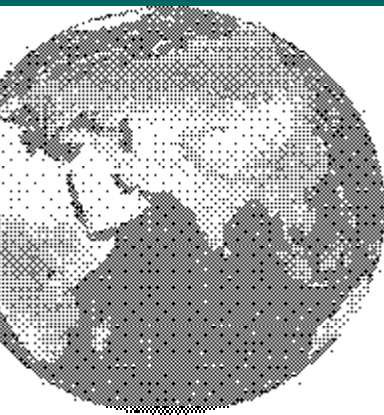




sudansite.com



**Background paper for the African Workshop on Adaptation  
Implementation of Decision 1/CP.10  
Of the UNFCCC Convention**

Accra/Ghana, 21st.-23rd. September, 2006

**Dr. Balgis Osman-Elasha**



# Overview

Causes of vulnerability of Africa to climate change

Status of systematic observations

Status of existing capacities for impacts studies,

Key impacts of climate change in Africa

Current and planned adaptation

A summary of the adaptation requirements

Opportunities for Africa/ Existing initiatives and programmes related to adaptation



# Africa in the news

**Ethiopia is suffering from severe floods leading to the death of more than 200 people and other 250 missing (1st week of August, 06)**

(<http://allafrica.com/stories/200608110123.html>)

**Flash flood in Kenya's drought-stricken northern Marsabit district .**

**Source: Kenya Red Cross Society KRCS/ July, 2006**



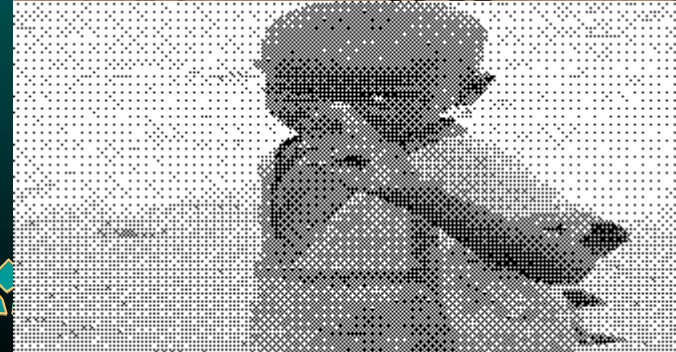
# Africa in the news

Hundreds of thousands affected  
by water shortages in Somalia  
*Reuters\_2/16/06*

Drought ravaging Kenya results  
in parents trading daughters as  
young as 8 for livestock and cash  
*Los Angeles Times/ 3/19/06*

Drought forces Tanzania power  
cuts *BBC News\_ 2/2/06* From

[www.waterwebster.com/Africadrought.htm](http://www.waterwebster.com/Africadrought.htm)



# Causes of vulnerability to climate Change in Africa

- Many factors (**multiple stressors**) contributed and compounded the impacts of the current situation of climate variability example:
  - Poverty
  - Illiteracy and lack of skills
  - Weak institutions and physical infrastructure
  - **Lack of technology and information,**
  - Poor access to resources and management capabilities etc....



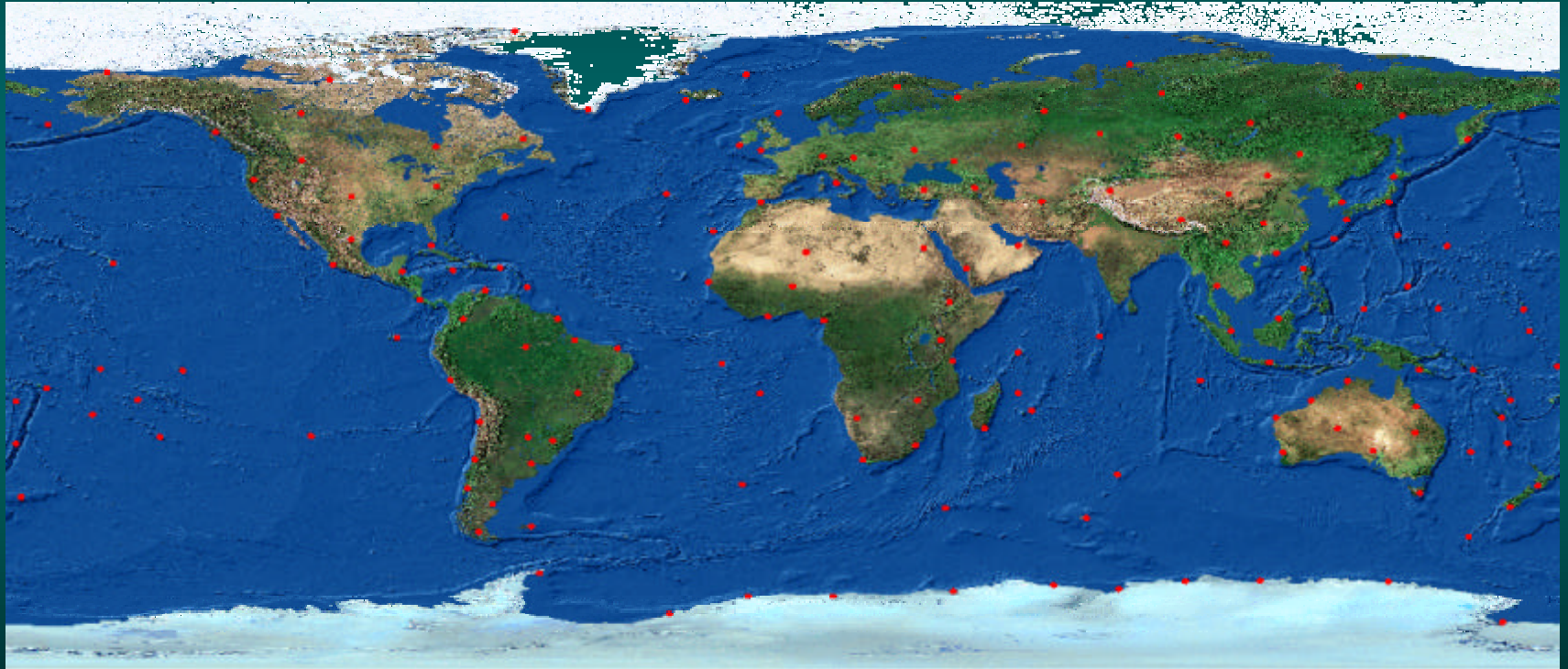
# Observation and data needs

- The lack of observational climate data in Africa, is recognized as a **constraint to understanding current and future climate variability**
- Deficiency of data on Africa, has been stressed in the G8 Gleneagles Plan of Action, 2005, *which noted that "Africa's data deficiencies are greatest and warrant immediate attention"*.
- **The weaknesses of the ground-based and upper air observing systems contribute to these deficiencies.**
- Another gap relates to the low coverage in Africa by the network of WMO World Weather Watch (WWW) stations – Africa has station density of one per 26,000 km<sup>2</sup>, **eight times lower than the WMO minimum recommended level.**



# Fig (3) GCOS Upper Air Network – World Map

Source: NOAA/NGDC)



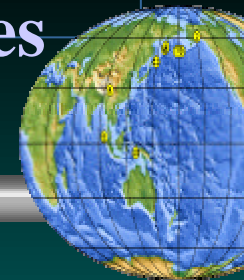
# Observation and data needs (2)

To address this evident gap, a **coordinated** effort of capacity building, training, research, & development to provide for a **continent-wide** monitoring, making available reliable **climate observations** and **transform** them into useful products for a wide spectrum stakeholders





# Availability of analytical tools and capacities for studies on V&A to climate change



## Availability and use of the Global and Regional Circulation Models

### 1. Global Circulation Models (GCMs)

- provide **coarse** climate prediction – with low resolution and on a very broad scale of (300km<sup>2</sup>).
- In the V&A assessments -under NC- African countries depended on **generated climate scenarios** based on inputs from GCMs, generally designed in developed countries, e.g. through **downscaling** using MAGIC-SCENGEN.
- The results of these studies confirmed that these scenarios could provide important information which give **good indicator** of future climate change and that, the use of GCM could provide for long-term climate **risk assessments** at a general level

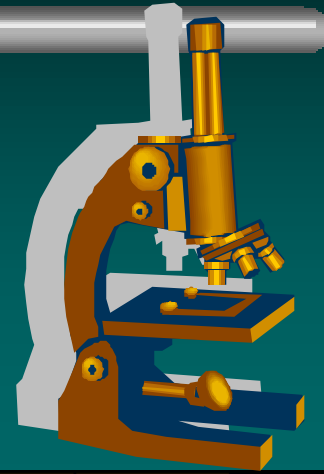


# USE of Regional Circulation Model (RCMs)

Regional climate models are needed to provide **fine-scale** climate information for impact studies & prediction process.

