

Climate Change & adaptation in Africa/Ethiopia

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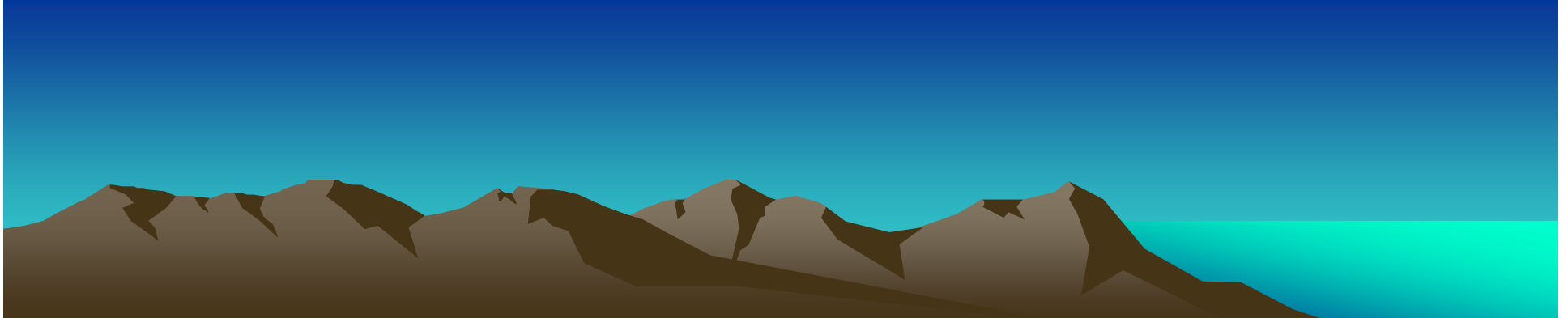
UN-SPIDER Regional Workshop
“Building Upon Regional Space-based Solutions for Disaster
Management and Emergency Response for Africa”

Addis Ababa, Ethiopia,
6 to 9 July 2010



Outline

- Overview of Climate change in Africa/Ethiopia
 - CC Impacts
 - Ecosystem & Biodiversity
 - Land Degradation
 - Disaster
 - Ongoing efforts to CC
 - Adaptation to CC
- IWMI activities in Climate Change Adaptation
- Conclusion



Introduction - CC impacts

The African continent is vulnerable to the impacts of climate change because of several factors:

- poverty,
- recurrent droughts,
- Population growth and urbanization,
- inequitable land distribution,
- over exploitation of resources,
- subsistence rain-fed agriculture, etc.



Introduction - CC impacts

Sectors particularly vulnerable to climate change:

- **Agriculture:** Extreme weather events, combined with a low capacity to adapt to the adverse impacts of climate change, aggravate food security risks
 - Due to shortage of rainwater/changes in rainfall patterns,
 - exposed to flooding /erosion, declining soil fertility,
 - decline in productivity, reduced yield, food insecurity
- **Water:** is a prime natural resource to be affected by CC
 - floods or droughts, loss of wetlands
- **Ecosystems:** rapid environmental degradation resulting from agricultural expansion to marginal lands and deforestation,
 - loss of biodiversity, desertification, etc.
- **Human Health:** Climate-related hazards have a significant impact on human health.
 - Malaria (increase in temperature), vector and water borne diseases, malnutrition (during drought years)
- **Energy:** use of biomass as source of energy increase CO₂ emission.



Cases: Drying Lakes

- Lake Haromaya, Ethiopia: the most dramatic changes on wetland degradation
 - severe soil erosion, resulted from the intense rainfall, and steep slopes,
 - over abstraction of the water which led to problem of sedimentation and siltation and
 - complete dried up of the lake.
- The case of Lake Haromaya can be an example of the serious threat and an alert for other existing lakes in Ethiopia/Africa.



Cases: Drying Lakes



Lake Haromaya in the year 1989 (a)
and in the year 2005 (b).



(Dagnachew, 2007)

Cases: Drying Lakes ...

- Lake Naivasha, Kenya, an official 'Ramsar Site' - 30,000 ha, has turned into a shallow mudpool during the 2009 drought.
- The wetland areas are facing commercial overexploitation. Flower farmers in the lake continue their production, despite the extreme water shortage that the area is facing (Wetland International, 2009).
- The falling water levels, pollution caused by agro chemicals and fertilizer residues, over-exploitation of fisheries



(Source: Wetlands International)

poor wetland management, especially unsustainable use of water resources, is the root cause of the totally drying up of wetlands in Africa.

