoli
Cairo
Nouakchott
Banjul
Dakar
Bamako
Niamey
N'Djamena
Khartoum
Asmara
Ouagadougou
Conakry
Freetown
Addis Ababa
Yaounde
Bangui
Abidjan
Accra
Lagos
Libreville
Kampala
Nairobi
Muqdisho
Kinshasa
Kigali
Dar es Salaam
Luanda
Llongwe
Harare
Maputo
Cape Town
N
5 - 100 m
100 - 250 m
250 - 500 m
500 - 1000 m
1000 - 2500 m
2500 - 5000 m
Greater than 5000 m



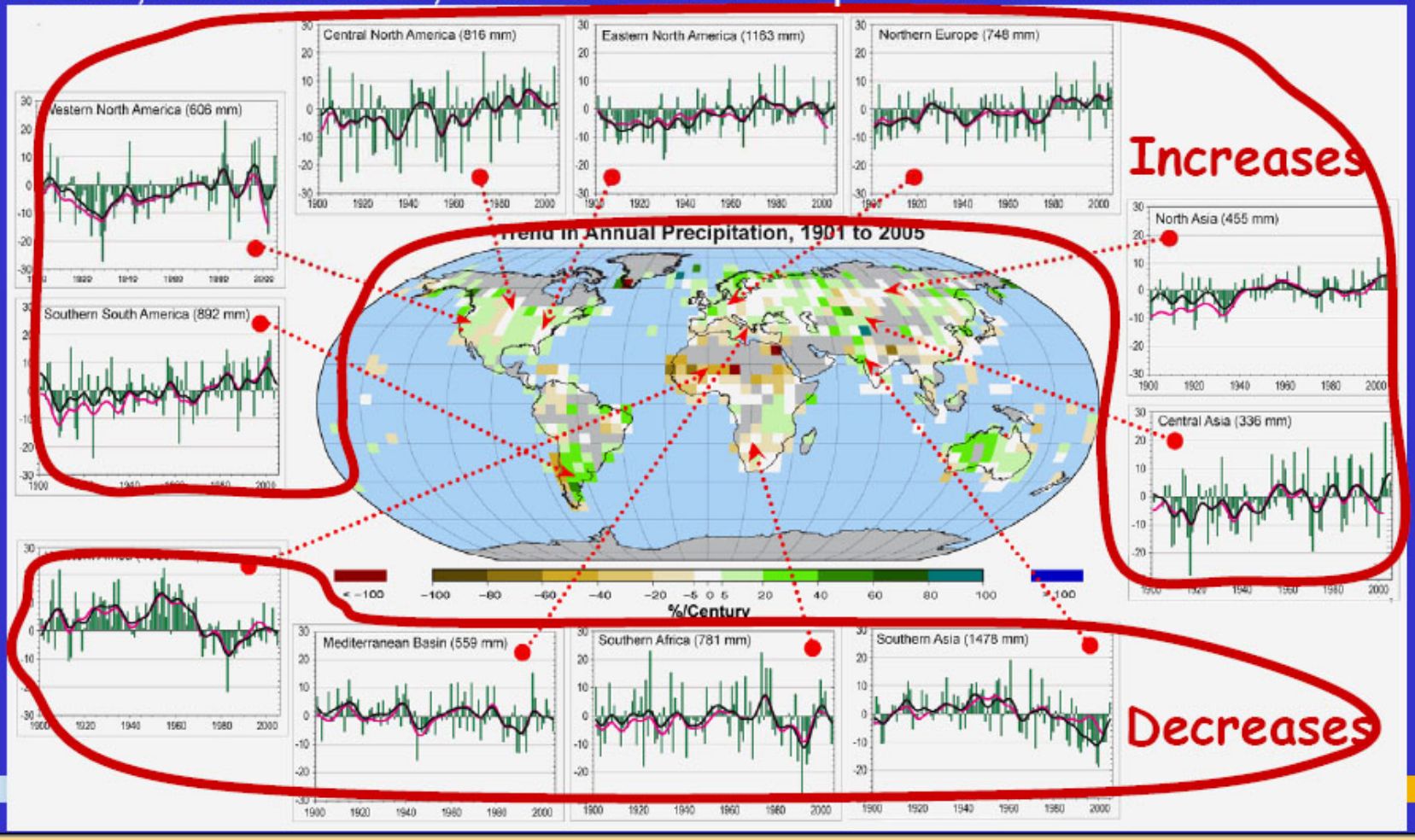


Observed continental-scale changes in surface temperature: Blue = natural: Red = due to anthropogenic forcing: Black line = Decadal averages of observations (1906–2005)

