

SCIENCE AND POLICY OF CLIMATE & CLIMATE CHANGE: A REGIONAL PERSPECTIVE

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Presentation Outline

- Introduction
- Science of Climate /Climate Change
- Climate Change Mitigation and Adaptation
- Evidence of Climate Change
- Current Situation and Trends
- Some Impacts of Climate Change
- Key Climate Change Issues
- Guiding Principles In Climate Change Debate
- Policy Recommendations for Intervention
- Opportunities
- Monitoring and Evaluation

1. Introduction

- **Climate** is the average weather conditions of a given location observed over a period of time (at least 30 years);
- **Climate** plays an important role in man's culture, how and where he lives, in health and sustaining plant and animal life. **Climate also** plays an important role in many socio-economic and environment activities since it determines the space-time distribution of the world's resources such as water, fauna, flora and many others;
- Over Millennia, man and ecosystems have adapted to particular climate conditions;
- If climate changes, the lifestyles and world's ecosystems as a whole will have to change accordingly!
- Currently, Scientific evidence points towards a discernible change in the global climate (IPCC Special Report 2018/2019);
- A **Disaster** is a serious disruption of the functioning of the society causing widespread human, material or environmental damage and losses which exceed the ability of the affected community to cope using their own resources;
- About **90%** of all natural disasters world-wide are **climate-related**; and the remaining 10% of the disasters often emanate from **geological, biological** and **technological** activities;
- A climate related disaster, like drought and floods, can reverse a country's GDP by 10-15% and slow down gains in development;
- In developing countries, about **60%** of all economic activities are weather and climate sensitive;

2.0 Science of Climate Change

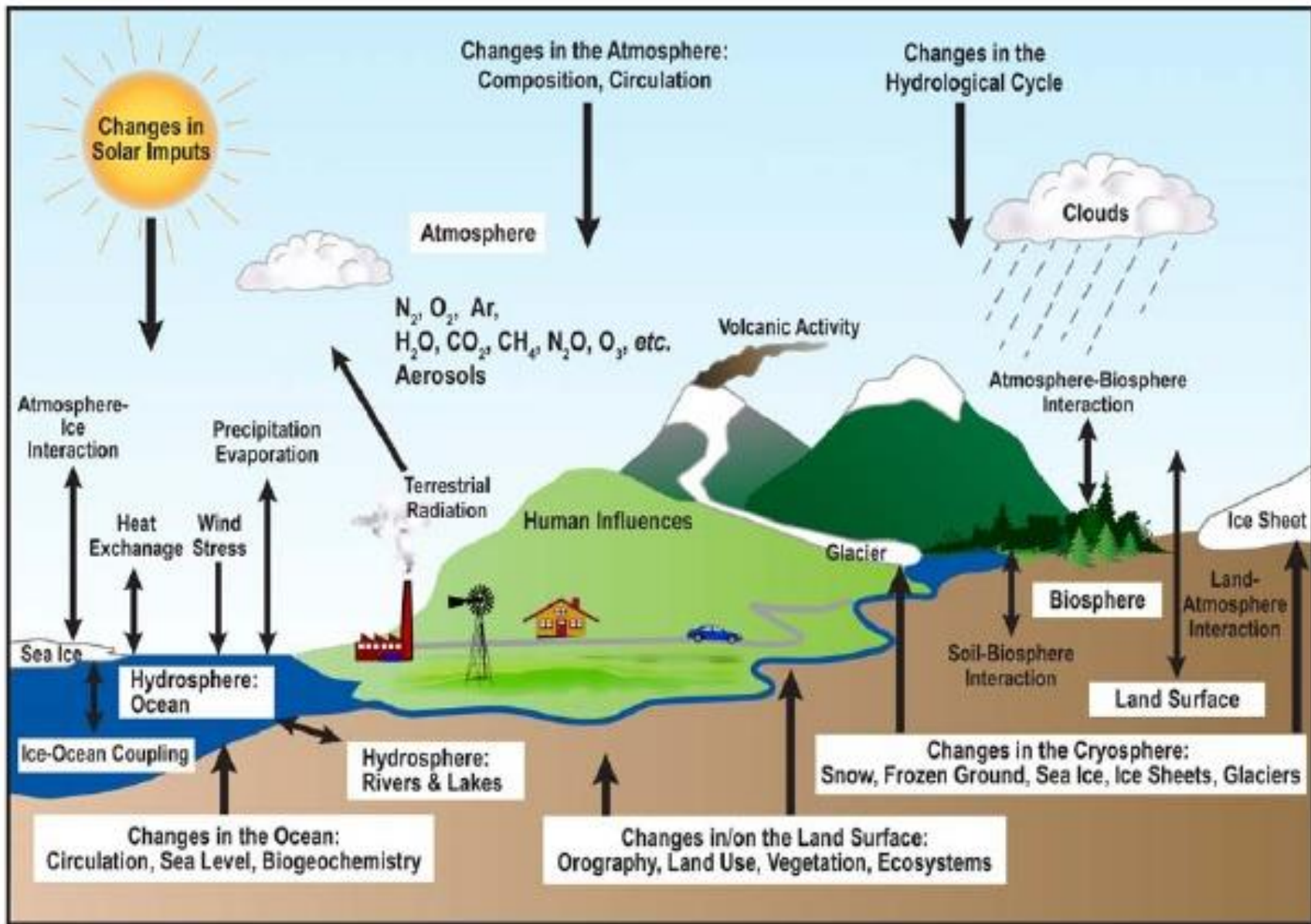
Definition:

Climate Change is a permanent shift in the traditional space-time patterns of climate, e.g. a change from one climate mode to another climate mode, which is outside the normal range of natural climate variability regardless of the causes.