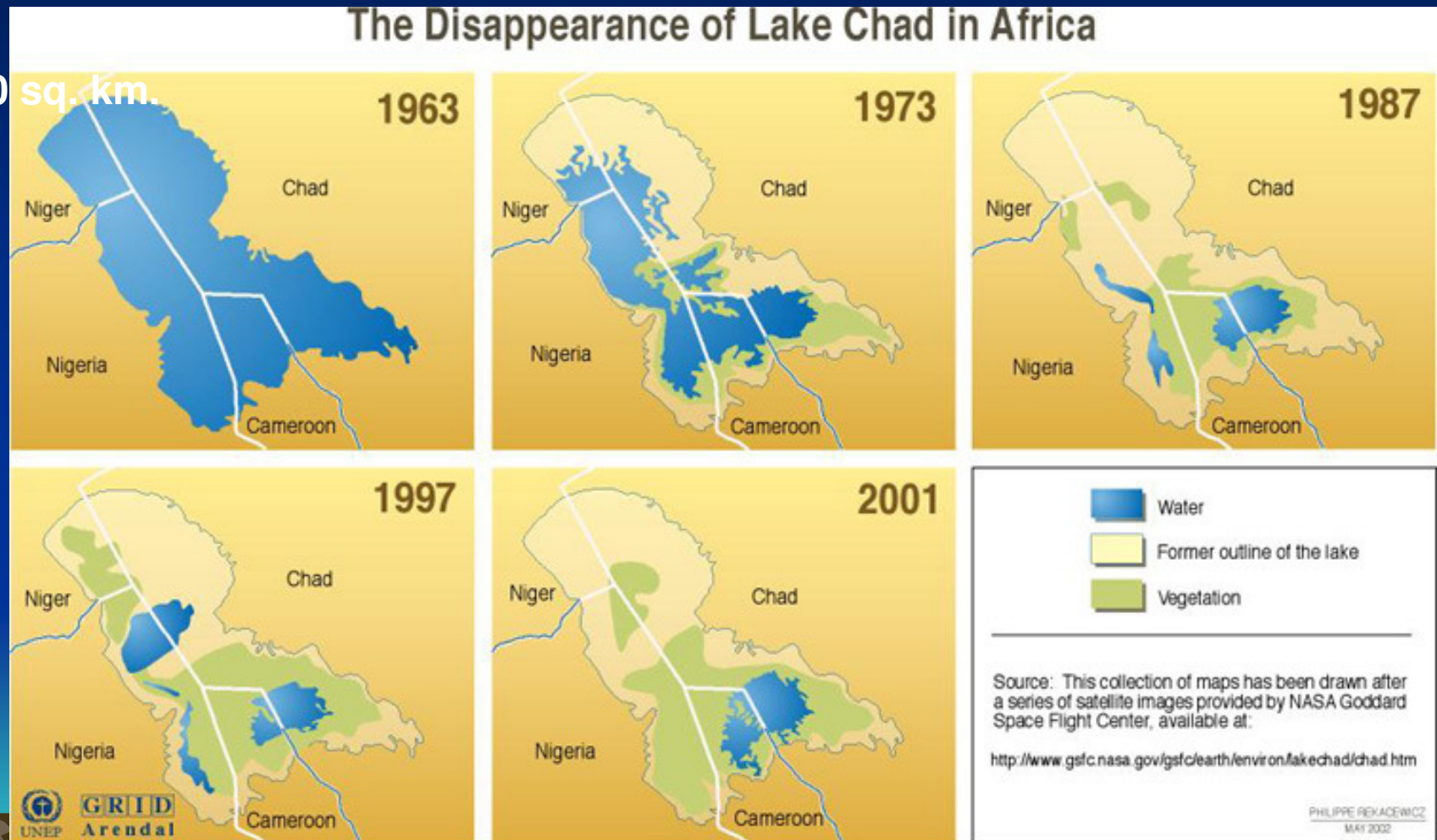
Cases: Drying Lakes ...

- Lake Chad, once one of Africa's largest freshwater lakes, has shrunk dramatically in the last 40 years.
- Lake Chad's shrinkage is due to:
 - ever increasing demands of an expanding population
 - Overgrazing surrounding the lake, and
 - subsequent decline in vegetation causing extensive desertification.
- * this environmental degradation is mainly due to resource depletion



Cases: Drying Lakes ...

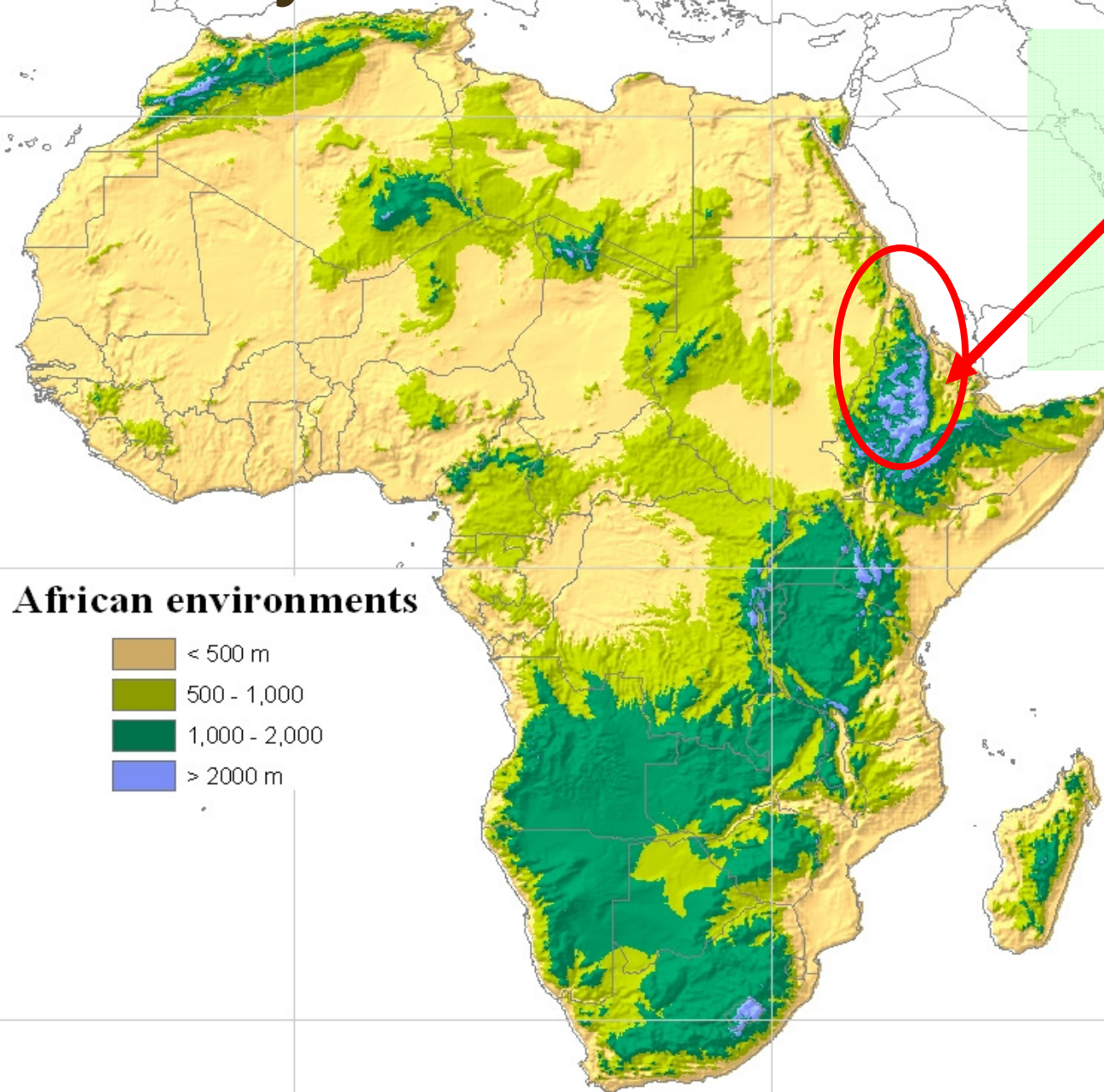
25,000 sq. km.