Africa is characterized by **low capacity** regarding the development and use of RCM (**variations** in capacity among **African regions**)

Some efforts are being undertaken & RCMs with a **higher resolution** (typically 50 km<sup>2</sup>) are currently being developed for **smaller areas** and for shorter **timescales** (approximately 20 years).



# Methods and tools for the assessments of impacts and vulnerability

- In most of **impact** studies focusing on specific sectors, countries applied **impact models** e.g. Decision Support System for Agro-technology Transfer (DSSAT)
- To a lesser extent, **socio-economic analyses** were also applied.
- recent impact and vulnerability studies ( AIACC project) employed some more **sophisticated impacts models** and **vulnerability-based** assessments.
- **Bottom-up approach**, recognizing local **coping strategies** and **indigenous knowledge** and technologies, hold the most promise for vulnerable African communities.



# Critical gaps and capacity building needs in V&A assessment

Africa has a **low level of expertise** (institutional and human) in climate science, particularly in **prediction** at **longer time scales**, as most predictions are supplied from international centers **external** to Africa

Little **financial resources** are allocated to climate at national levels, since climate is seen as a lesser priority compared to other **urgent needs**.

Lack of capacity related to use of **methods** for V&A **assessment**;

Retention of expertise (**Brain drain**)



# Other gaps identified

- Lack of country-specific **socio-economic scenarios**,
- Lack of collecting, quality control, archiving, retrieval, preparation and analysis of **data**.
- Lack of comprehensive studies on possible adaptation measures and **cost-benefit analysis** of adaptation options



# Interventions related to capacity building

- A number of options and initiatives have been identified to address gaps in the areas of **observations, research and model development, prediction** activities, and of the **delivery of climate services**. Examples include:
  - **The AIACC programme, (model development and construction of regional scenarios appropriate to the assessment of impacts and vulnerability in Africa)**
  - **IRI programme which set up contracts for the supply of model software and training**
  - **WMO and START which have supported training workshops in climate modelling.**
  - **South-North Cooperation (Meteo France in supplying data and capacity building in W. and N Africa.)**



## What are the historical and current climatic changes in Africa

### Major areas of concern addressed in the **TAR**

- Length of growing seasons;
- Water availability;
- Incidences of extremes of weather events;
- Changes in flood risks,
- Desertification,
- Distribution and prevalence of human diseases and plant pests, (IPCC 2001a).



# What are the historical and current climatic changes in Africa

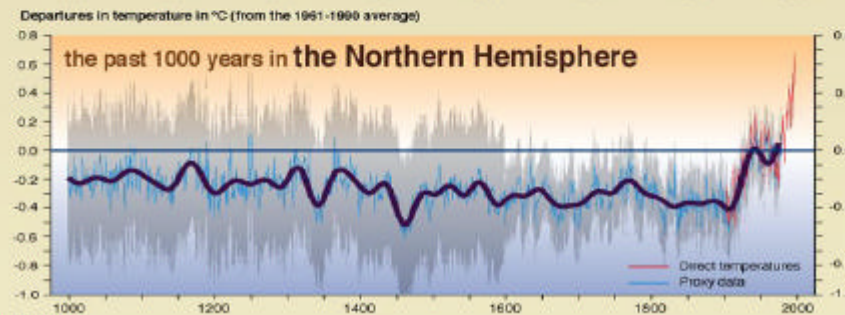
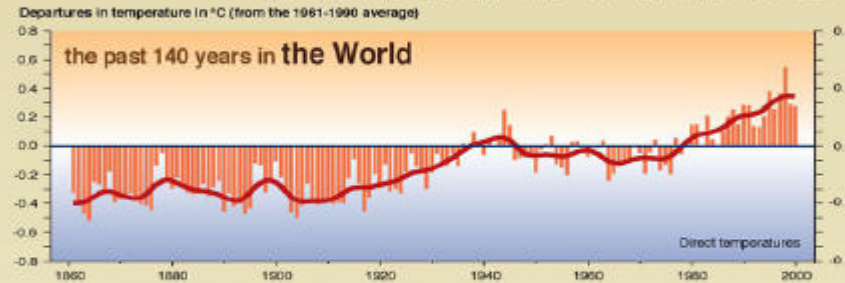
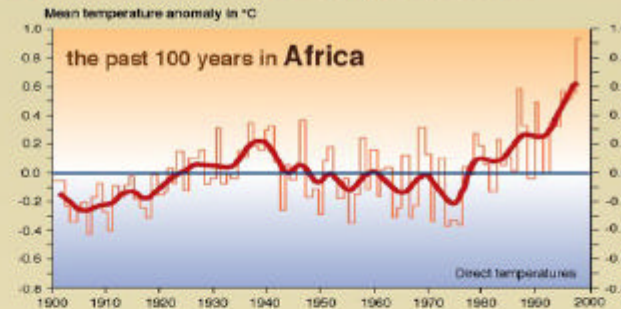
## Temperature:

Based on historical records, a warming of approximately **0.7°C** over most of the continent during the 20th century (TAR)

Warming occurred at the rate of **0.05°C /decade**

V. high temp. records have also been indexed e.g. The 5 warmest years in Africa had all occurred since 1988, with **1995** and **1998** being the two **warmest** years.

### Variations of the Earth's Surface Temperature for...



IPCC  
AR4  
Working Group I Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Sources: World Meteorological Organization (WMO), United Nations Environment Programme (UNEP), Climate Change 2001, impacts, Adaptation, Vulnerability, and Synthesis Report.





## 2. Precipitation

- A **decrease** in precipitation over the 20th century particularly after the 1960s over the **subtropics and the tropics** from Africa to Indonesia (IPCC)
- An average of a **25%** decrease in rainfall has occurred over the Africa Sahel during the past **30 years**