(***4th IPCC WGI & II SPM, 2007***)

Precipitation (rain & snow) is variable – but there is evidence for systematic change

Precipitation has increased in eastern parts of North and South America, northern Europe and northern and central Asia – and decreased in the Sahel, Mediterranean, southern Africa and parts of southern Asia.



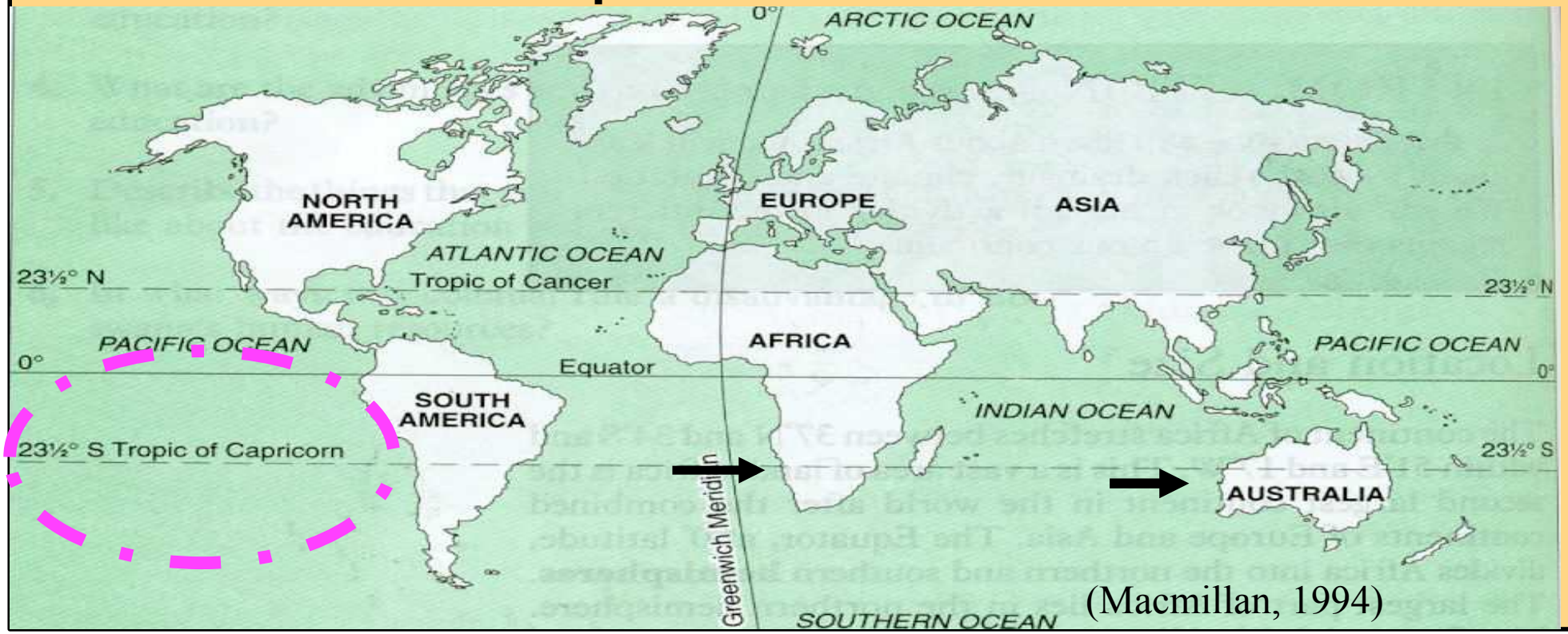
IPCC,2007

Slide from C. Justice, UMD

E.g. of interconnectedness: Influence of *El-Nino Southern Oscillation Phenomenon*