1,350 sq. km.

Ecosystem & Biodiversity

80% of Afro alpine ecosystem falls in Ethiopia

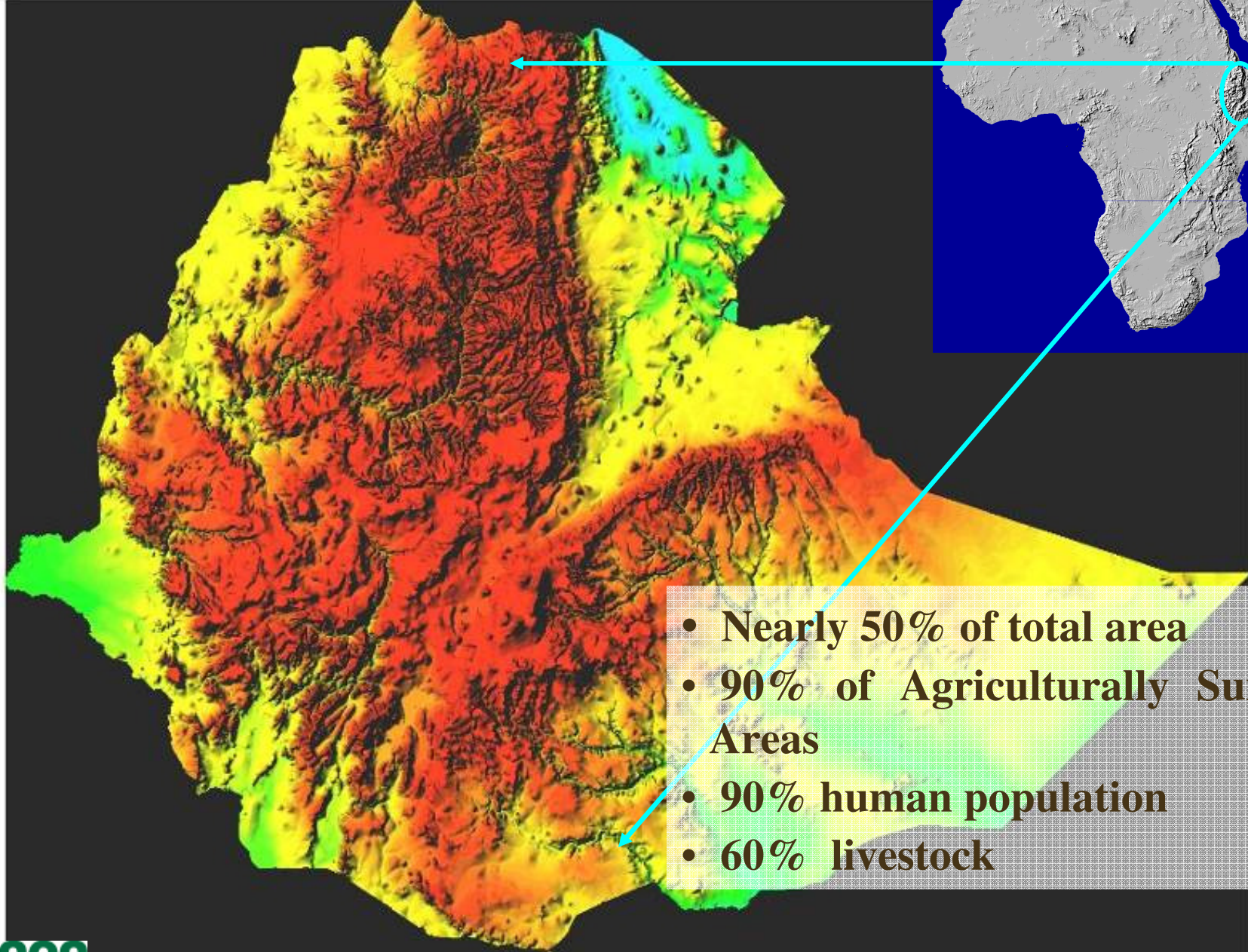


African environments



(Gete, 2007)