# Historical and current climatic changes in Africa

## Precipitation changes: trend over land from 1900 to 1994



# historical and current climatic changes in Africa

## Observed changes

### Floods

Floods and droughts, are becoming increasingly **frequent and severe.**

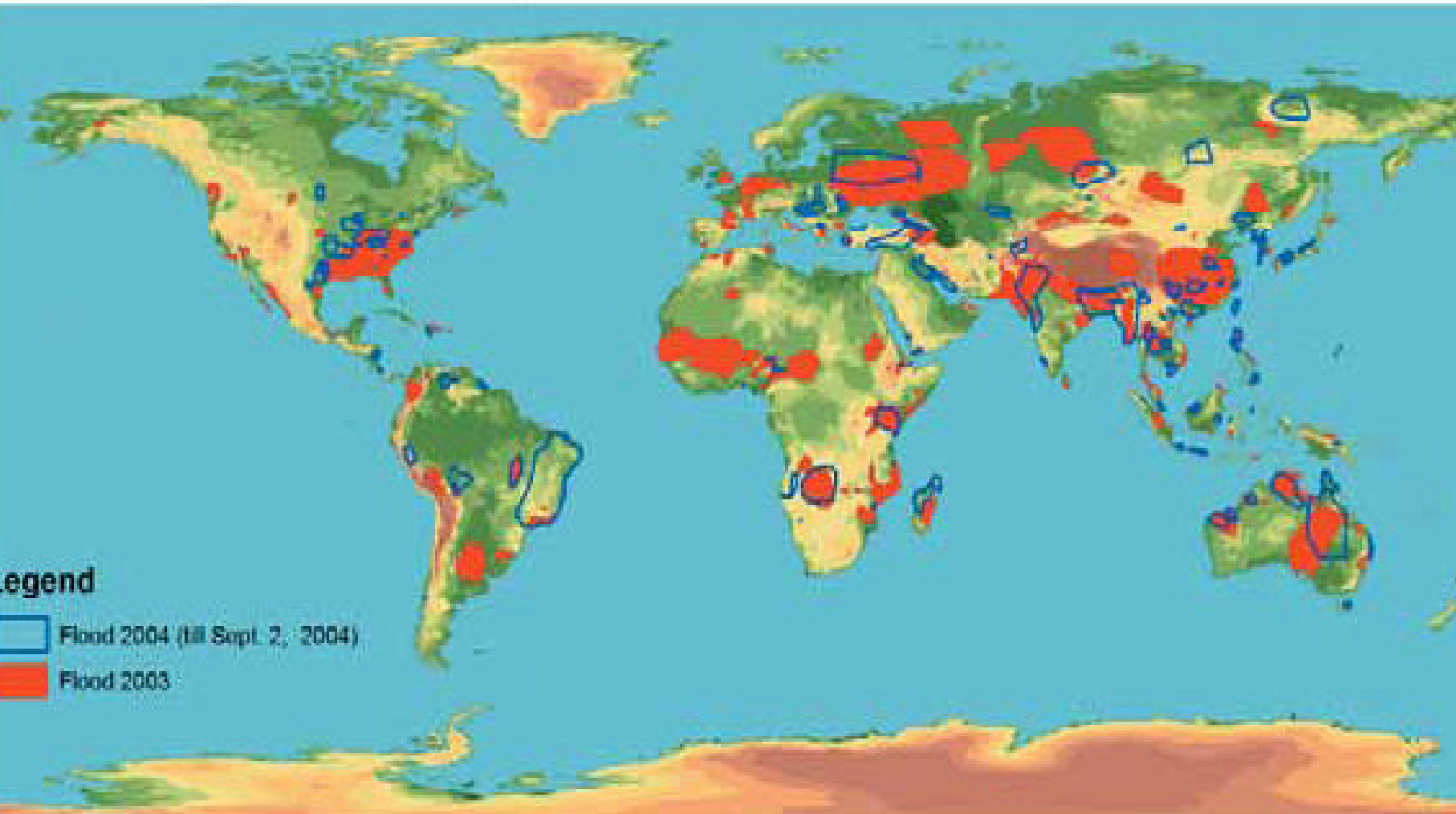
- **Variation** between regions.
- Communities located in dry areas have also been affected by flash floods.
- The years 2000 and 2001 witnessed a huge flooding event in **Mozambique**, resulted in **500,000** people made homeless and **700** lost their lives.



# Major flood events around the world in 2003& 2004

Data Source: DFO 2004, <http://www.dartmouth.edu/~7Efloods/Archives/index.html>

## Global Major Flood Map



# Historical and current climatic changes in Africa

## Observed changes (2)

### Droughts

- have particularly affected the **Sahel**, the **Horn of Africa** and **Southern Africa** since the end of the 1960s.
- Estimates suggest that **one third** of African people live in drought-prone areas (220 million are annually exposed to drought)
- The **1980s** witnessed very severe famines associated with the famous drought of **1984-85**
- Drought could also contribute to **armed conflict**, internal population displacement (**IPD**), and economic crisis.

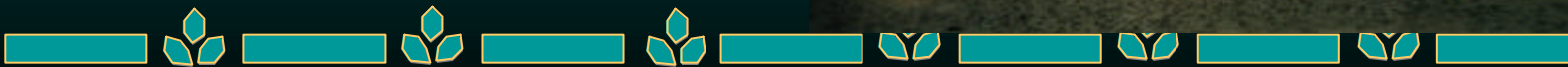


# historical and current climatic changes in Africa

## Observed changes (3)

### Sand storms:

- The frequency of occurrences of dust storms has increased in some parts of the Sahel Bet. 60s-80s.
- Many negative impacts on agriculture, water infrastructure and health



# What are the likely future climatic changes in Africa?

- **Temperature:** by 2100 it is expected to increase by 2–6°C

## **Precipitation:** Still debatable

- More humid regime in the Sahel / **Brooks, (2005)**
- Dryer condition over the Sahel/ (**Hulme et al. 2001**).



# Likely future climatic changes in Africa

## Extreme events

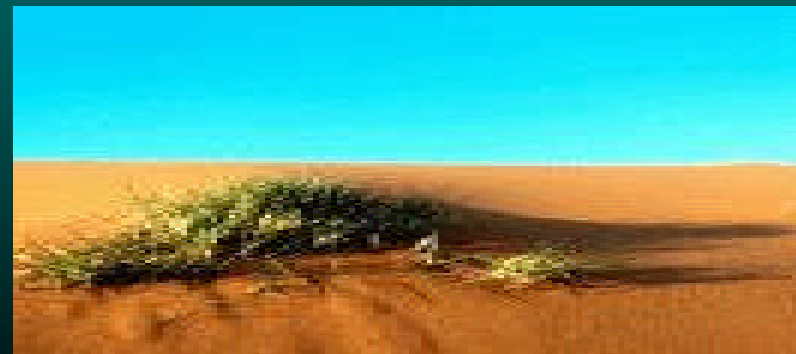
- GCM suggest that in a general terms the climate in Africa will become **more variable** with CC.
- The exact nature of climatic changes are not known and still debatable, but there is general consensus that **extreme events** will **increase** and may get **worse**.
- Increased frequency of recorded disasters are generally **linked** to climatic change plus other factors(socio-economic and demographic changes).





# Key impacts and vulnerabilities to future climate change

- The key vulnerable sectors identified by the majority of the African parties (agriculture and food security and water).
- Areas include ; low-lying and other small island countries, countries with low-lying coastal areas & fragile mountainous ecosystems.

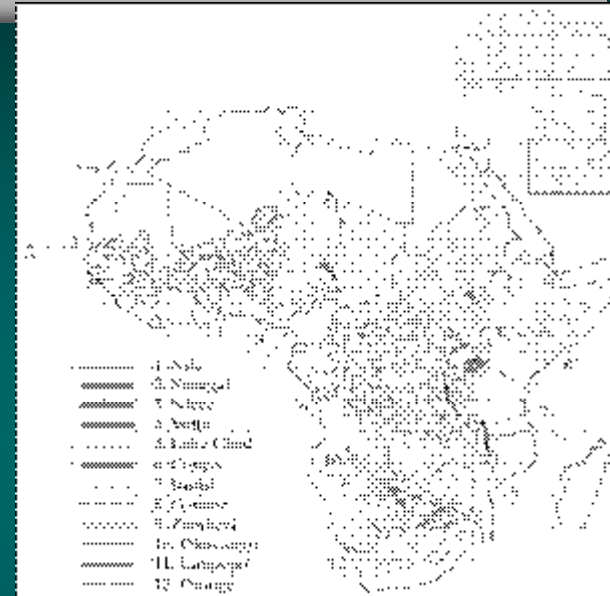


# Water Resources (1)

Changes in temp., ppt. & SLR - are expected to have an impact on **availability** and **quality** of freshwater in Africa.

UNEP (2002), suggested that by 2050 rainfall in Africa could decline by **5%**

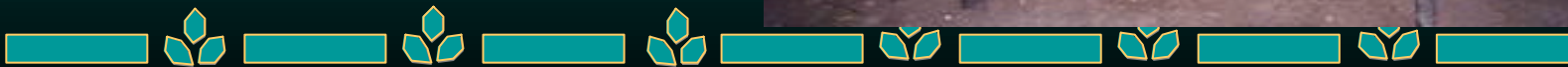
By 2025, it is projected that around **480 million** of people in Africa will face either water **scarcity** or stress with a subsequent potential increase of water **conflicts** (almost all of the **50 river basins** in Africa are transboundary)



# Key impacts on the energy



- More than **70%** of Africans still rely on traditional biomass fuels.
- CC will impact **traditional sources** of energy
- Increasing temp in addition to heat islands and increasing heat stress in urban areas will increase **demand for energy**
- The World Energy Outlook projects that by **2030, 50%** population of sub-Saharan Africa will still be **without electricity**



# Impacts on Health

- Africa shoulder **21%** of the global disease burden,
- Expected increase in the population of disease-carrying **mosquitoes** as a result of changes in **temp.& ppt.**
- Changes in **PPT.** will affect the TP of other **vectors-** and **water-borne pathogens**



# Impacts on Health (2)

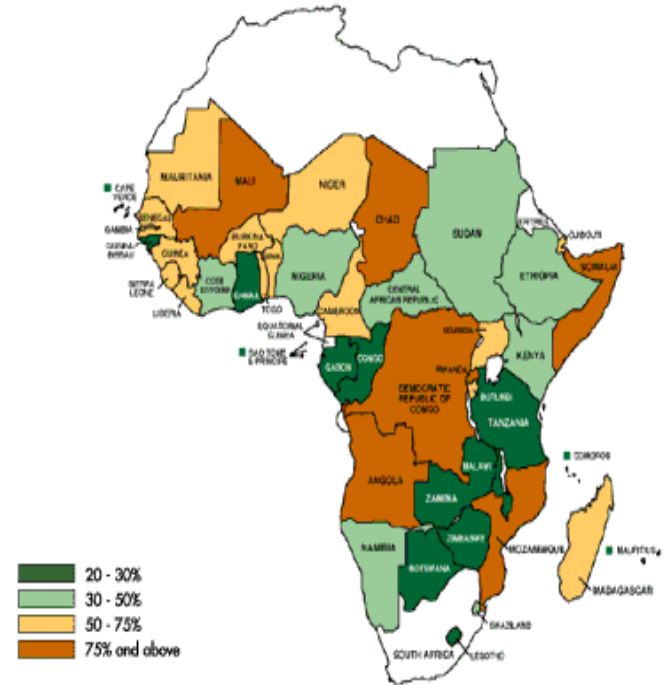
**Cholera** may increase with climate variability and change.