- Cyclic warming & Cooling of the surface of Central & Eastern Pacific Ocean – normally colder

- **El-Nino event:** Warming of the Central & Eastern Pacific Ocean results in heavy rain in ***S. America*** with **droughts in Southern Africa & Australia.**
- **La-Nina event:** Unusually cooler Pacific – Drought in South America & **a wet period in Southern Africa & Australia**



(Macmillan, 1994)

Rainfall:

Mostly summer rainfall influenced by

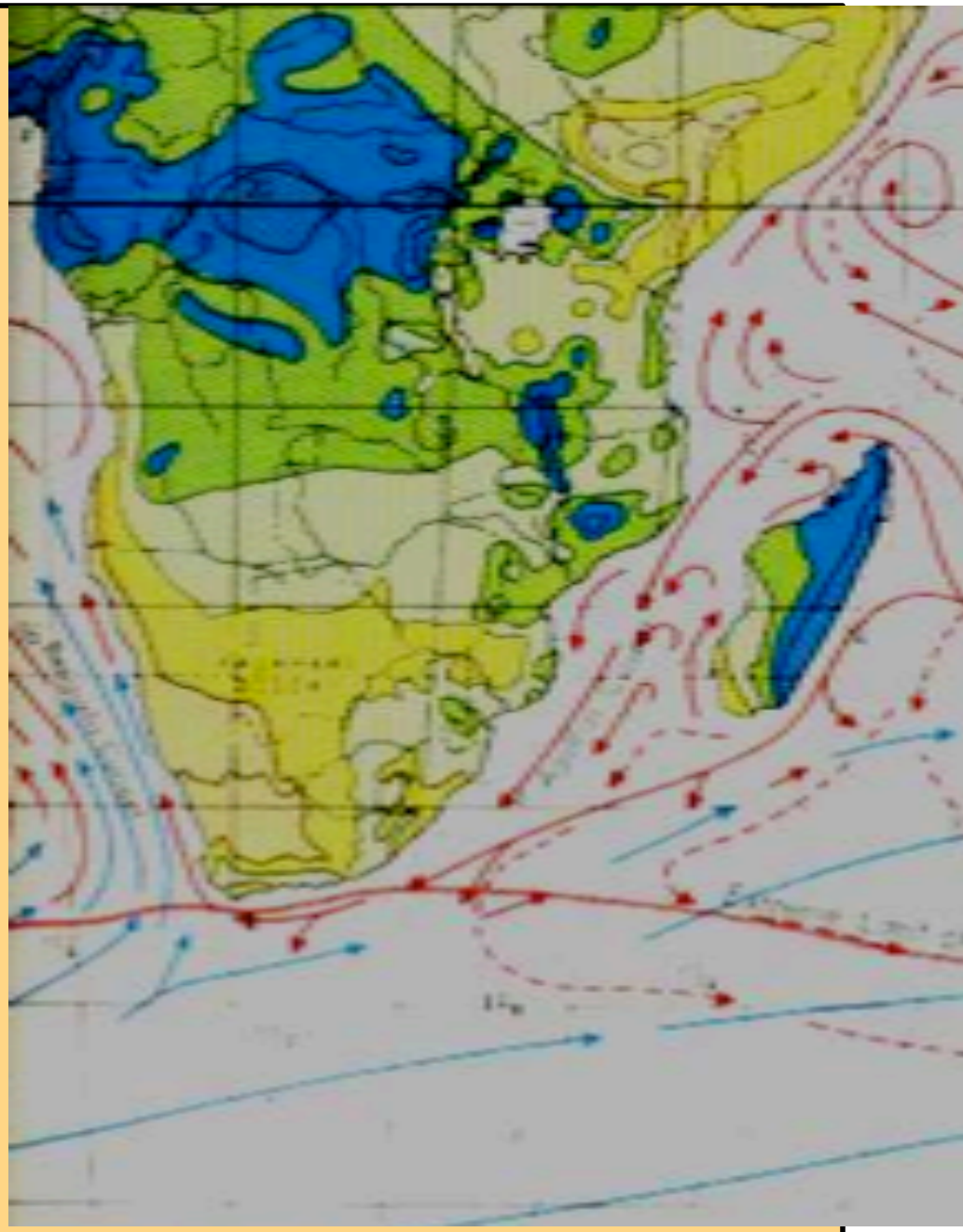
Ocean Currents:

A cold N-flowing, nutrient-rich Benguela current on the W coast

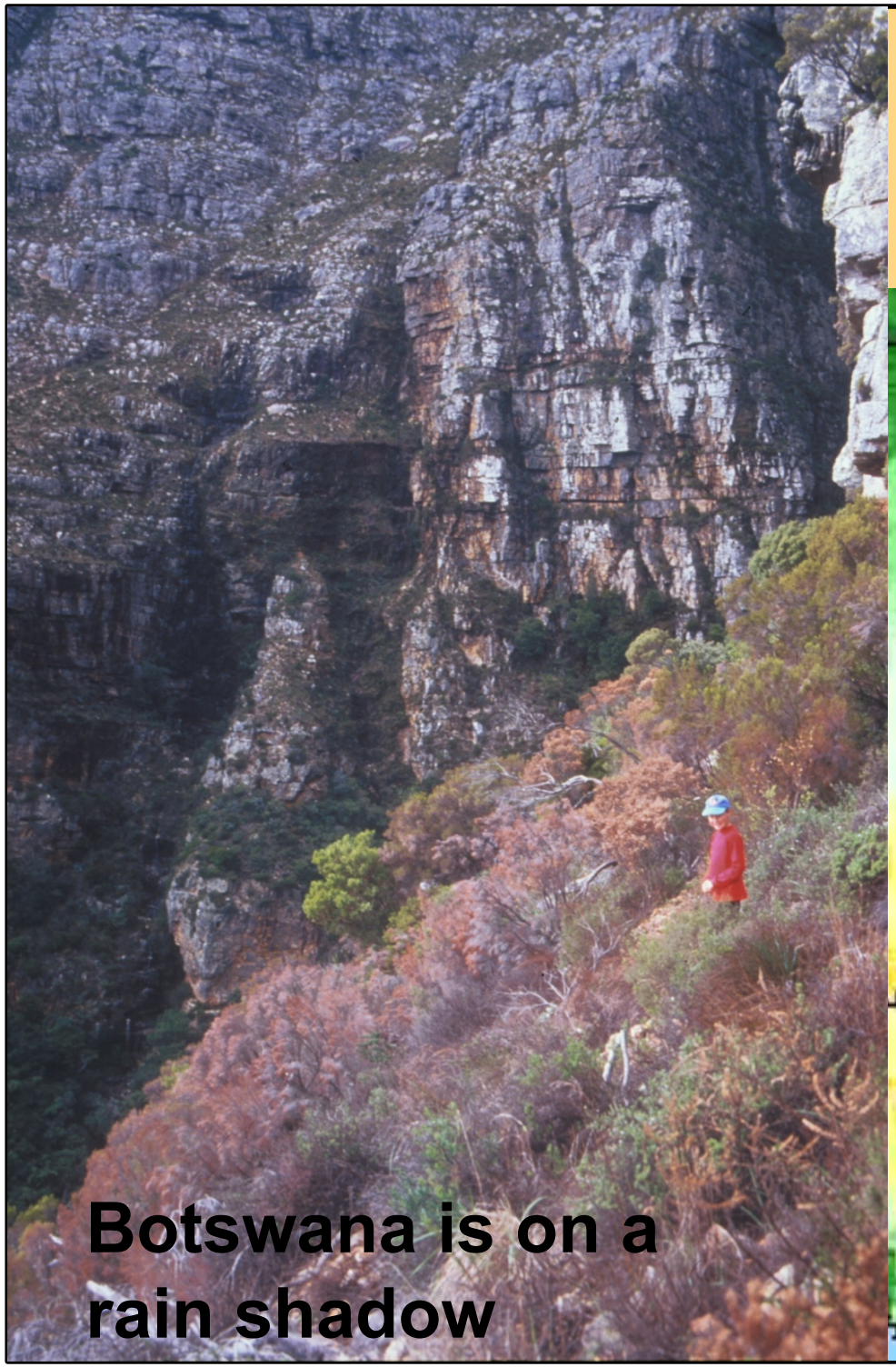
&

Warm, S-flowing, nutrient-poor