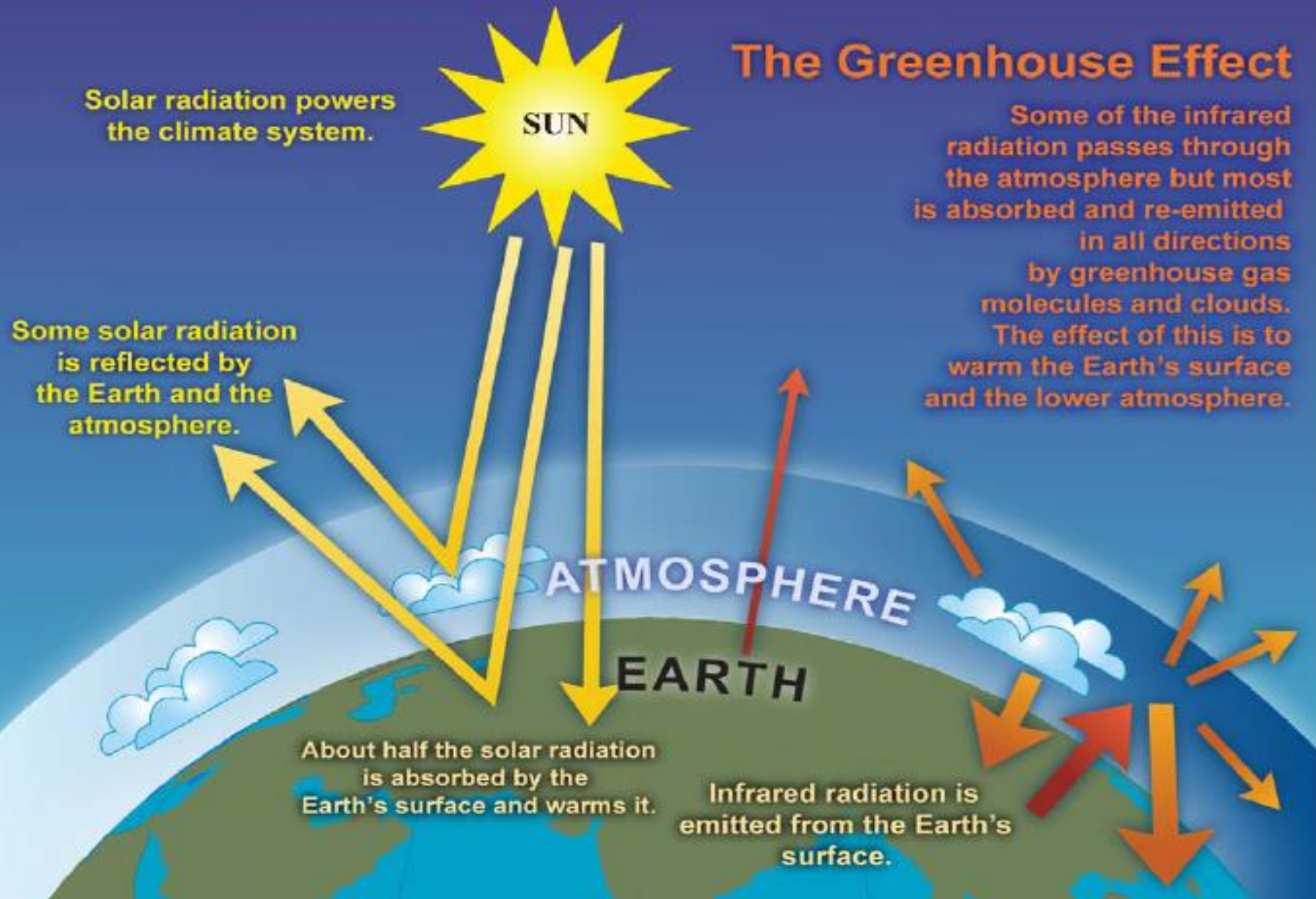
Causes of Climate Change:

- **Human activities (anthropogenic)** are dominant force responsible for most of the global warming:
 - Through changes in the greenhouse gases (GHGS): CO_2 , CH_4 , N_2O , CFCs, O_3 (tropospheric and stratospheric), H_2O ; aerosols and land use / cover changes;
 - Largest contribution of GHGS comes from the burning of fossil fuels by industrial plants and automobiles, which releases CO_2 to the atmosphere.
- GHGs affect climate by altering incoming solar and out-going infrared radiation energy balance (**‘Greenhouse effect’**).

