

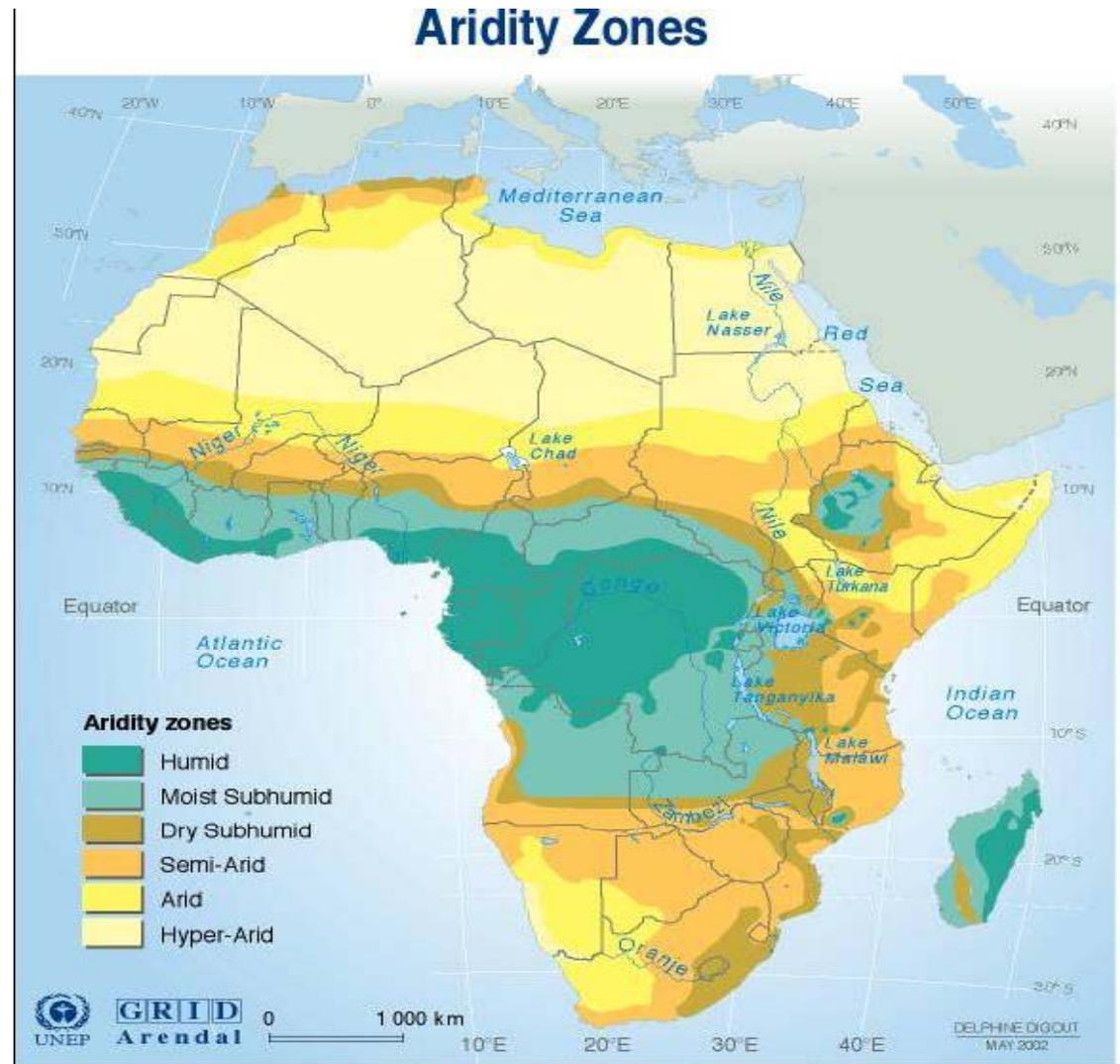
Challenges of WRM in Africa

Francis Mutua
University of Nairobi
Kenya

Renewable water resources and water availability by continents

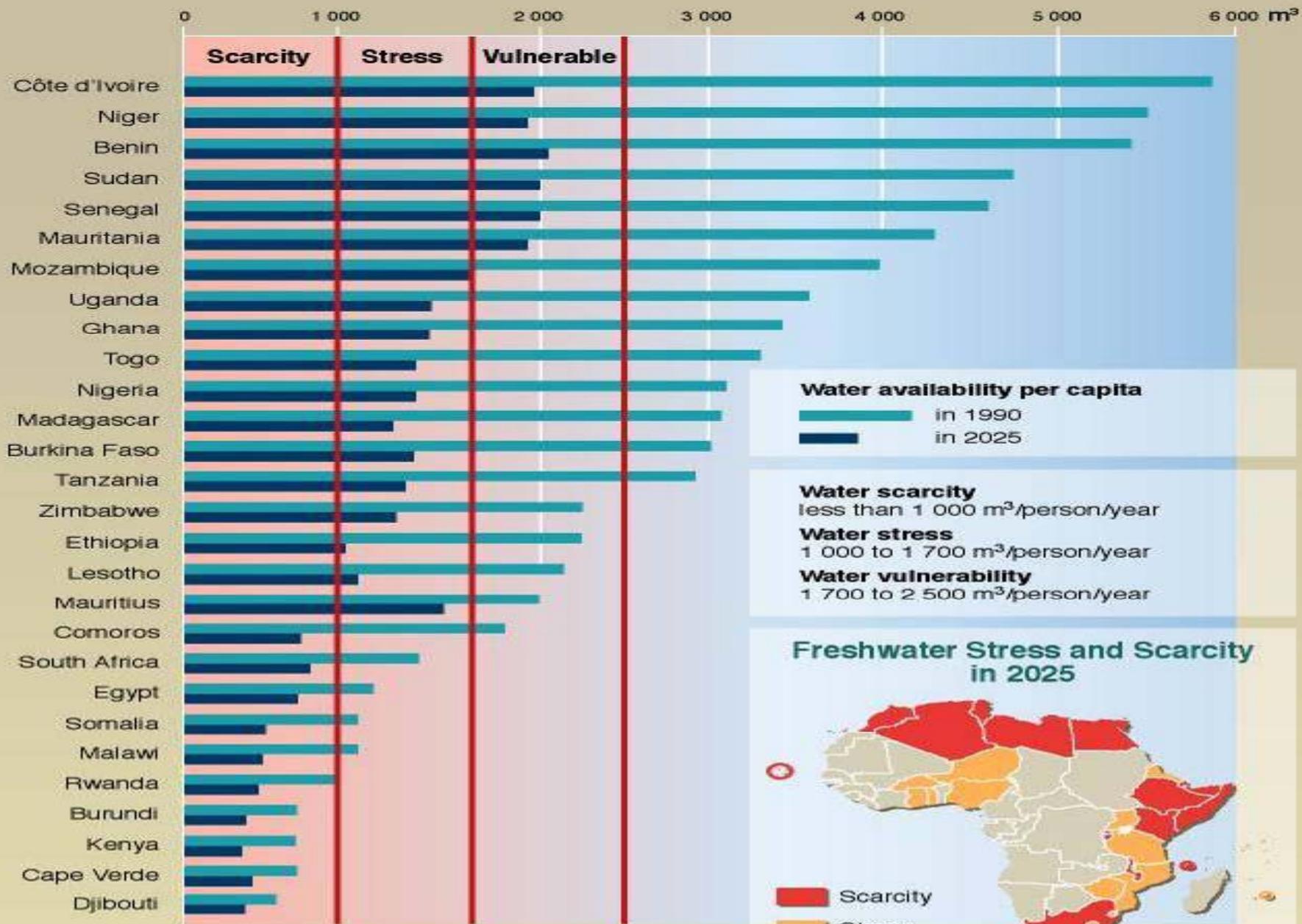
Continent	Area, 10 ⁶ km ²	Population x10 ⁶	Water resources, km ³ /yr		Potential water availability x10 ³ m ³ /yr
			Mean	Spatial C _v	per capita
Europe	10.46	685	2900	0.08	4.23
North America	24.3	453	7890	0.06	17.4
Africa	30.1	708	4050	0.10	5.72
Asia	43.5	3445	13510	0.06	3.92
South America	17.9	315	12030	0.07	38.2
Australia and Oceania	8.95	28.7	2404	0.10	83.7
The World	135	5633	42785	0.02	7.60