Ethiopia: Shaded Relief

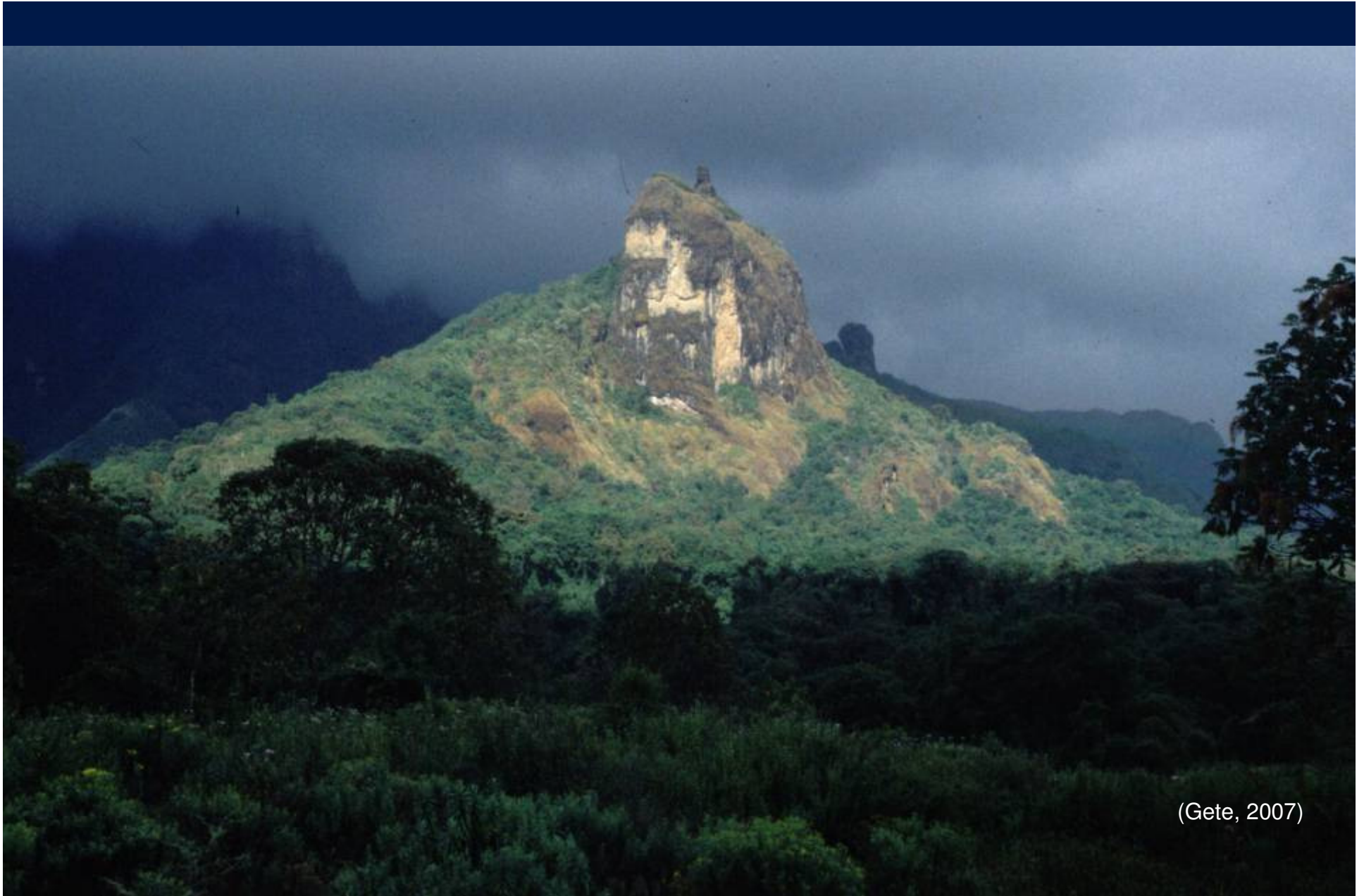


- Nearly 50% of total area
- 90% of Agriculturally Suitable Areas
- 90% human population
- 60% livestock

Highlands hold extraordinary landscape



(Gete, 2007)



(Gete, 2007)

The Bale mountains is the largest area of Afro-Alpine habitat in the whole of the continent.



The evergreen montane forests of Hareenna Escarpment,
(about 2,500 to 4,000 masl) Bale Mountains.

Biodiversity ...



5,200 plants, of which 555 endemic

high rainfall, together with the great variation in altitude and topography, result in rich diversity in vegetation.

(Gete, 2007)

620 bird species,
29 endemic Species



(Gete, 2007)

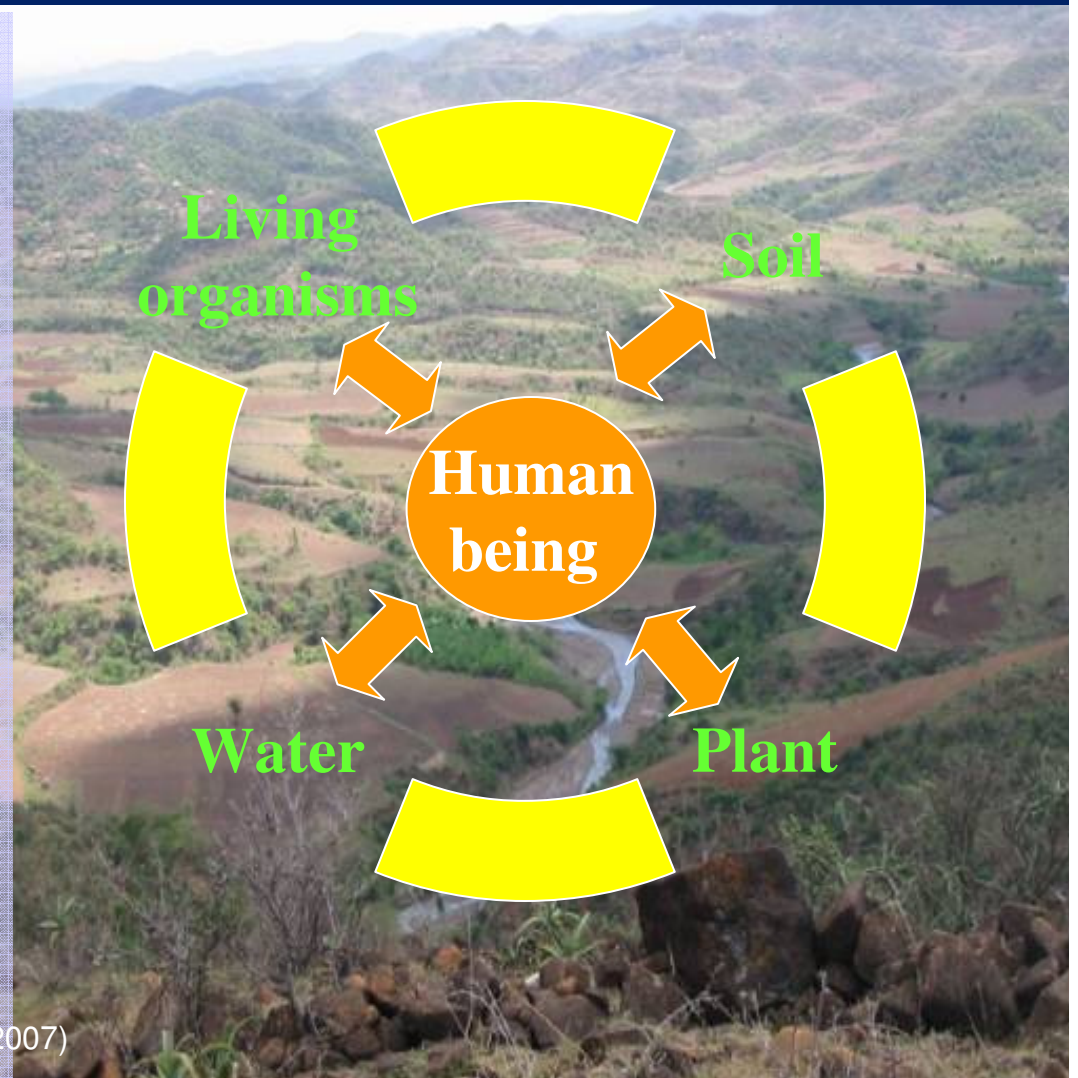
Biodiversity ...