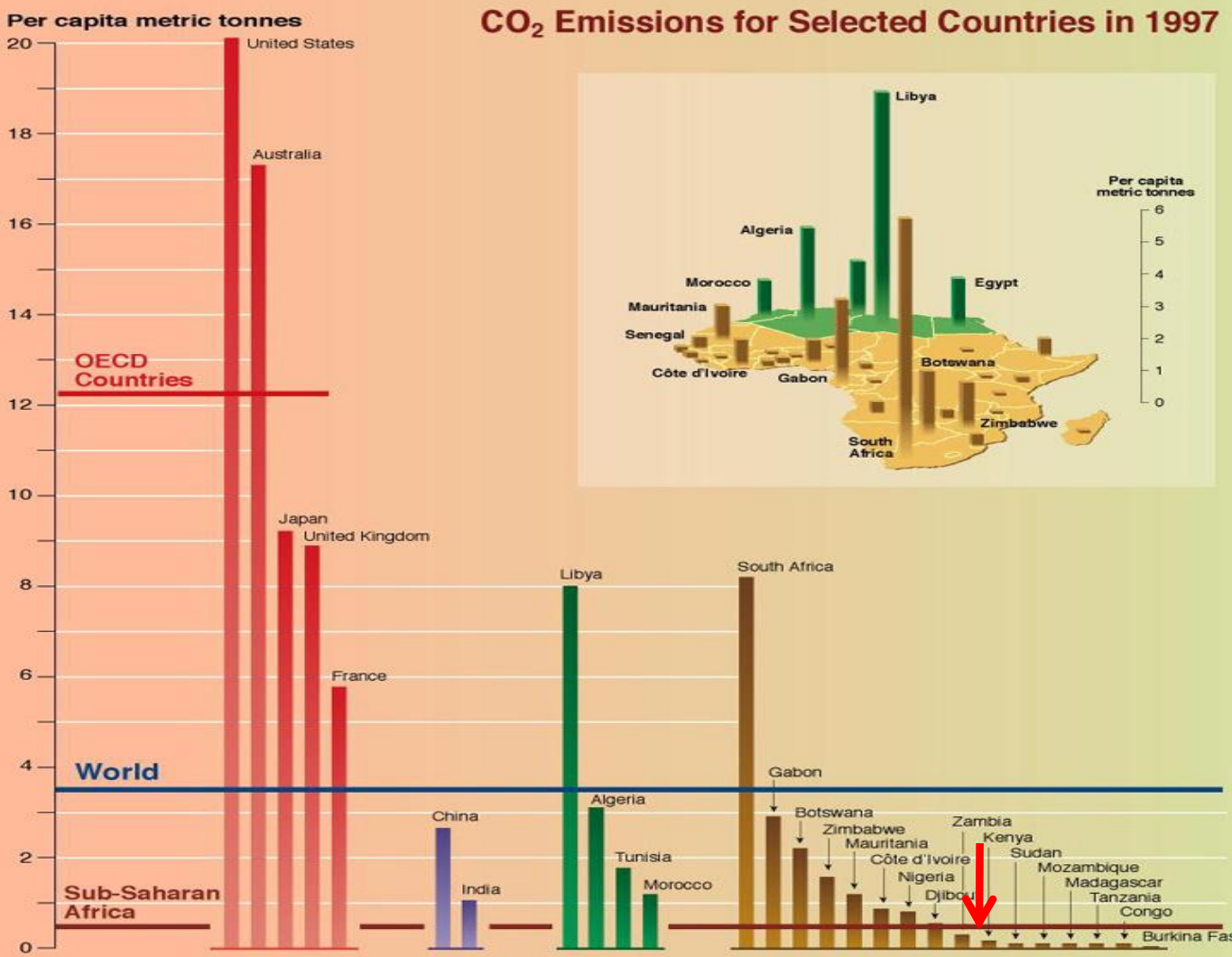
2.1 Schematic View of the Components of the Climate System, Their Processes and Interactions



2.2 Greenhouse Effect (Effect of Heat Trapping Gases)



2.3 African Emissions: African Major Sources of GHG, Emissions Per Capita, and Comparison With Emissions From Other Countries



The IPCC TAR concluded that Africa is **very vulnerable** to climate change given its low capacity to respond and adapt.

However, Africa's contribution through greenhouse gas emissions is insignificant.

When comparing the greenhouse gas emissions per capita in the typical African country with the typical European country, the Europeans emit roughly 50-100 times more, while the Americans emit 100-200 times more.



Sources: Human Development Report 2001, United Nations Development Programme (UNDP).

3.0 Climate Change Mitigation and Adaptation

Climate Change and associated disasters pose a threat to ecosystems, infrastructure and socio-economic systems, and can pose a major challenge to sustainable development;

- **Climate Change Mitigation** are strategies to reduce the emissions of GHGs from human activities, thereby reducing or completely eliminating the human-induced climate change component and slow down global warming;
- **Climate Change Adaptation** are strategies to build resilience of communities, households and systems to cope with adverse impacts of climate extremes;
- **Disaster Management** involves policy and administrative decisions and integrated operational activities, which pertain to various stages of a disaster at all levels.

4.0 Evidence of Climate Change

Global Signals of Climate Change Include the Following Features:

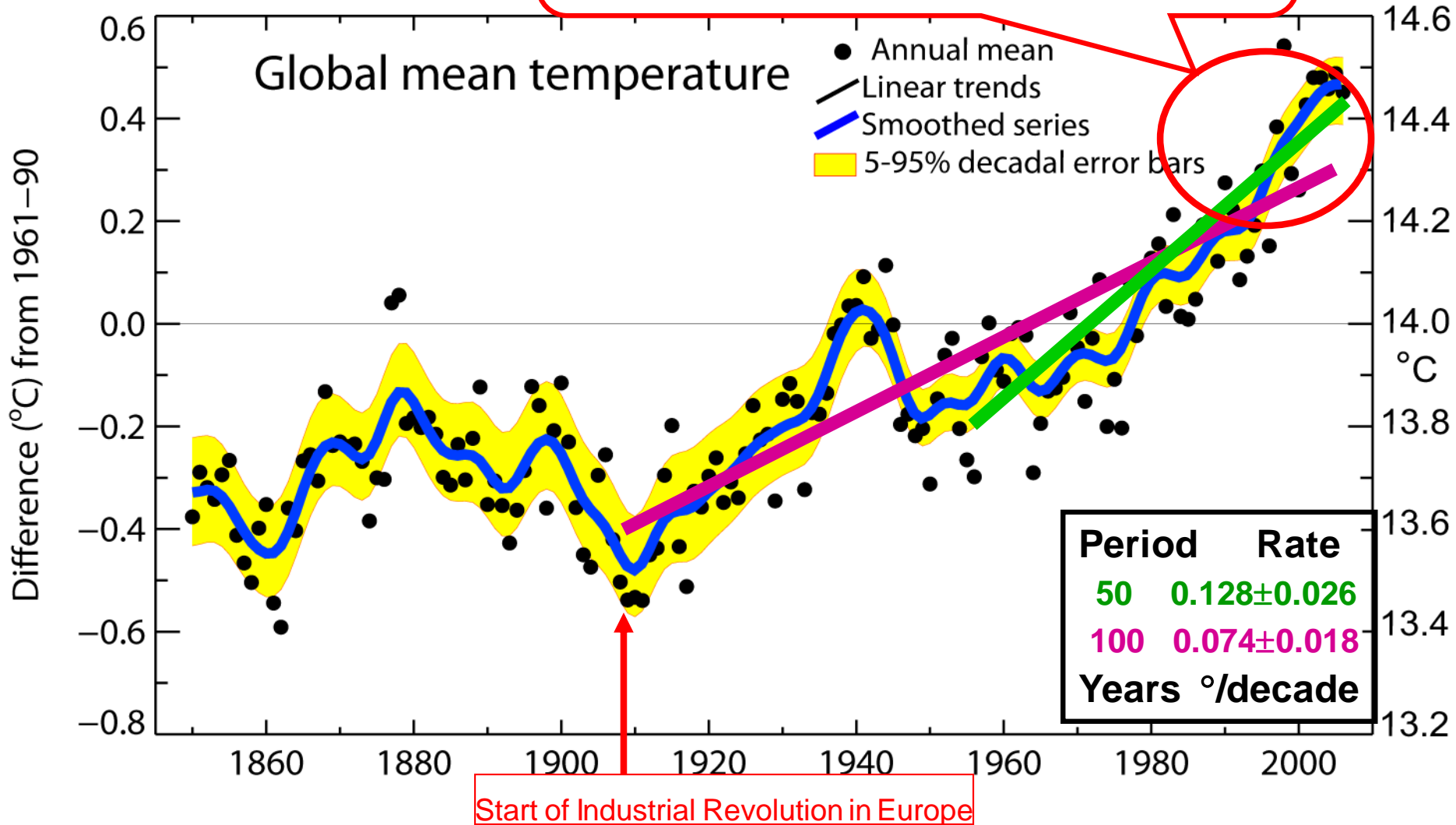
- a) Increases in global average air and ocean temperatures;
- b) Widespread melting of snow and Polar ice; and
- c) Rising global average sea level.