Extreme spatial and temporal variability of climate and WR

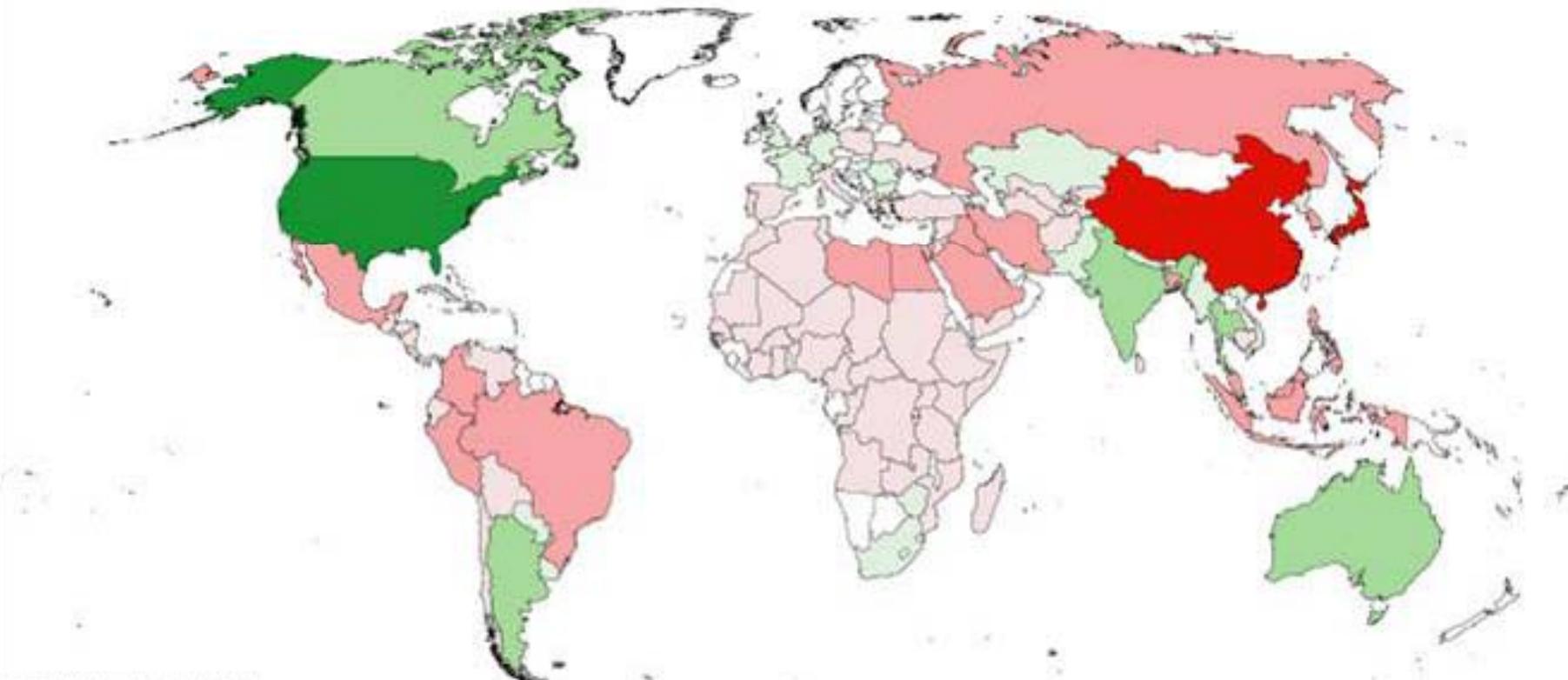


Source: World Meteorological Organization (WMO), United Nations Environment Programme (UNEP), *Climate Change 2001: Impacts, Adaptation, and Vulnerability*, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

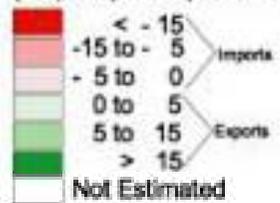
Water Availability



Virtual Water Flows



Virtual Water Flows (1995)
(Crop evapotranspiration equivalent in cubic kilometers)



Natural Challenges and threats of WR in Africa

- Among the “natural” threats are:
 - multiplicity of trans-boundary water basins;
 - Poor transboundary initiatives for sharing WR
 - Nationally (Nile, Niger, Orange, etc)
 - regionally
 - extreme spatial and temporal variability of climate and rainfall → WR, coupled with climate change;
 - High spatial variability of the water resources
 - growing water scarcity,
 - shrinking of some water bodies, and desertification.
 - Unbalanced water trading opportunities
 - Promotes drive to share drops and not benefits