Wild life species,
endemic Species

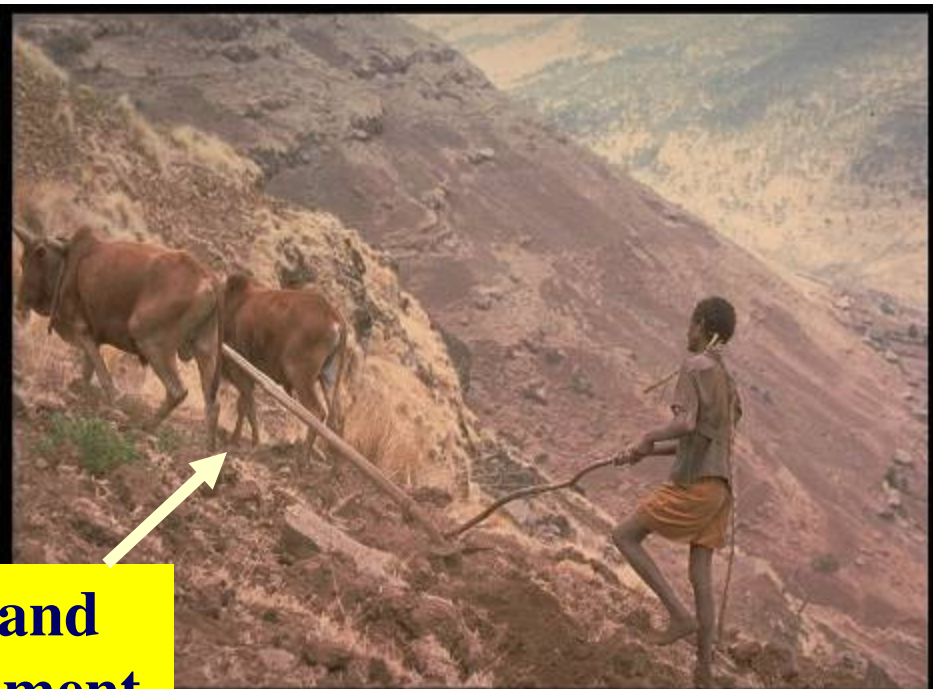


Land Degradation

- Highlands are facing serious land degradation and loss of biodiversity
 - Human intervention
 - Poor land and water management



(Slide adapted from Gete, 2007)



**Poor land
management**



(Gete, 2007)

Results:

- Barren landscapes unprotected in many parts of the country,
- Encroachment of virgin forest areas for cultivation without protection

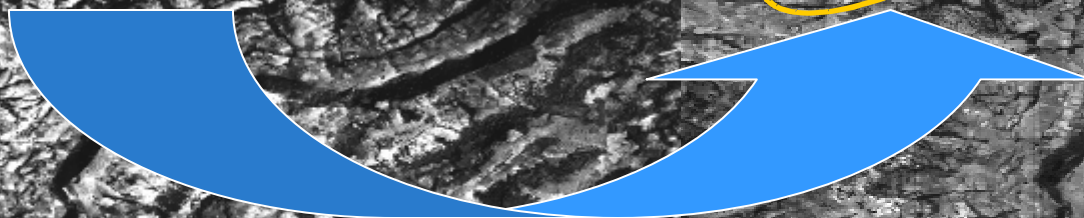
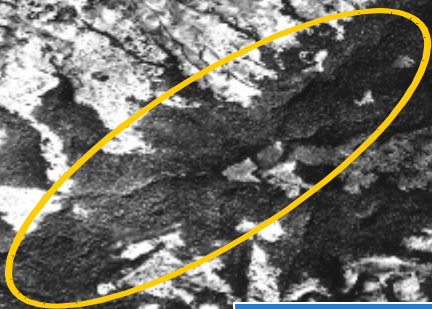


(Gete, 2007)

a-1
1957

a-2
1982

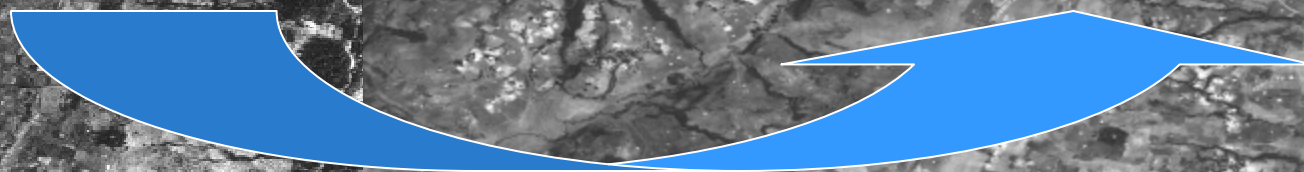
In only
26 years
98% of
the forest
cover was
cleared!



b-1
1957

b-2
1982

Anjeni RU



Land Degradation...