Local Features of Climate Change In Africa Include the Following Signals :

- Increase in maximum and minimum temperatures;
- Recession and drastic declining trends of glaciers on Mt. Kenya, Mt Kilimanjaro and Ruwenzori;
- Increased frequency and intensity of rainfall extremes (droughts, floods) causing loss of life, eco-systems and infrastructure damages associated with flooding; and economic losses due to decreases in hydro-power generation, famine and disease outbreaks;
- Sea level rise; and
- Shrinking and decline in lakes and river levels where some streams have now become seasonal;

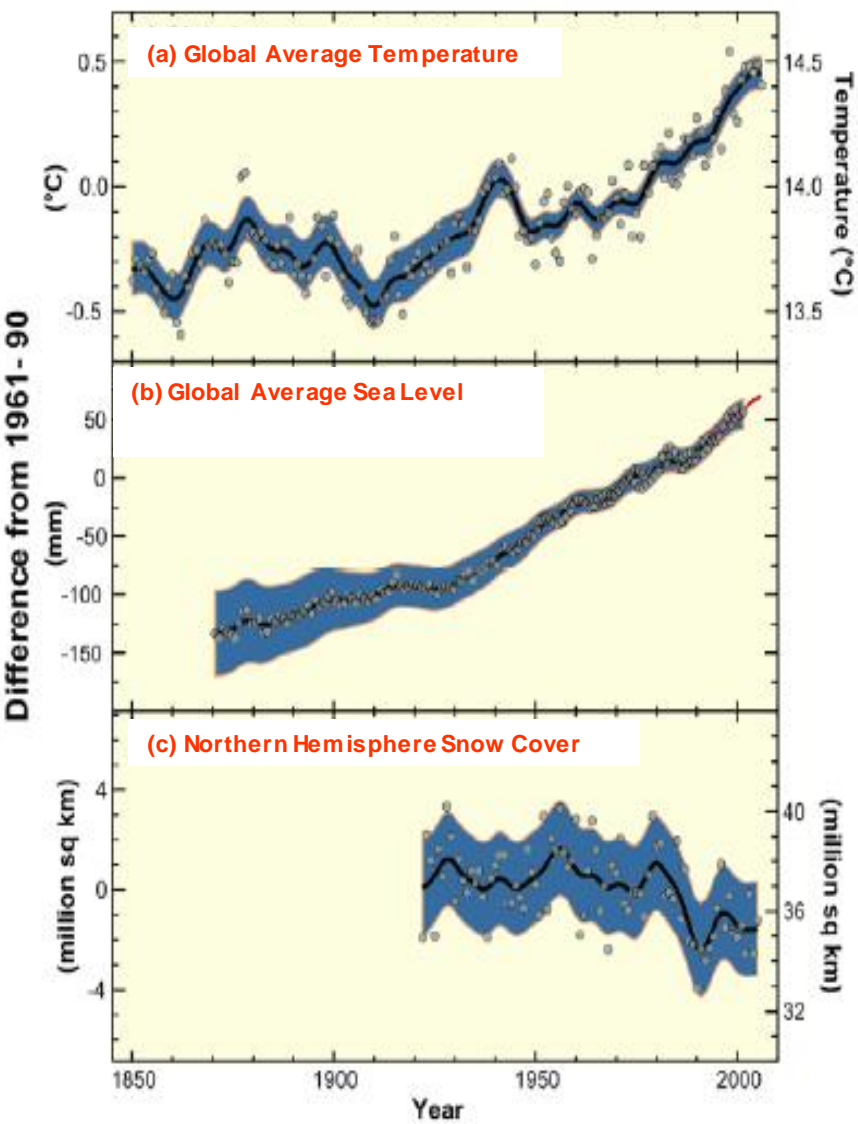
4.1 Global mean temperatures are rising faster with time

Warmest 12 years:
1998, 2005, 2003, 2002, 2004, 2006,
2001, 1997, 1995, 1999, 1990, 2000