Floods can **contaminate** public water supplies and drought leads to unhygienic practices because of **water shortages**

Impact on **animal health**, production of dairy products, meat and reproduction.

Changes in **crop production** are likely to have a significant impact health in Africa. (malnutrition)

**Access to Healthcare in Sub-Saharan Africa**  
Percent of Population with Access to Health Care



Access to health care is defined as the percent of the population that can reach appropriate local health services by the local means of transportation in no more than one hour.

Source: World Bank. *Better Health in Africa*. Washington, DC: World Bank, 1994; United Nations, 1997.

Data not available for Equatorial Guinea, Eritrea and South Africa.

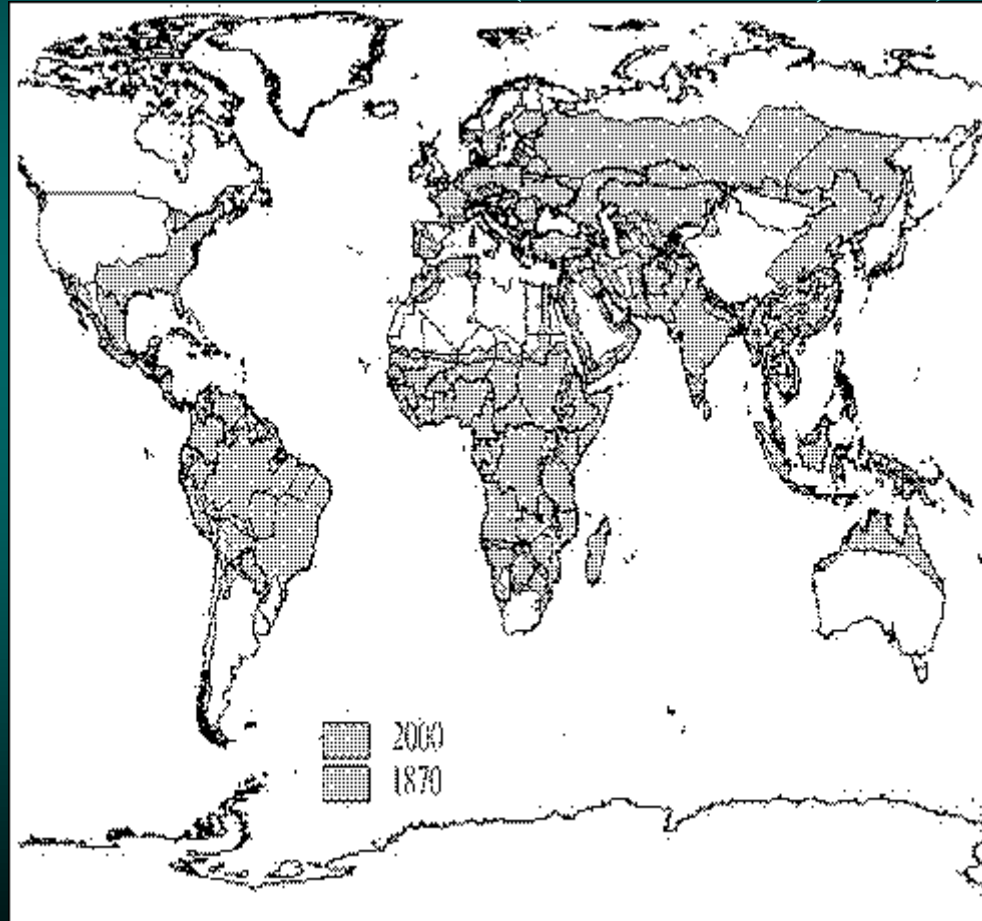
# Impacts on Health (3)

## Focus on malaria

About **90%** of the annual global rate of deaths from malaria occurs in Africa south of the Sahara. Moreover, malaria causes at least **300 million** cases of acute illness each year

Malaria Epidemics in 1870 -2000.

Current & historical distr. (Source: WHO, 2003)



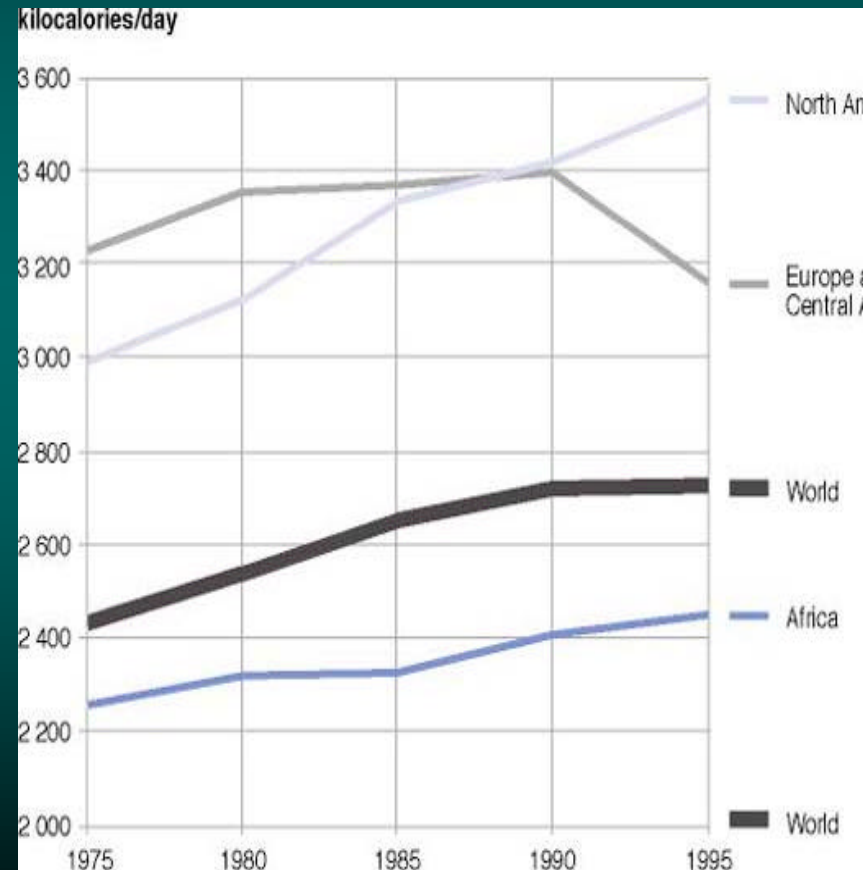
# Impacts on Agriculture and food security

Agric. Dependency on **Rain** – makes it highly vulnerable to CC variability, seasonal shifts, and ppt. patterns

Africa will account for the majority of extra people at **risk of hunger** by the **2080**

20% in the primary productivity of **Lake Tanganyika** in East Africa (roughly **30%** decrease in fish yields)

Fig (14) Calorie consumption per person in selected regions of the world in 2001/Source: FAO (2003)