Mozambique current on the East

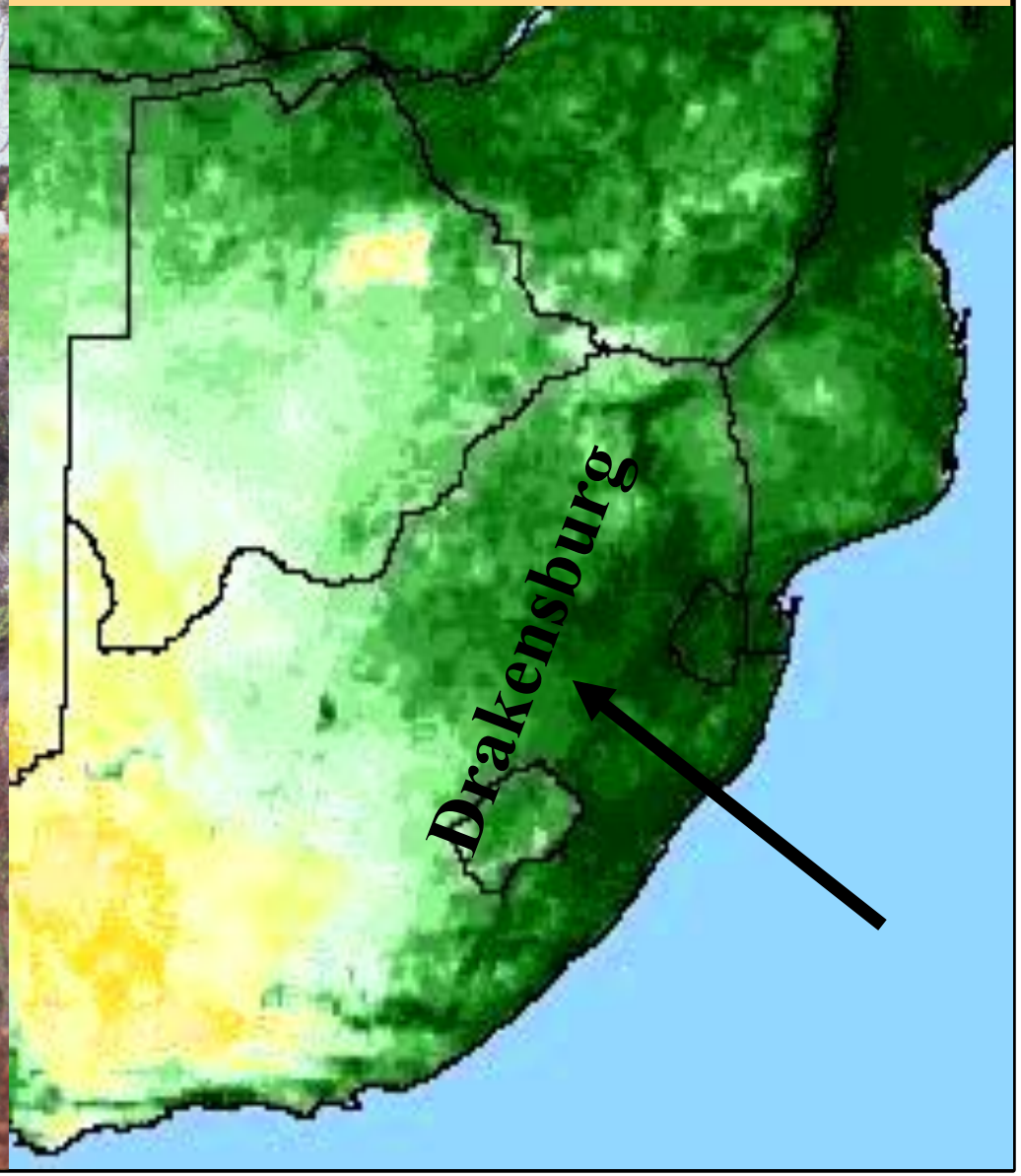
Hence an East-West gradient of increasing aridity