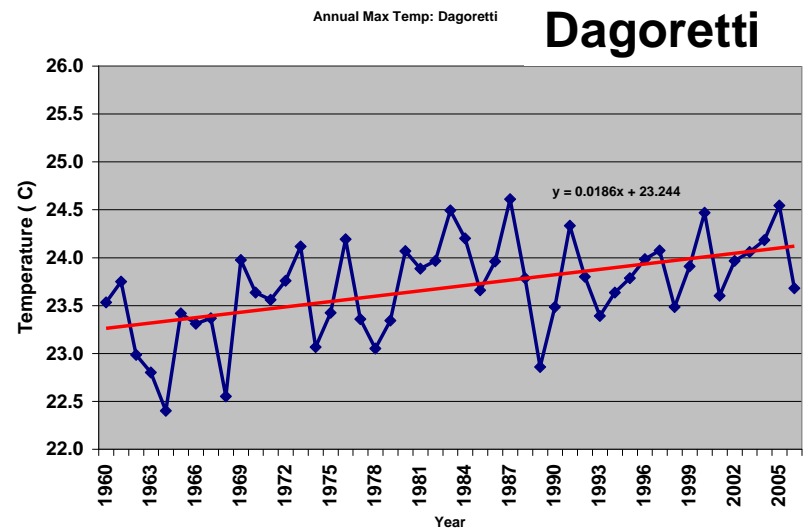
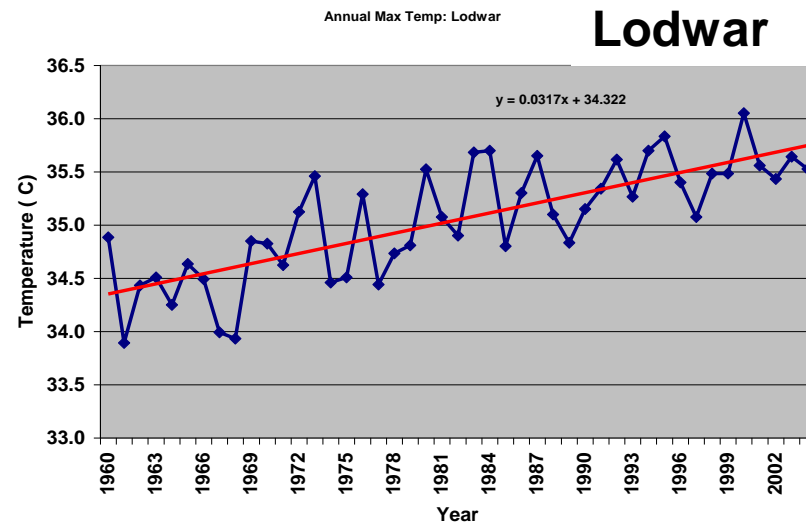


4.2 Current Situation and Trends

Global Average Trends



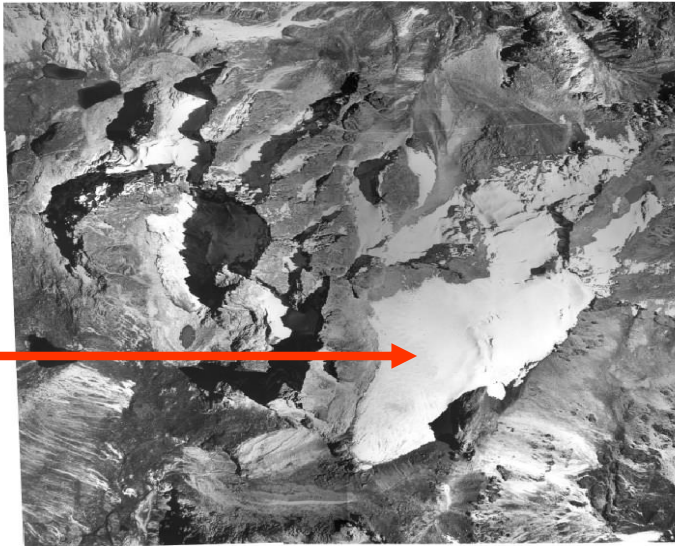
Local Max Temperature Trends



4.2.1 Current Situation and Trends: Recession of Lewis Glacier on Mt. Kenya

- The volume and extent of Mount Kenya glaciers have shown drastic declining trends in the recent times. Mount Kenya had as many as 18 glaciers at the turn of the century. Only 11 have survived to the last decade with an overall area of less than 1 KM²

1947



1993



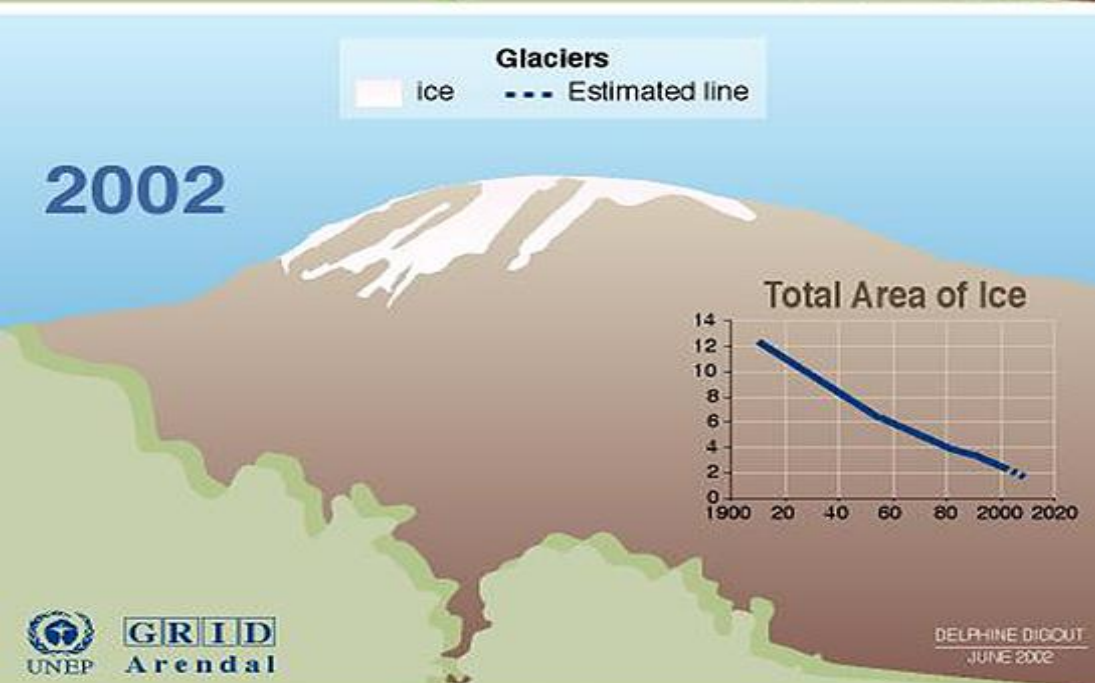
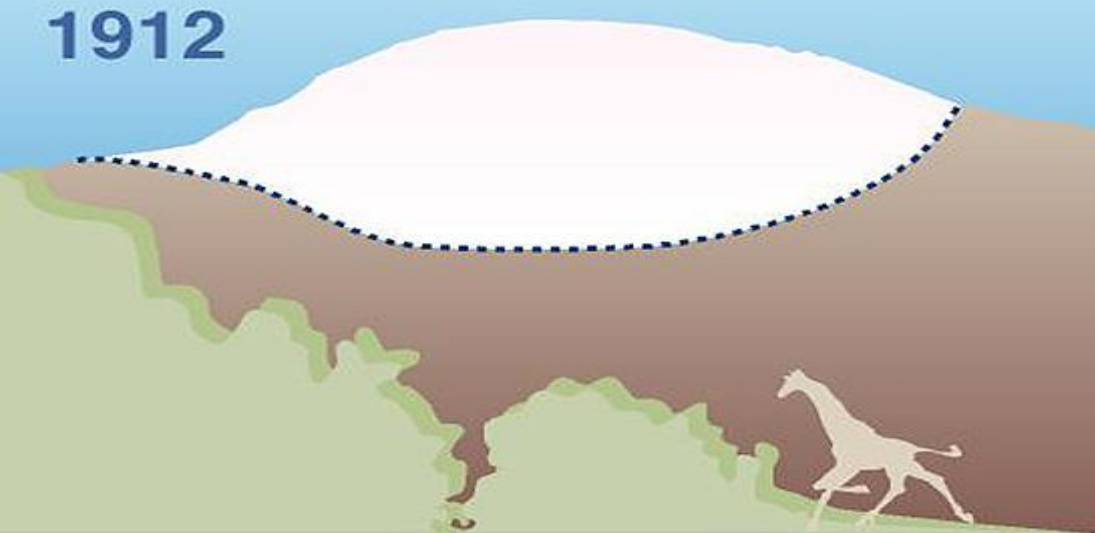
1987