- Huge gully erosion washed away cultivated lands
- common in most parts of Abbay (Blue Nile) Basin

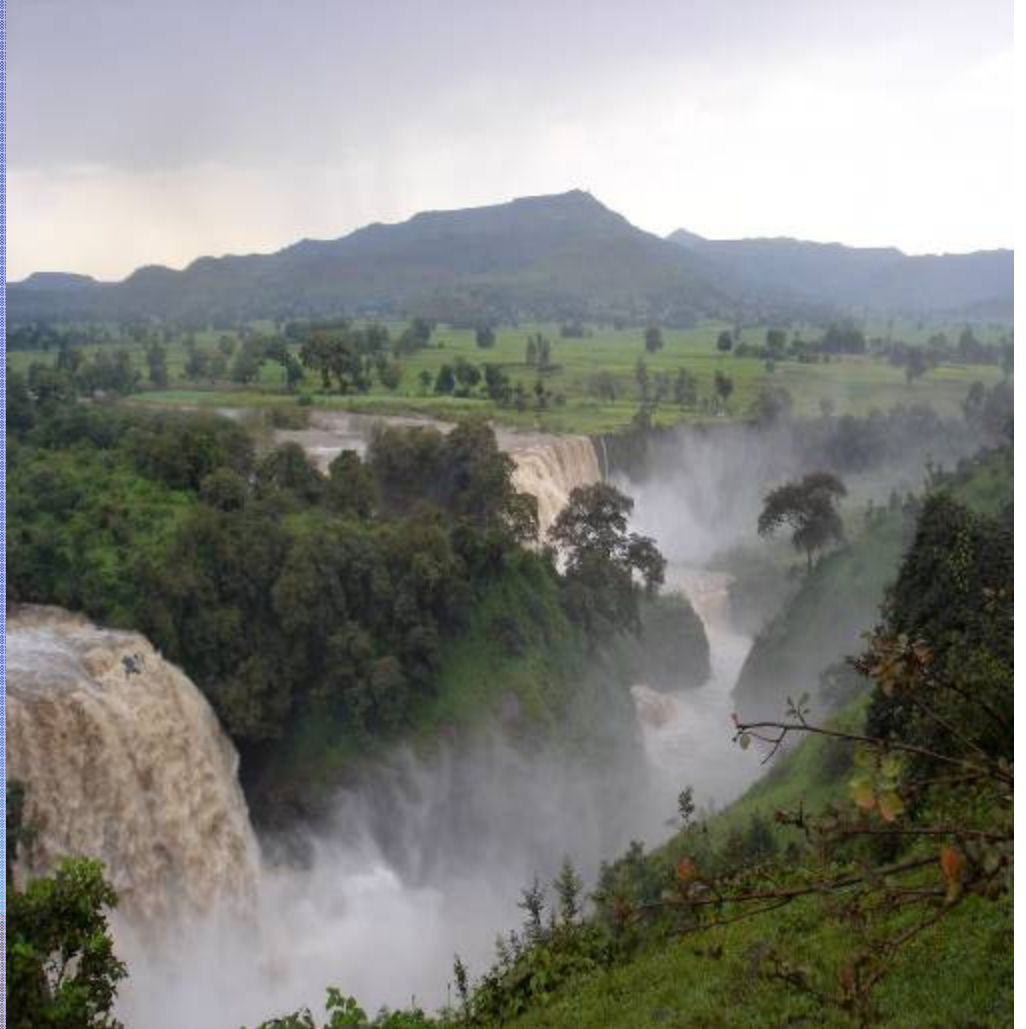


(Gete, 2007)

1.1.1997

Land Degradation ...

- Ethiopian Highlands are water Towers of Africa
- Annual surface flow from 12 major river basins is about 124 billion m³
 - 75% drains to the neighboring countries



(Slide adapted from Gete, 2007)



Blue Nile River in Ethiopia, exporting the fertile soil



problem of sedimentation
costs too much to dredge
the sediment.

Disaster

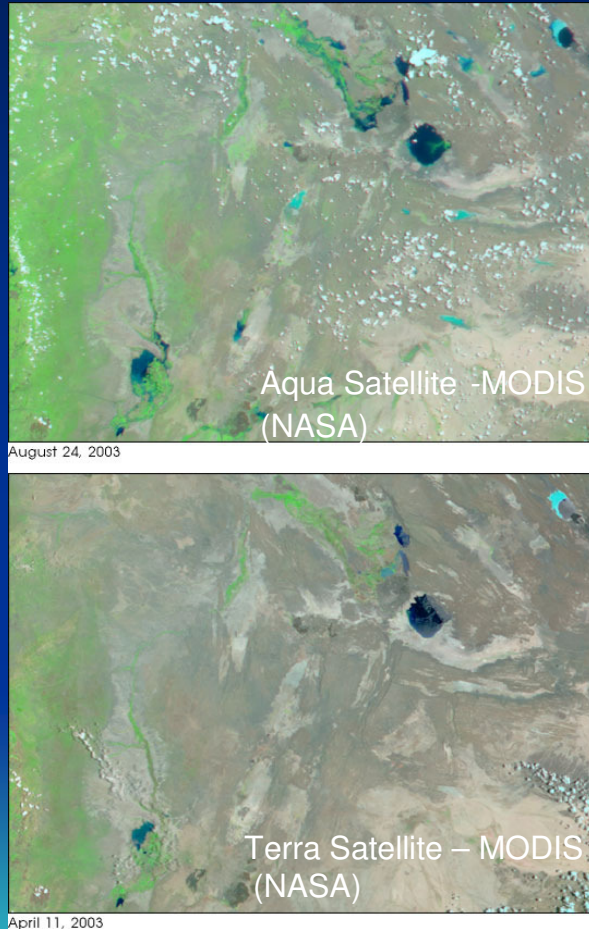


Flood events cause severe damage on human beings and properties

(Gete, 2007)

Disaster...

Flooding along the Awash River in Ethiopia

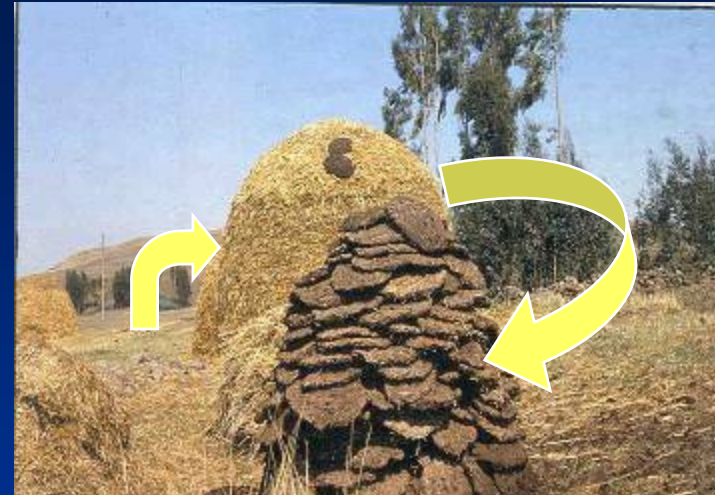


- Awash River in northeast Ethiopia flooded 19,480 sq.km. of land.
- Over 7,000 people were forced out of their homes
- hundreds of animals were swept away by the flood.