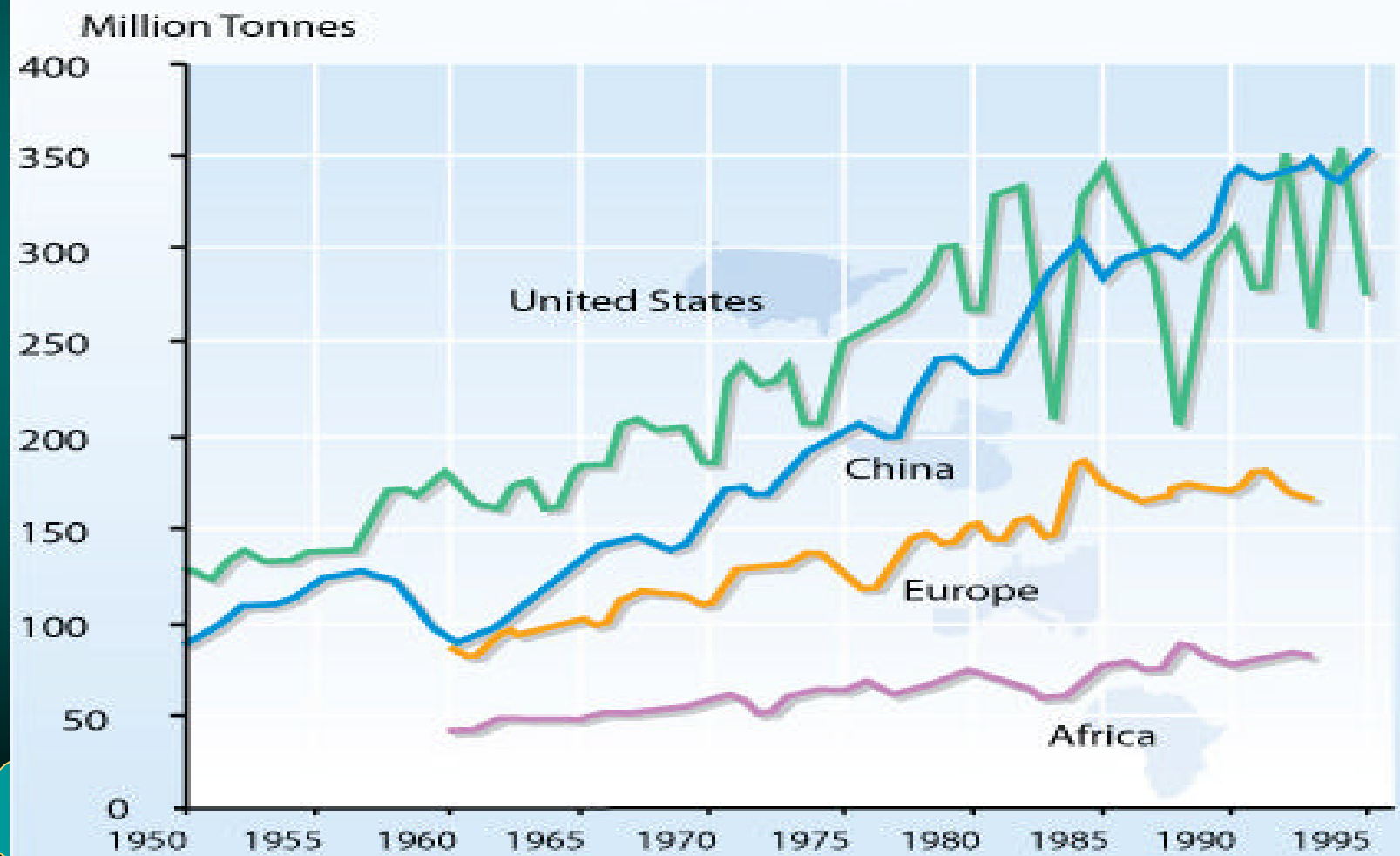


# Fig (17) Grain Production for selected areas 1950-1995

Source UNEP, (2004)

## Grain Production For Selected Countries

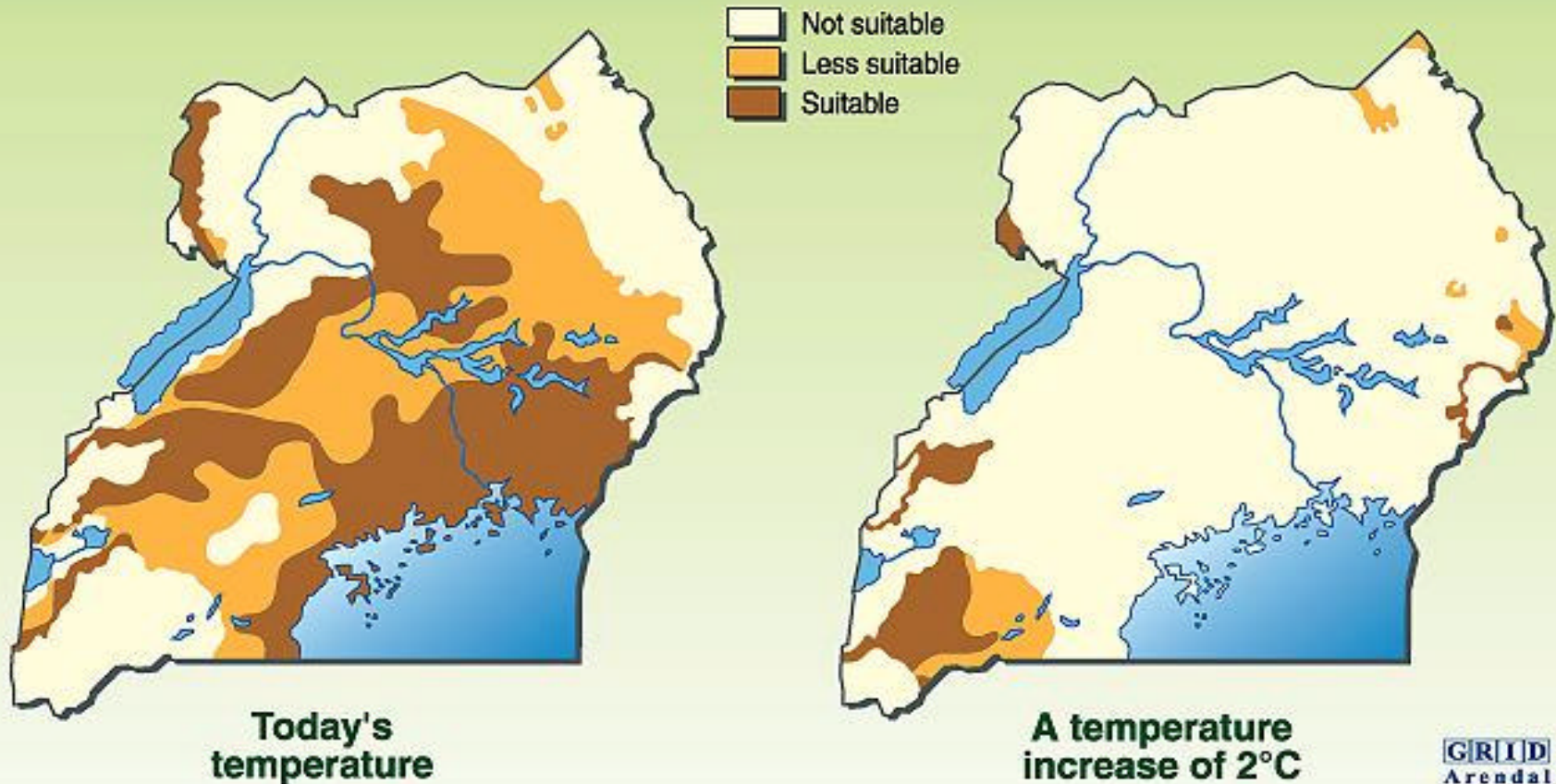
Source : USDA





# Impact of Robusta Coffee in Uganda wif temp. increases by 2°C

## Impact of temperature rise on robusta coffee in Uganda



# Impacts on ecosystems & biodiversity

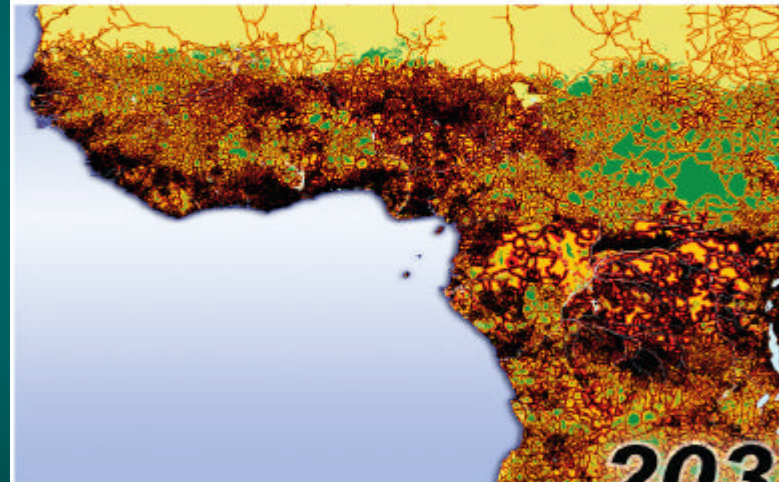


By 2085 between **25% -42%** of the species' **habitats** are expected to be **lost** altogether

**Key areas** such as Congo basin, wetlands , delta areas, sudd areas (Okavonga) & mountain ecosystem will be impacted



2002



2037



Current distribution of African great apes (Chimpanzee, Bonobo and Gorilla).