2004



4.2.2 The Melting Snows of Kilimanjaro



Increasing temperatures have led to the melting of mountain glaciers on Africa's major mountains

An artist's view of the awesome snowcap of Mt. Kilimanjaro, with the peak rising 5895 meters above sea level.

The white cap of Kilimanjaro varies in size over the year, and may grow and shrink at intervals depending on solar influx, precipitation and other factors. But since 1912, there is clear evidence that the glaciers have shrunk consistently and dramatically. At the February 2001 meeting of the American Association for the Advancement of Science (AAAS), researchers reported dramatic changes in the volume of ice capping the Kibo summit of Kilimanjaro. An estimated 82% of the icecap that crowned the mountain when it was first thoroughly surveyed in 1912 is now gone, and the ice is thinning as well - by as much as a meter in one area. According to some projections, if recession continues at the present rate, the majority of the glaciers on Kilimanjaro could vanish in the next 15 years.

The main impact of regional warming is most likely on the forest belt. Regional warming has increased the vulnerability of the forest to fires. And fire occurrences are increasing on Kilimanjaro. Over one century, the forest line went down up to 500 metres in some areas.

The disappearing glaciers on Mt Kilimanjaro are among the few undisputed signs of global warming from Africa (IPCC SPM 2001). Other glaciers in Africa (Ruwenzori in Uganda and Mt Kenya) are also under similar threats.

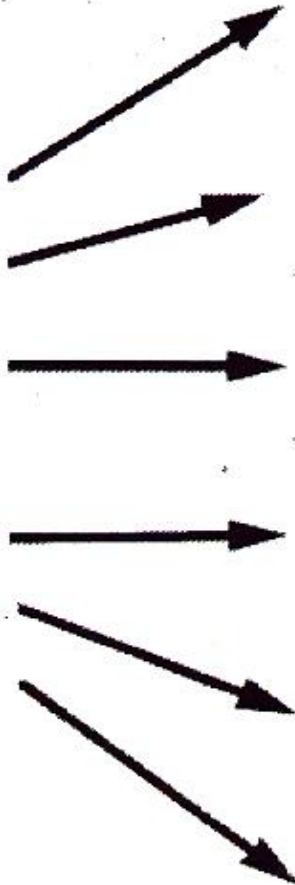
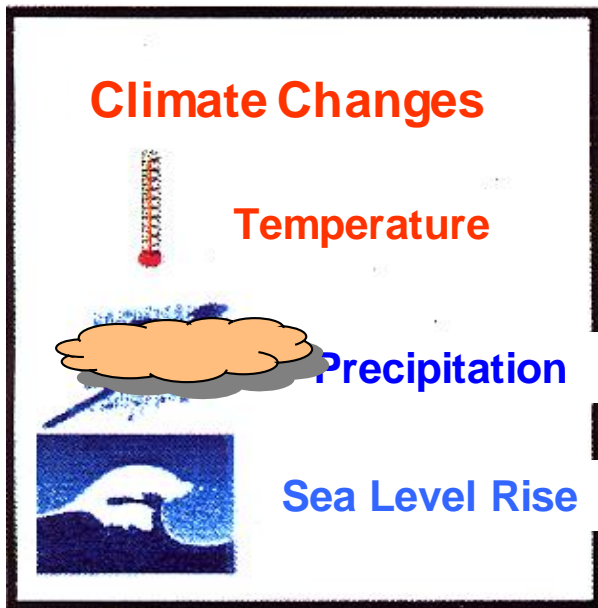
The impacts on river flows and on tourism are likely to be significant.