(Source: NASA Earth Observatory)

Access to Energy

- Nearly 95% HH energy in Ethiopia is generated from biomass
 - Rural - 81 % from fuel wood, 10% cow dung, 9% crop residue and the rest other sources
- This kind of removal of biomass resulted in:
 - Deterioration in soil chemical and physical properties
 - High soil loss by runoff
 - Reduction in soil productivity
 - Increase CO2 emission
 - Enhance land degradation of diff. forms
 - Desertification
 - Poor carbon sequestration
- Aggravates climate change!



(Slide adapted from Gete, 2007)

So what do we need to do?

Comply with International conventions

- UNFCCC
- UNCCD
- CBD...

Adapt to Climate Change



Ongoing Efforts on CC

- Efforts towards addressing some of the drivers of Climate Change both in Research & Development,
- Global Change Research Network for African Mountains is established in July, 2007 at Kampla, Uganda
- Establishment of high altitude observation system and research network in Ethiopia, Jan. 2008, Addis Ababa
- Some actions by continental and sub-regional organizations of Africa



Initiatives in Africa to Address Climate Change

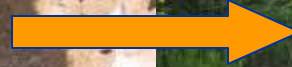
- The African Monitoring of the Environment for Sustainable Development (AMESD) is a joint AU-EU initiative to help African countries manage their natural resources by providing them with timely information on their environment
- The New Partnership for Africa's Development NEPAD environment action plan has its fifth Programme Area dedicated to combating climate change in Africa. With projects in the Agriculture, Capacity building for Observing systems Climate Change, on water and climate in the Sahel region, adaptation to climate change
- The Africa Environmental Information Network (AEIN) is a multi-stakeholder capacity building process that aims to harness and enhance access to information and knowledge to support the management of Africa's environmental resources as assets for sustainable development
- Climate Information for Africa's Development (ClimDev-Africa) is an African development programme to integrate Climate Risk Management (CRM) into pertinent policy and decision processes throughout the continent
- Special Climate Change Fund and the fund for Least Developing Countries (collectively known as the Clean Development Mechanisms) of Kyoto Protocol which will help promote conservation and encourage use of cleaner technologies



Research

- Numerous measures for mitigating the negative impacts of global change have been developed by research programmes
 - Land Management
 - Crop / livestock productivity
 - Water management
 - Protected area management
 - Biodiversity conservation and management, etc
- different kinds of land management interventions by development groups, with success.





(Gete, 2007)

Adaptation

- As our climate changes in response to rising temperatures, adaptation will be vital to reduce the impact of climate change,
- key to food security and livelihoods.

Adaptation:

- In human and natural systems,
- Technological (agricultural water management, IWRM, NRM), livelihood diversification, institutions/ governance, etc.



Adaptation...

Efforts on implementing adaptation strategies:

- Develop and/or adapt technology for alternative sources of energy – biofuels, renewable resources like solar panels, efficient cooking stoves,
- Adopting Agricultural Systems to climate change,
 - Adapting crops to changed conditions
 - Drought resistant crops for food security – e.g. Casava
- Afforestation - The Ethiopian Millennium “Two Trees for Two Thousand” campaign,
- Conservation of Wetlands,
- Soil Conservation,
- Forest Conservation – mitigate soil degradation and help manage water runoff



Adaptation...

Rainwater Harvesting



Plastic lined pond



Cylindrical tank

(Bewket, 2007)

Adaptation...



Implications for adaptation to cc:

- cheaper construction by households,
- privately owned-maintenance and management,
- food and nutrition security

Rainwater harvesting & drip irrigation

(Slide adapted from Bewket, 2007)

IWMI in CC

- International Water Management Institute (IWMI) is one of the 15 international research centers supported by the Consultative Group on International Agricultural Research (CGIAR).
- IWMI is dealing with the land and water management, in the agriculture and water sector
- Major themes:
 - Water Availability and Access
 - Productive water use
 - Water quality, Health and Environment
 - Water and Society



IWMI in CC ...

- Current projects:
 - Rethinking Water Storage for Climate Change adaptation in Sub-Saharan Africa
 - Enhancing adaptive capacity to climate change impacts through well-managed water use for aquaculture integrated with small-scale irrigation in the Chinyanja Triangle in Africa (Malawi, Mozambique and Zambia)”
 - Sustainable Management of Wetlands
 - Agriculture Water Management Solutions
 - ...



IWMI in CC...

- The goal of the project “Rethinking Water Storage for Climate change Adaptation in Sub-Saharan Africa” is to improve livelihoods and increase resilience of rural poor in SSA vulnerable to climate change risks through better water storage mechanisms, improved investments and institutional support.
- Examines various storage types and options
 - economic feasibility,
 - suitability in various physiographic and socio-political conditions,
 - distributional outcomes,
 - impacts on local livelihoods,
 - environmental consequences,
 - resilience to CC



IWMI in CC...

- we can expect increased rainfall variability and an increase in average temperatures.
 - rainfall will decline, which means there will be less water in rivers and it will take longer to recharge groundwater aquifers.
 - total precipitation may increase, but it will all fall within a shorter period of time and annual dry spells will be longer
- Higher temperatures will increase the amount of water plants require for growth.
- We need to store more water, not just for irrigation, but also for domestic, industrial and environmental uses
- an obvious response to increased climate variability due to CC is to store water in wet periods for use in dry periods

(IWMI Water Figures Newsletter, 2009).



IWMI in CC...

- Understanding how we adapt to our current state of climate variability is the key to adapting to future climates
- Water storage is one option for adaptation



Traditional stonelined artesian well, Ethiopia.

Photo Credit: Matthew McCartney

IWMI in CC...