- High impact
- Medium - high impact
- Low - medium impact

Source: The Great Apes - the Road Ahead. UNEP 2002.

# impacts on forests and woodlands

Congo Basin (USAID, 2004)

climate change will likely result in **species range shifts**, as well as changes in **tree productivity**, adding further **stress on forest ecosystems**

**Fire incidences** which currently represent a huge threat to tropical forest in Africa are expected to **increase** with rising temperature resulting from CC



# Impacts on coastal zones and marine ecosystems

- More than **25%** of Africa's population lives within **100km** of the coast, and projections suggest that the number of people at risk from coastal flooding will increase from **1 million** in 1990 to **70 million** in 2080
- **Sea levels** projected to rise in Africa by **15-95 cm** by the year **2100**.
- Coastal **infrastructure** in **30%** of Africa's coastal countries are at risk of partial or complete **inundation** due to accelerated **SLR**



# Impacts on coastal zones and marine ecosystems

## Potential impacts of SLE Nile Delta

### Potential impact of sea level rise: Nile Delta

Population: 3 800 000  
Cropland (Km<sup>2</sup>): 1 800



Population: 6 100 000  
Cropland (Km<sup>2</sup>): 4 500



## Observed bleaching of coral reefs in the eastern coasts of Africa, UNEP, 1998

### Threats to the Coral Reef

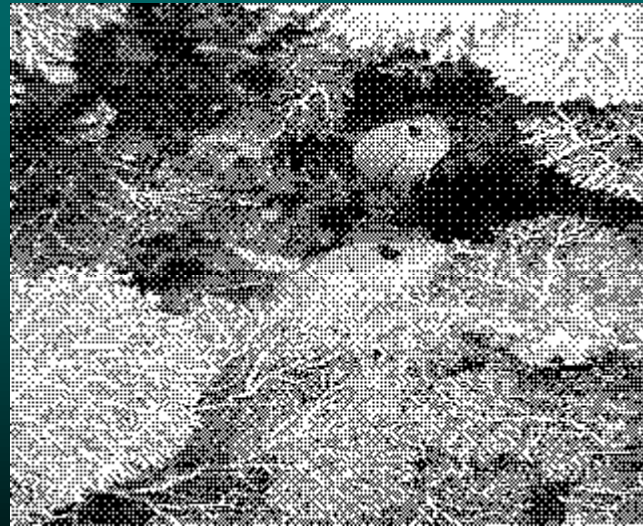
#### Estimated threat to coral reefs

- low
- medium
- high



# Impacts on coastal zone and marine areas (2)

- Floods and hurricanes could lead to **mass migration, health problems & psychological stress.**
- Threats to coastal and marine ecosystems e.g. **lagoons and mangrove forests**
- Damage to **coral reef** systems has far reaching implications for fisheries, food security, and tourism and overall marine biodiversity



# Conflicts and human migration

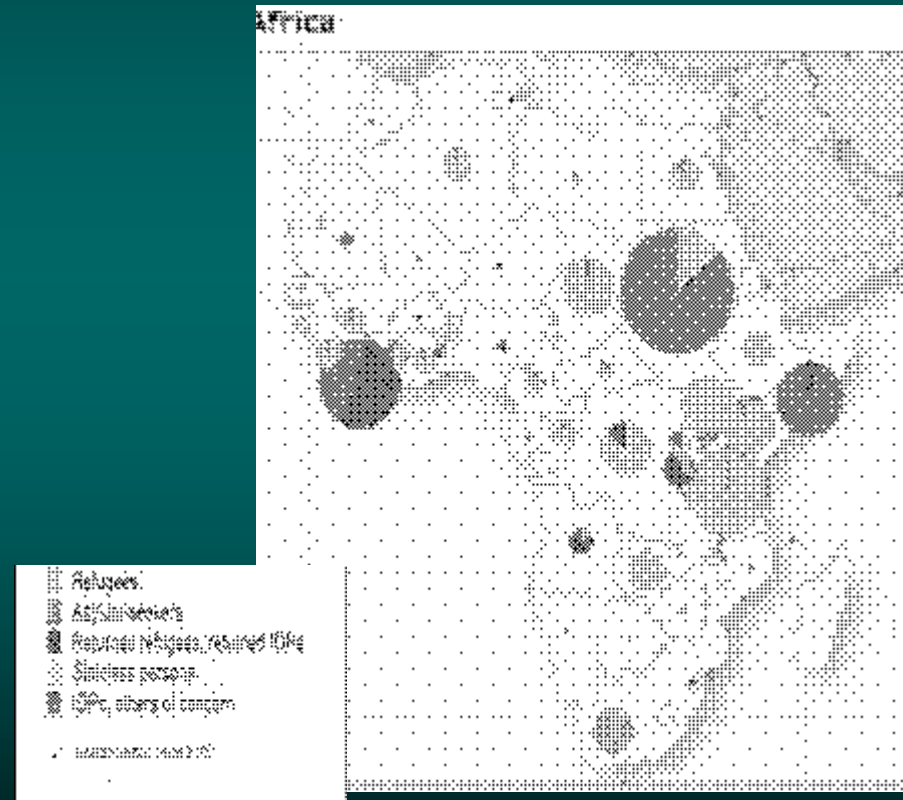
- A number of evidences suggest that climate variability and change can be a contributory factor in **conflicts**
- TAR-(IPCC 2001b) highlighted conflicts over water resources, especially in **international shared basins**, where there is a need for regional coordination in water management as an important aspect of Africa's vulnerability to climate change



# Conflicts and human migration

- The only region with increase in the total no. of Refugees is the GHA (+0.2%).
- In Darfur (Sudan), the number of (IDPs) is reported by UNHCR as increased from **662,000** to **842,000** during 2005.

## • Refugees and IDPs in Africa, 2005





# Impacts on MDGs

- CC has the potential to **undermine** economic development, increasing poverty & delaying or preventing the realization of the MDGs.
- Many of the MDG targets for 2015 are unlikely to be met due to the potentially **adverse impacts** of CC. that could largely impede development efforts in **key sectors**
- The lack of effective adaptation can jeopardize the achievement of MDG **goal 1** (eradicating extreme poverty & hunger), **goal 6** (combating HIV/AIDS, malaria and other diseases) and **goal 7** (ensuring environmental sustainability).



# Adaptation to Climate Change

- High vulnerability of Africa is attributed to a large extent to its low **adaptive capacity**.
- Due to high climatic variability, Africa's inhabitants have been developing highly **effective strategies** to cope with drought since historical times
- Local people in Africa have perceived, interacted with and made use of their environment with its meager natural resources and changing climatic conditions in what could be seen as **practical coping mechanisms**



# Adaptation to Climate Change

## Examples for current adaptation measures

- Utilization of wild fruits and vegetables in animal feed and the distant **movements** to areas that are less affected by drought
- **diversification of incomes** (crops, herds and jobs)
- Tribal and individual **movements** and migration