5.0 Projections of Future Changes in Global Climate

- A warming of about **0.2°C per decade** is projected for a range of emission scenarios for the next two decades;
- Even if the concentrations of all GHGS and aerosols had been kept constant at year 2000 levels, a further warming of about **0.1°C per decade** would be expected;
- Temperature and precipitation extremes will be **more frequent**;
- Precipitation **decreases** likely in most sub-tropical land regions and increases in high latitudes.
- **A 1 m sea-level rise** in coastal zones of many African countries with a coastline would have a big adverse impact on crops losses such as mangoes, cashew nuts and coconuts;

Attribution to climate change requires research to filter out climate variability and capture the anthropogenic contributions and other factors

6.0 Some Impacts of Climate Change



Health Impacts

Infectious Diseases
Air Quality-Respiratory Illnesses



Agricultural Impacts

Crop Yields
Irrigation Demands



Forest Impacts

Forest Composition
Geographical Range Of Forests
Forest Health And Productivity



Water Resource Impacts

Water Supply
Water Quality
Competition For Water



Impacts On Coastal Areas

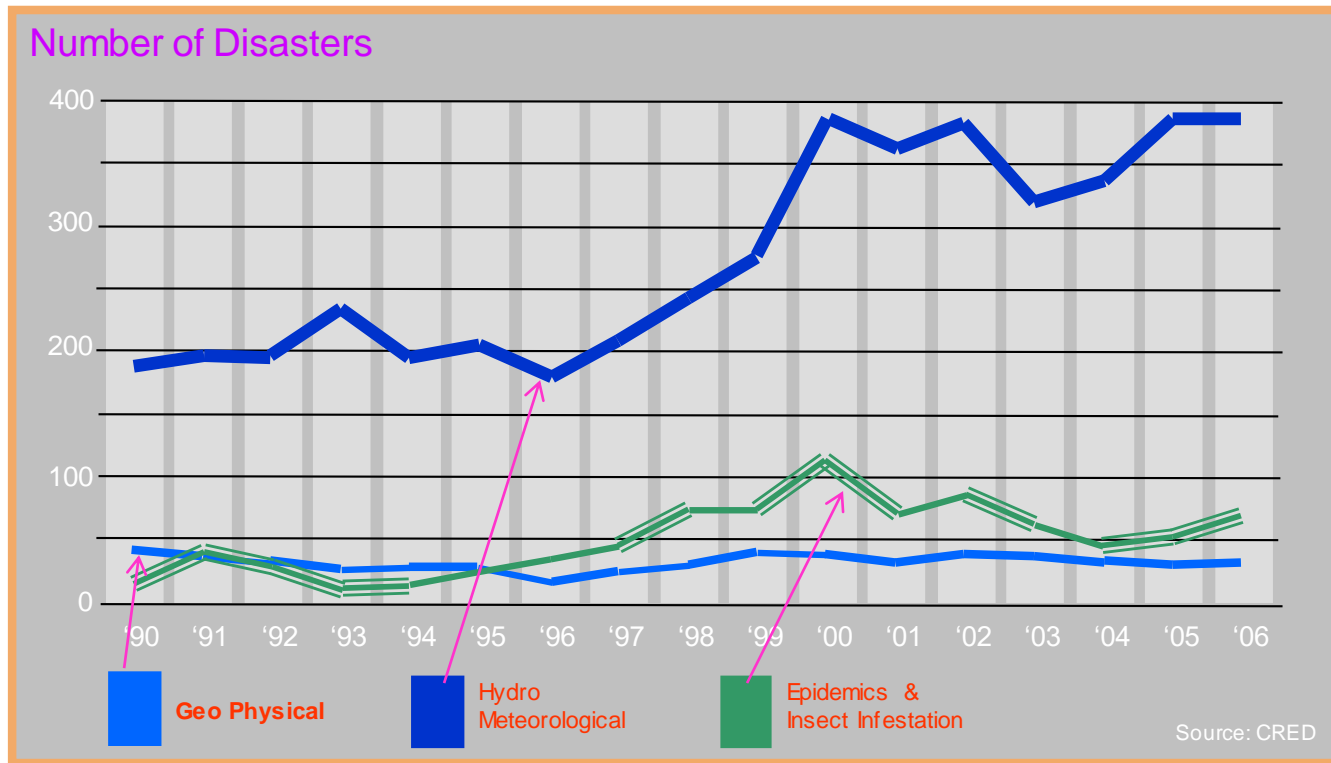
Erosion Of Beaches
Inundation Of Coastal Areas
Additional Costs To Protect Coastal Communities



Species And Natural Areas

Loss Of Habitat And Species

6.1 Global Disaster Trends: 1990 – 2006



- Most of global disasters are due to hydro-meteorological (climate-related) causes;
- The frequency and intensity of disasters have increased in the last decade.

6.2 Climate Change Signals and Their Associated Impacts In Kenya: Declining River and Lake Levels



Lake Nakuru with a burnt patch to the south-east of the declining Lake

6.3 Rise in Frequency and Intensity of Droughts and Floods



Severe Drought Causing Lack of Water for Drinking, Sanitation and Pasture



Widespread Flooding of River Nzoia Causing Logging of Agricultural Land for Crops and Loss of Life and Property

7.0 Key Climate Change Issues

Africa is very vulnerable to the impacts of Climate Change because of factors such as:

- *widespread poverty;*
- *frequent and recurrent droughts in Eastern, Southern Africa and Sahel;*
- *inequitable distribution of resources;*
- *land use / cover change; and*
- *overdependence on rain-fed agriculture.*

Key Issues In Climate Change that Require Policy Enactment

- National inventories of greenhouse gas sources and sinks;
- Climate Change Mitigation;
- Climate Change Adaptation;
- Vulnerability to Climate Change;
- Research and Systematic Observations and Monitoring;
- Public Education and Awareness Raising;
- Public Involvement and Participation;
- Climate Information Gathering and Dissemination; Including Indigenous / Traditional Knowledge and Endogenous Technologies;
- Private Sector Participation and Technology Transfer;
- Economic and Financial Incentives for Environmentally Sound Technologies;
- Regional and International Cooperation.

7.1 Guiding Principles In Climate Change Debate

- a) Principles of Integration;
- b) The principle of public participation and inclusiveness;
- c) The principle of legitimacy, ethical, social, and cultural;
- d) The principle of intra and inter generational equity especially with regard to accessing resources;
- e) The principle of regional and international cooperation;
- f) The principles of environmental justice;
- g) The pre-cautionary principle;
- h) The polluter-pays principle;
- i) The principle of good governance;
- j) The principle of environmental standard setting;
- k) The principles of preventive action;
- l) The principle of environmental off-setting;
- m) The principle of common but differentiated responsibilities.