Effect of relief



Botswana is on a rain shadow



Rainfall in the northern part

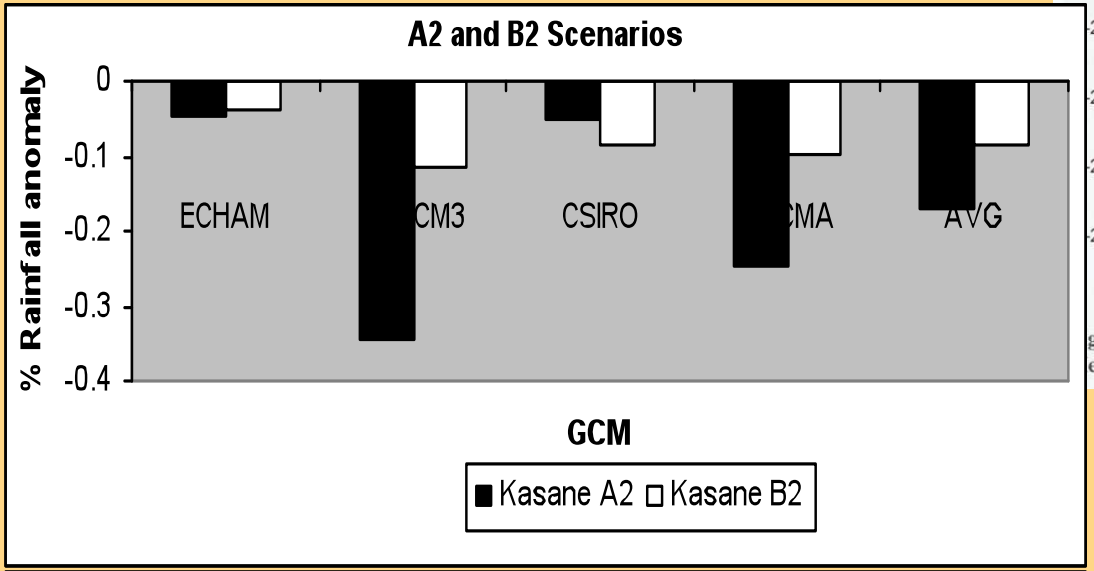
ITCZ- dominates resulting In high rainfall – *But some years it fails to reach Botswana*