# Planned adaptation

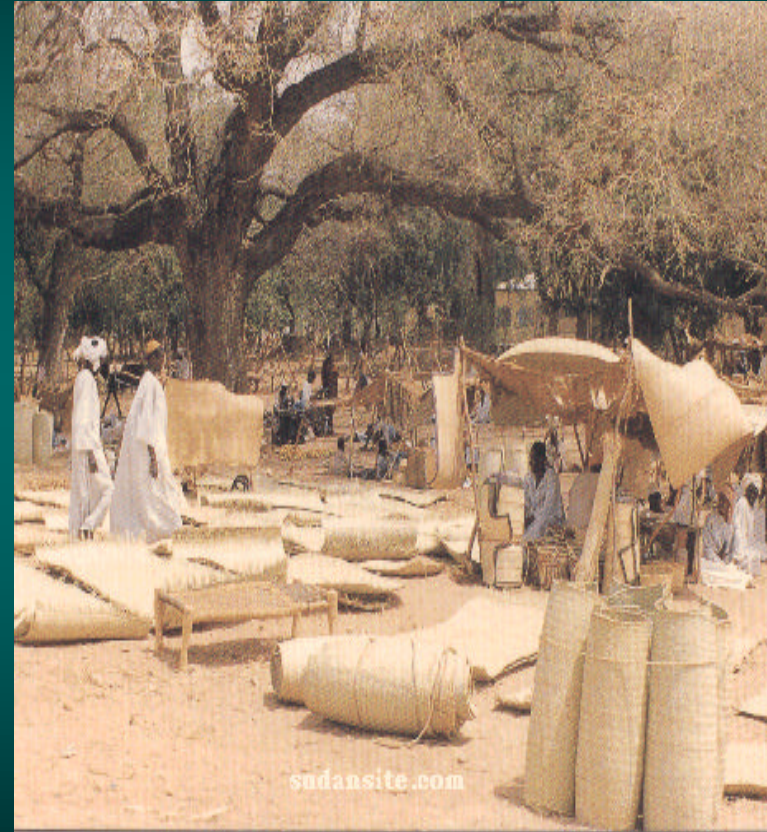
Planned adaptation is becoming a **must**, if we want to avoid or minimize the inevitable **threats** of CC impacts to Africa

A number of **added benefits** could also be expected from a planned adaptation measures such as:

A better **management** of natural resources

Development of **reliable system** of seasonal predictions;

**Diversifying** economic activities



# Planned adaptation

## Agriculture:

- A majority of National Communication Reports mentioned the development of a more **heat- and drought-resistant crops**
- Use of **early maturing / high yield varieties** & supplementation and sedentarization of animal herds
- Improving the production **efficiency** in arid lands and marginal areas

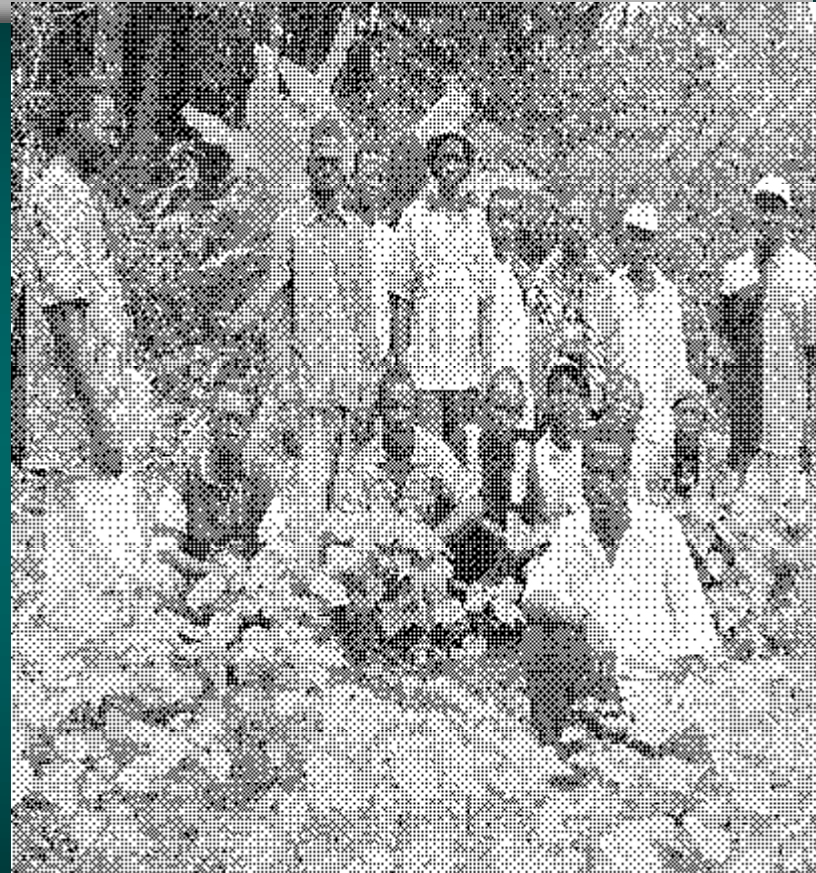


# Planned adaptation

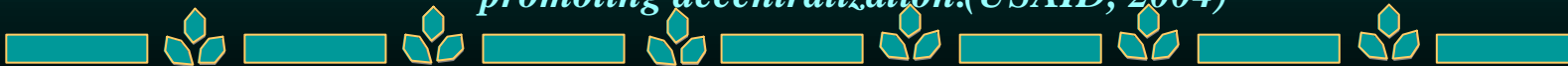
## Forestry:

Community Based Natural Resource Management (CBNRM) approach to promote use of **ecosystems goods and services** as apposed to a reliance on agriculture e.g. Botswana.

Establishment of seed banks to preserve **biological diversity** and provide farmers with an opportunity to diversify their products and tree cover



*Community Forestry Agents in Guinea are empowered to manage local natural resources as a result of policy reforms promoting decentralization.(USAID, 2004)*



# Planned adaptation

## Water

- Use of **supplementary irrigation** (reduce dependency on rain)
- Improved water **management** and utilization of different available sources (e.g. shallow wells)
- **Harvesting and storage**
- **Efficiency of water use**



# Planned adaptation

## Coastal zones

- **Integrated** Coastal Zone Management (ICZM)
- Sea walls and **armors**; pillar housing and **raised** foundation levels
- Development of a **Sustainable Fisheries Livelihoods Programme** (West Africa).
- **Dykes** and protective measures are proposed for the Nile Delta in Egypt
- Establishment of **marine reserves** e.g. in Seychelles





# Planned adaptation

## Health:

- **Early warning system:** Githeko and Ndegwa (2001) showed that with the use of models, malaria epidemics in the western Kenya Highlands could be forecasted 2-3 months before they occur.
- Improvement of **health services**



# Adaptation requirements

- Far more work is needed if adaptation itself has to be seen as an essentially dynamic, continuous and non-linear process (ILRI, 2006). E.g.
- **Better forecasting and early warning systems.**



# Adaptation requirements

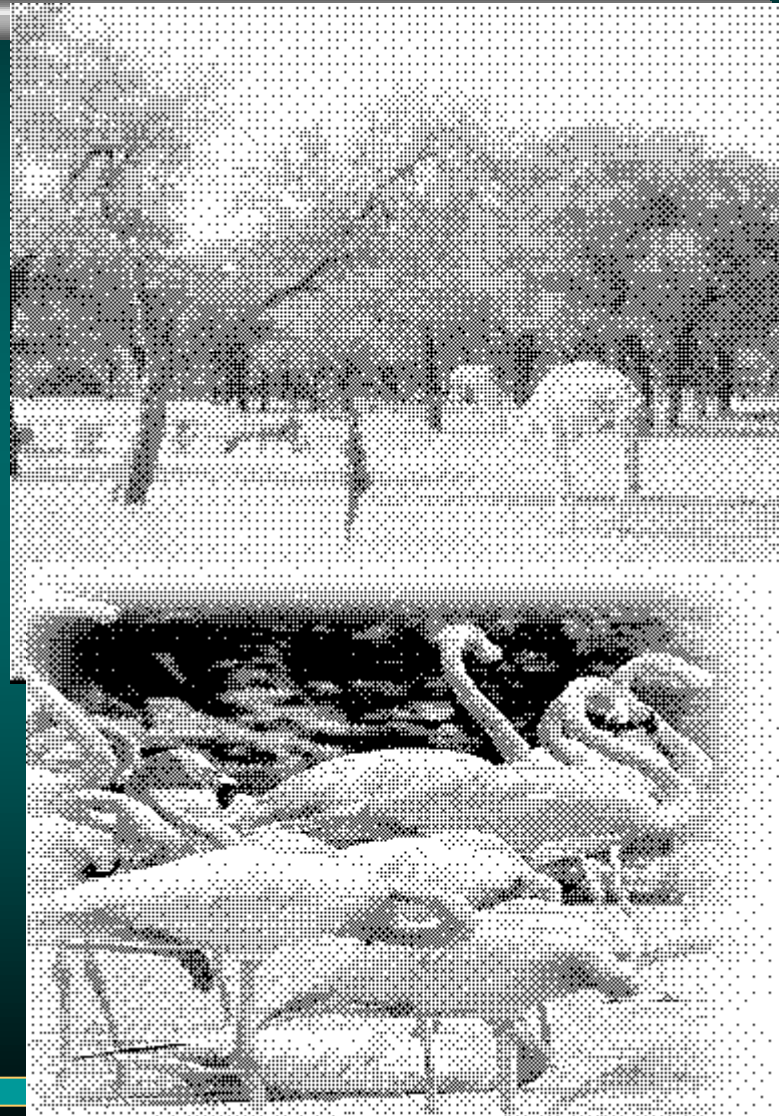
- **Education and awareness** creation on CC among governments, institutions and individuals;
- **Linking** research to **policy-making**, with an emphasis on getting research messages to appropriate target groups;
- Linking research to **existing local knowledge** of climate related hazards and involving local communities in adaptation decision making.