8.0 Policy Recommendations For Intervention

Development of Climate Change adaptation, mitigation strategies and operational plans which support investment in areas that adapt Climate Change under Vision 2030 for sustainable Development. The following issues are relevant:

- a) Undertake National **inventories** of greenhouse gas sources and sinks;
- b) Formulate and enforce Climate Change **mitigation** measures;
- c) Mainstream Climate Change **adaptation** strategies into National Planning and Programmes;
- d) Assess the **impacts** and **vulnerability** to Climate Change and build resilience for communities and ecosystems to cope to Climate Change;
- e) **Research and Development** (R&D) in Climate Change and Disaster Management to understand and develop scenarios that are likely to impact on socio-economic systems;
- f) Sustain **systematic observations** for monitoring, early warnings and attribution.

8.0 Policy Recommendations (Cont'..)

- g) Enhance **public education and awareness** raising in Climate Change and disaster management with a view to facilitate effective involvement, participation, and increase capacity to adapt ;
- h) Enhance Climate Change and disaster management systems for information gathering and dissemination;
- i) Document, adopt and adapt **indigenous / traditional knowledge** and endogenous technologies relevant to Climate Change and Disaster Risk Reduction with a view to increasing adaptive capacity at community and household levels;
- j) Promote direct investments as well as public-private sector partnerships for participation in **environmentally sound technologies**, through for instance economic and financial incentives;
- k) Foster effective participation in **regional and international cooperation** in Climate Change and Disaster Management Agenda;
- l) Foster political support in mainstreaming of climate Change and disaster management in national development planning.

8.1 Policy Requirement on Climate Change Integrated Planning and Economics

- **Payment For Ecosystem Services:** Policies should be enacted to encourage payment for ecosystem services such as medicinal plants and biodiversity;
- **Pricing of Natural Resources:** Policies should be enacted in pricing of natural resources like trees which act as carbon sinks, e.g. absorption of CO₂ by trees;
- **Carbon Foot Prints:** Policies should be enacted to promote Carbon Foot Prints for quantification of carbon emission and costing by those who travel;
- **Mass Transport:** Policies should be designed and enacted to promote mass transport as a mechanism for reducing CO₂ vehicular emissions;
- **Incentives and Disincentives:** are necessary for *CDM projects, Carbon Foot Prints, and Mass Transport*
- **Mainstreaming** Climate Change and disaster mitigation into National Planning and Programmes;
- **Gender and youth** disaggregated climate services
- **Economic Forecasts** should incorporate Climate Forecasts;
- Develop **economic indicators of weather and climate** to enable monitoring of short and long term development strategies.

8.2 Policy on Education, Public Awareness and Participation

- Incorporate Climate Change and Disaster Management into Curriculum Development for environment education at all levels;
- Improve the concept of Awareness Raising and Public Participation in environmental matters including early warning;
- Institutional linkages and synergies required to maximize utilization of resources.

9.0 Opportunities for Climate Change Adaptation

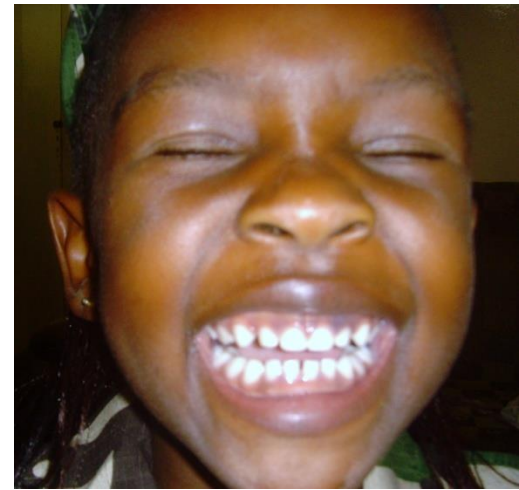
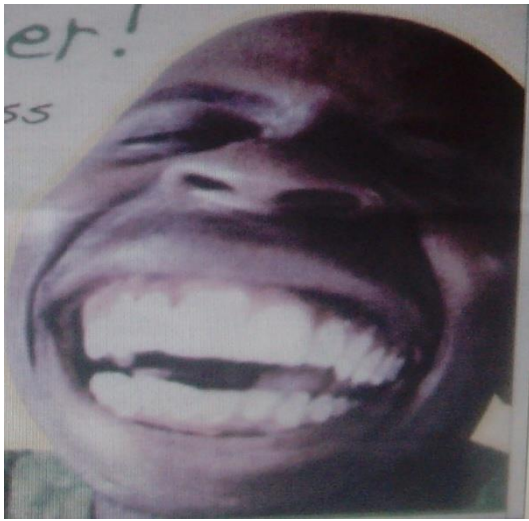
- Under the **Paris Agreement on Climate Change (2015)**, countries can access resources from Global Climate Fund (GCF), World Bank, African Development Bank (AfDB) and Development Partners, etc for adaptation and resilient building projects.
- Through the UNFCCC **Article 4.7**, a country can also access **International Adaptation funding** (e.g. GEF) to do:
 - GHGs inventory;
 - Technology development, transfer and diffusion;
 - Capacity building (response and adaptation to climate change);
 - Research and Systematic observation;
 - Training Education and Public Awareness.
 - National Climate Change Coordination Activities Committee: (NCCCCAC): Formulation, coordination, and provision of guidance to Climate Change
 - Sendai Framework of Action (2015 – 2030) on Disaster Risk Reduction (DRR)

RESILIENCE BUILDING:

Finance, Capacity and Technology transfer

10.0 Monitoring and Evaluation

- Technical tools for monitoring the trends in Climate Change and associated disasters;
- Development of benchmarks for monitoring and evaluation in the implementation of the policies;
- Institutional arrangements responsible for monitoring and evaluation.



END
Be Happy !!!
And
Thanks
For
Your Kind Attention