Figure 1. Options for Adaptation

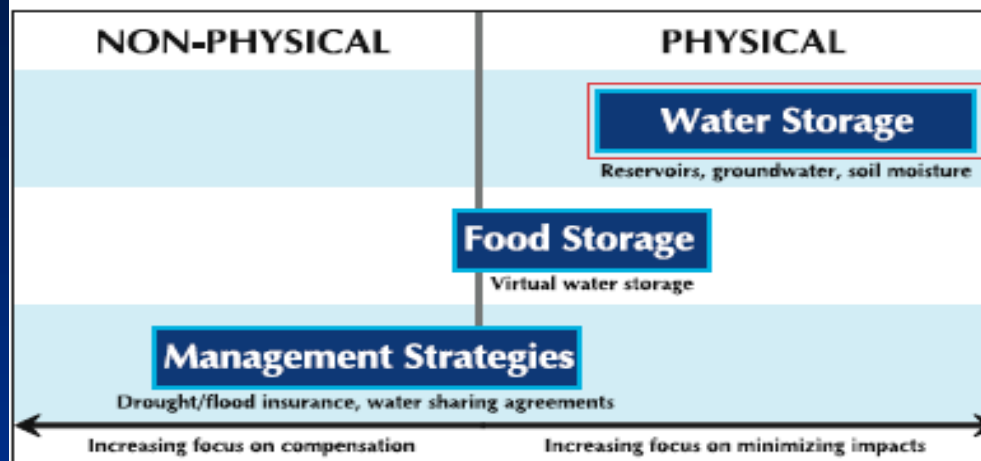
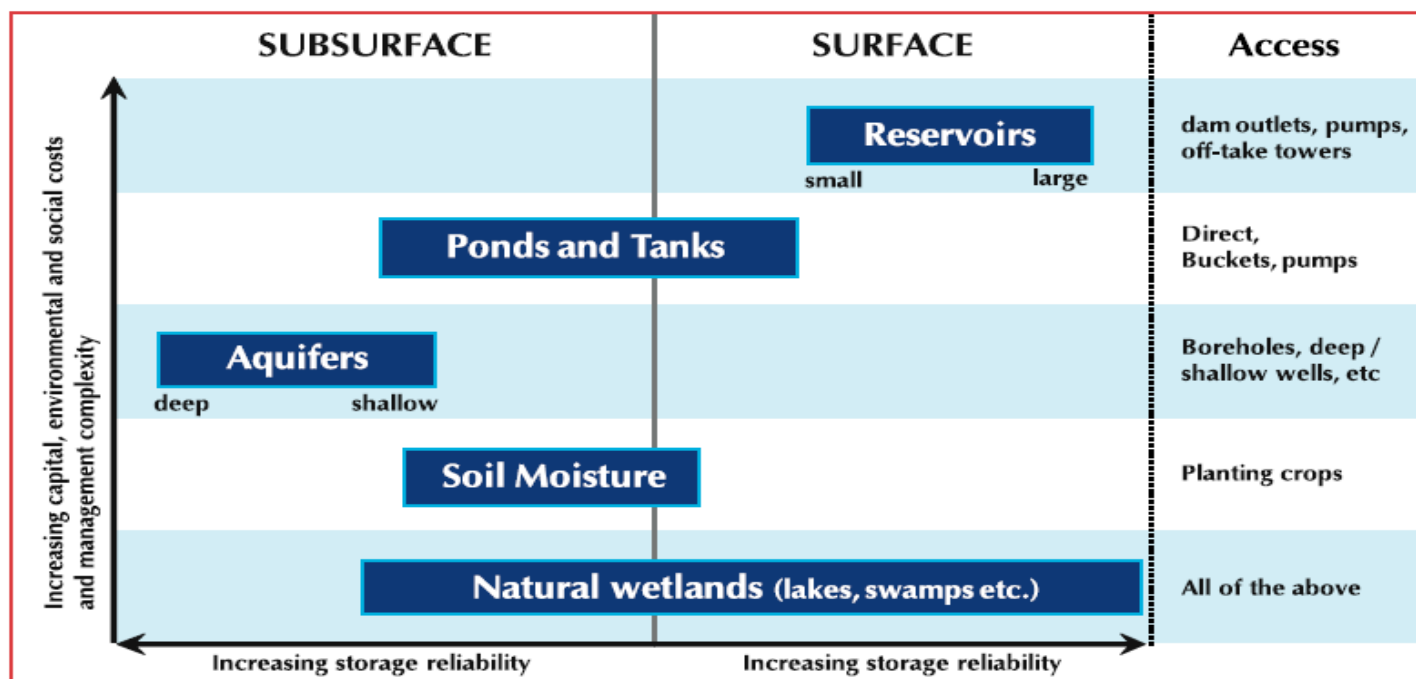


Figure 2. Water Storage Options



IWMI in CC...

- The right investments in agricultural water storage and management can significantly lessen poor people's vulnerability to climate change by reducing water related risks and creating buffers against unforeseen changes in rainfall and water availability.
- The project critically assesses different storage types in the light of CC risks, through detailed inventories, field surveys, modeling, meetings/workshops and exchanges among stakeholders.
- Simulation modeling, focused group discussions and expert interviews will be used to evaluate the technical and socio-economic resilience of storage options under different CC scenarios.
- development of guidelines for optimal storage development and investment strategies aimed at reducing poor farmers' vulnerability to climate change risks.



Conclusion

- Climate change is one more challenge to reducing poverty, hunger, disease and environmental degradation.
- With increasing extremes in rainfall patterns and rising temperatures, it is even more important to manage wetlands in a sustainable way instead of the uncontrolled exploitation of their water resources. Protecting and restoring wetlands is one of the solutions to adapt to climate change in Africa.
- Providing access to commercial fuel and efficient stoves would have highly positive impacts on human development. In developing countries, efficient cooking stoves that use clean biomass fuels are an important option.
- It is time to rethinking the best coping strategy to minimize the impact of climate change in Africa.
- Need for more research to assess the level of degradation on land and water resources, and device mitigation measures and adaptation strategies. And improve the understanding of the impacts of climate change and to make informed decisions on practical adaptation actions and measures.
- The use of space technology is inevitable and of great significance in Research & Development efforts to device adaptation strategies and to mitigate the impact of climate change.



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Thank you!