# Opportunities for Africa

Inspite of the gloomy picture that CC is drawing for the future of Africa, but the continent possess some unique characteristics which could provide good **opportunities** in the face of future CC E.g.

1. Africa is still not heavily polluted and is not considered as a source of GHG emission (There is a chance to follow a **SD path**)



# Opportunities for Africa

## 1. Social capital:

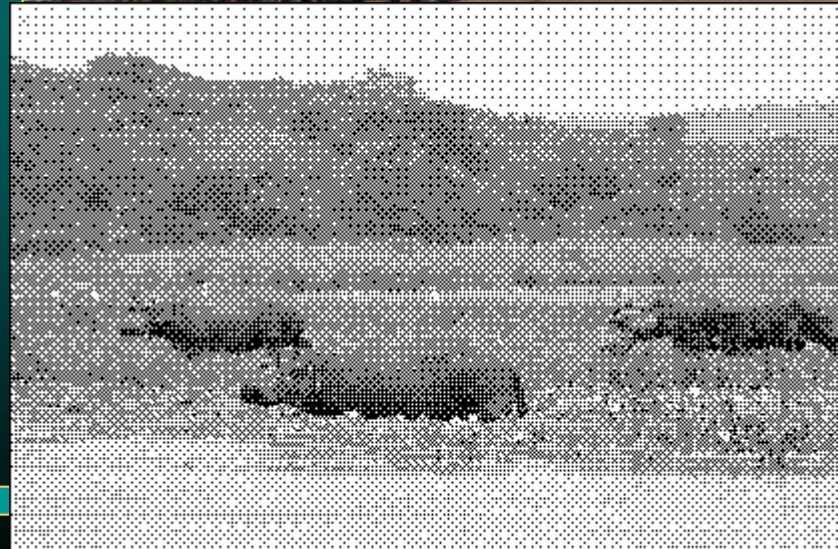
Africa possess a wealth of **social networks** that has enabled their survival over harsh climatic conditions. They represent safety nets for the people, compensated for their low financial capitals, and helped them maintain their livelihood



# Opportunities for Africa

## 1 Natural capital

Africa is rich in **natural resources**. It has a good potential for exploiting these resources in a more productive way through e.g **agricultural transformation** processes to sustainably utilize the rich resource base.

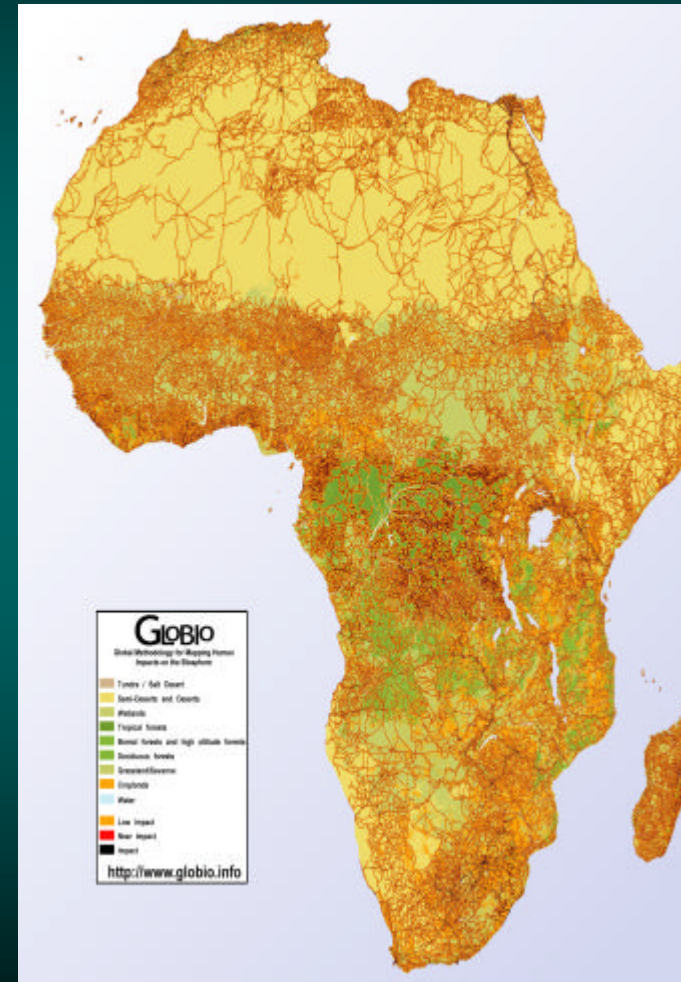


# Opportunities for Africa

## 2.2 Natural capital:

Africa is home to some of the greatest wilderness areas in the world, as well as some of the **greatest biodiversity hotspots**.

A study shows that the great deserts and the Central African rain forests have huge remaining tracts that show **low human impact** and development



# Opportunities for Africa/ Multilateral funding for adaptation

## Available funding for adaptation activities

- **The Global Environment Facility (GEF) Trust Fund**
- **The Special Climate Change Fund (SCCF)**
- **The Least Developed Countries Fund (LDCF)**
- **The Adaptation Fund under the Kyoto Protocol**
- **Funds under other Multilateral Environmental Agreements (MEAs)**

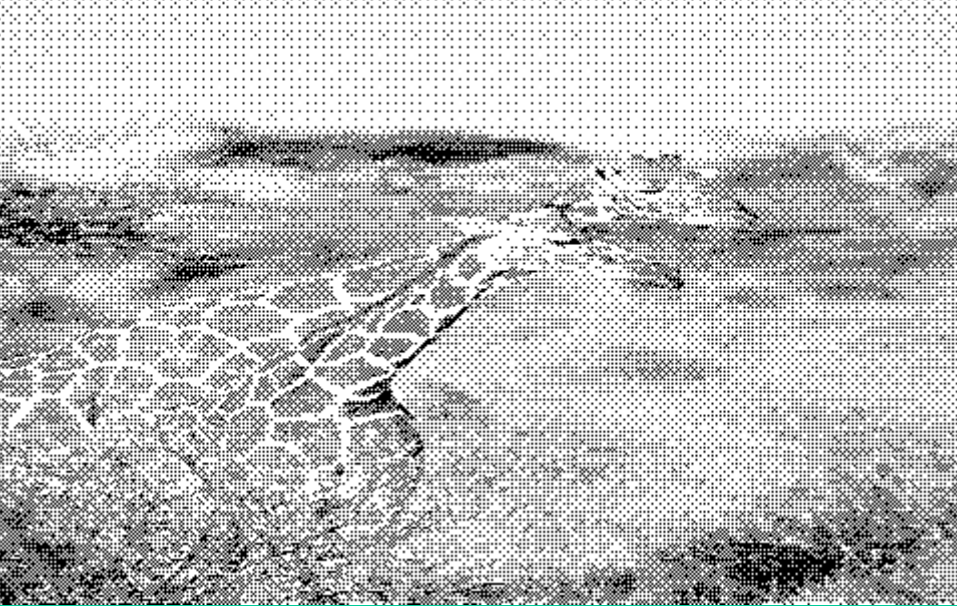




# Climate Change relevant initiatives, activities and institutions in Africa

- list is not an exhaustive one but it is meant to shed the light on some of the important adaptation relevant initiatives in Africa





😊 Thanks 😊

Awaiting your inputs 😊