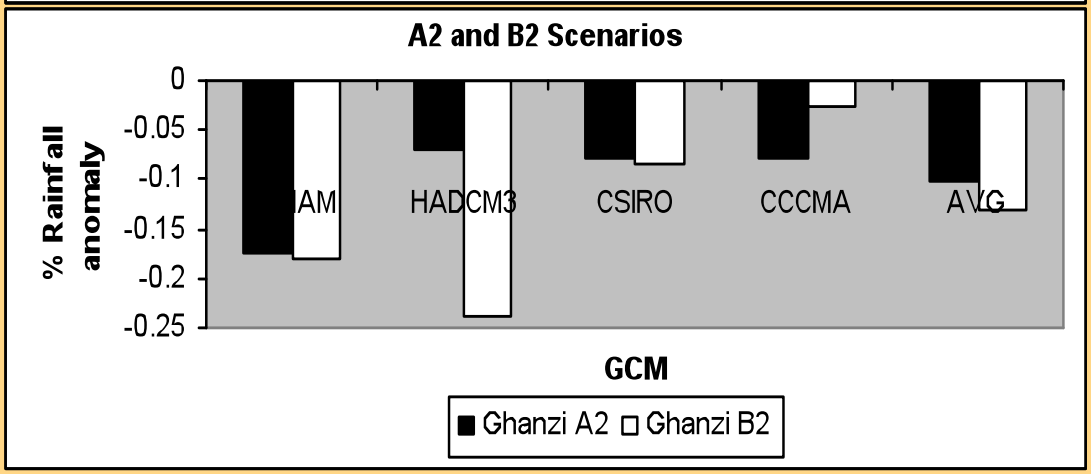
High degree Of inter-annual & inter-decadal rainfall variability characterize the climate.

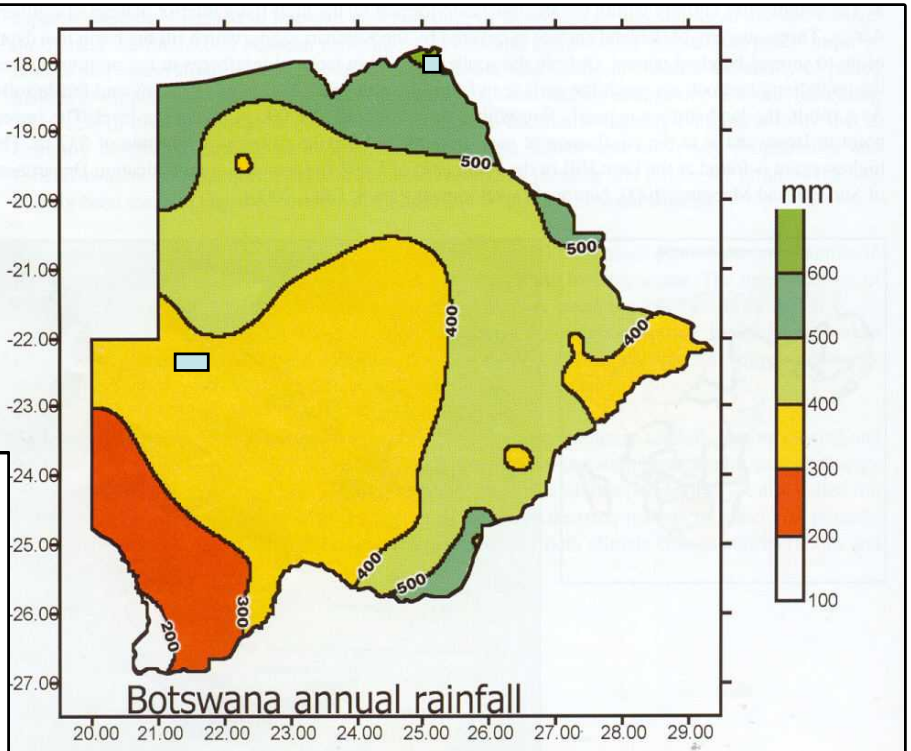
Variability & extreme events have increased since 1931 & as is the case with the intensity of extreme events (Tyson et al, 2002).

Rainfall records from 29 stations in Bots. over 65 years show that drought conditions of different severity occurred every 3-5yrs

* % annual rainfall anomaly 2099: from 5 GCMs over Botswana applied for 2 different scenarios, A2 and B2 confirm that aridity is most likely .







gure 1.2. Average annual rainfall for Botswana (Map provided by Department of eteorological Services).

More work is required on the spatial patterns of change in production that are likely to occur

A rough estimate of impact of drought in Botswana

- showed that depending on severity between 1983 and 2005 the:
  - cost of drought to GDP ranged from 0.39 in 1997 to 6% in 1983
- **Even under high uncertainty on level of impacts - increased ability to cope with current climate variability e.g. drought will contribute in reducing vulnerability to moderate warming.**

Water: Shortage of water affects all sectors of the economy & climate change will not make this better!

Ground Water Supplies ~ 80% of water needs – but this is fossil source (Scholes & Biggs, 2004)

- Major drainage systems of Botswana are shared
- *~ About 94% of the total water flow in Bots. originates outside its borders*

Increased local conservation of water; water demand management; land use management in catchments ; water transfer schemes & trans-boundary water protocols are key adaptation focus as in the water sector

Food production:

- **Impacts will vary with type of *crop type e.g.:***
- **Maize** is highly vulnerable than **Sorghum** to projected climate changes:

An e.g. Kalahari Sandveld:

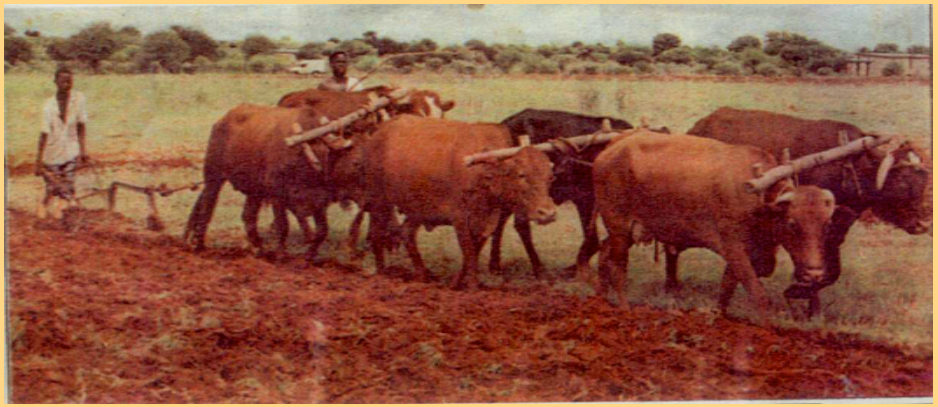
Temperature Rise (degrees Celsius)	Crop	Percent Reduction in yields
2 ^{0}.C	Maize	**21.6%**
	Sorghum	16.1%
3^{0} .C	Maize	**35.8%**
	Sorghum	25.6%

(Chipandzi et al, 2004)

**Impacts will depend on soil – sandveld more affected than hardveld

Other factors act to increase vulnerability to climate change:

Lack of credit and access to new technologies, obtaining inputs such as fertiliser etc



- **Government has recently launched the** Integrated Support Programme for Arable Agriculture Development (ISPAAD) - **a major subsidy scheme to address lack of inputs -**

Some results: Yields increased from 30,000 to 90 000 metric tons (mt) last year

In conclusion effective governance is instrumental in responding to climate change as is the case for sustainable economic growth

- **This requires among others:**
- Political stability which as a country we have – but what of the rest of region?
- Flexible institutions & skilled human labour
- A strong civil society, the media and developed political parties to generate healthy competition the required for effective delivery of services
- An educated & informed public that can make informed decision, take advantage of opportunities & pressurize government to act
- A private sector that is up to challenges