Human Related Threats

- On the other hand, the human threats include:
 - inappropriate governance and institutional arrangements in managing national and transnational water basins;
 - depletion of water resources through pollution,
 - Environmental protection and “development”;
 - unsustainable financing of investments in water supply and sanitation;
 - population pressure;
 - Political misalignment
 - unwillingness to share
 - high incidences of conflicts in most countries on the continent.
 - Poverty
 - Unwillingness to live with risks
 - Poor technologies & over-reliance on rain-fed systems
 - Customs and traditions
 - Many players, no referee
 - Poor monitoring networks (calibration of satellite data)
- All these provide good opportunities for change (natural or anthropogenic) to be very destructive

Floods vulnerability



Flood vulnerability

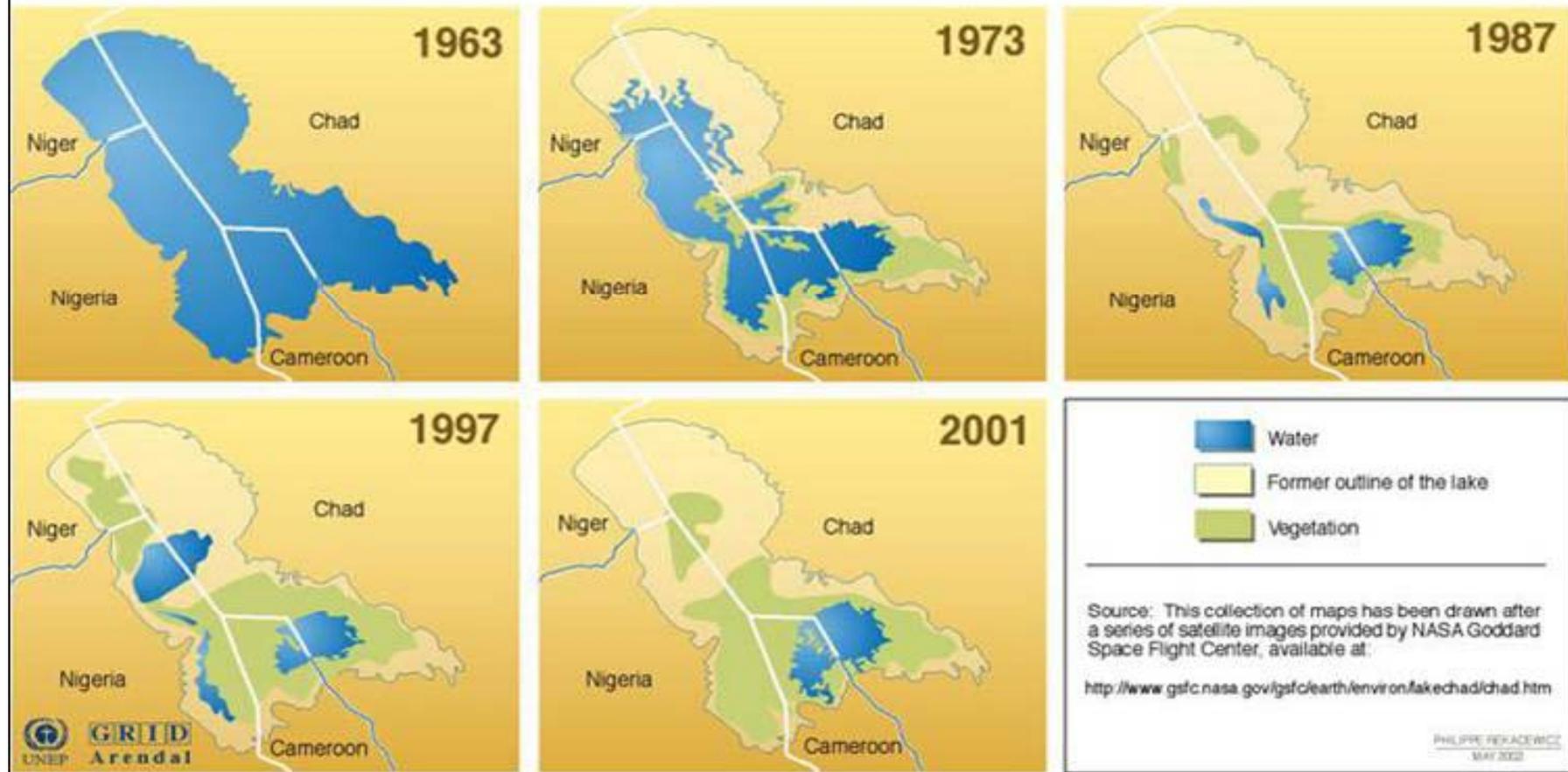


Drought Vulnerability

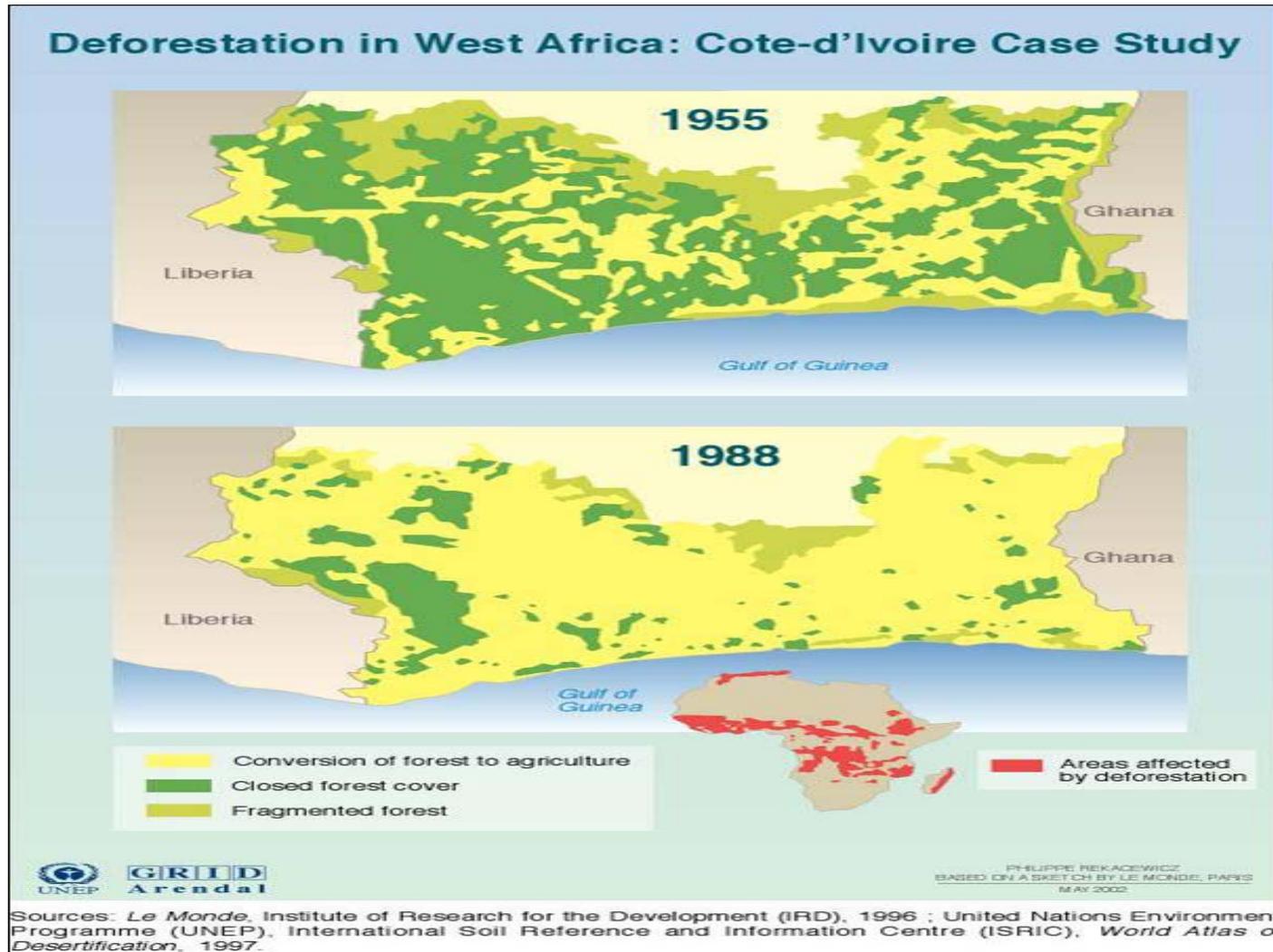


Shrinking Water Bodies

The Disappearance of Lake Chad in Africa



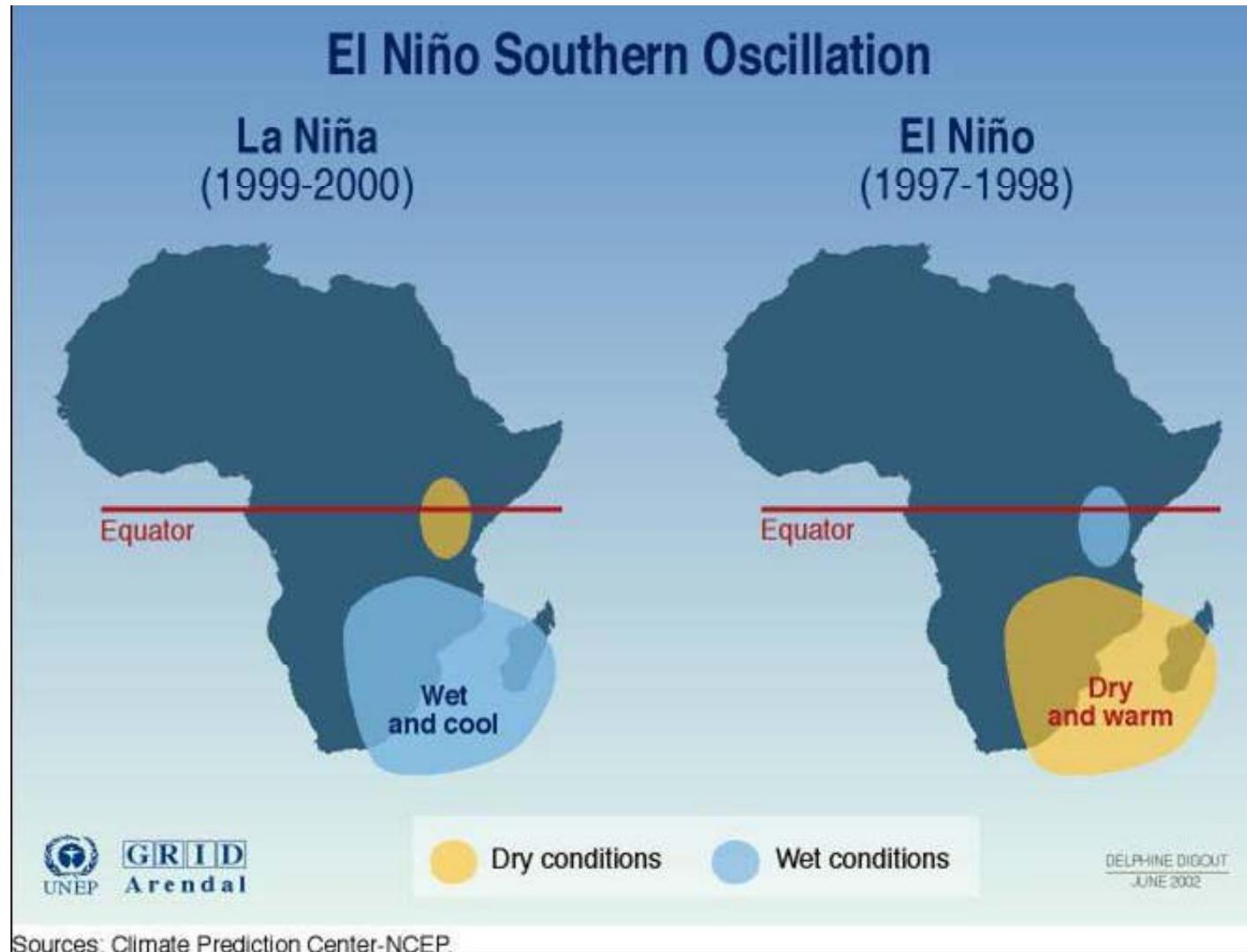
Environmental Degradation and Desertification



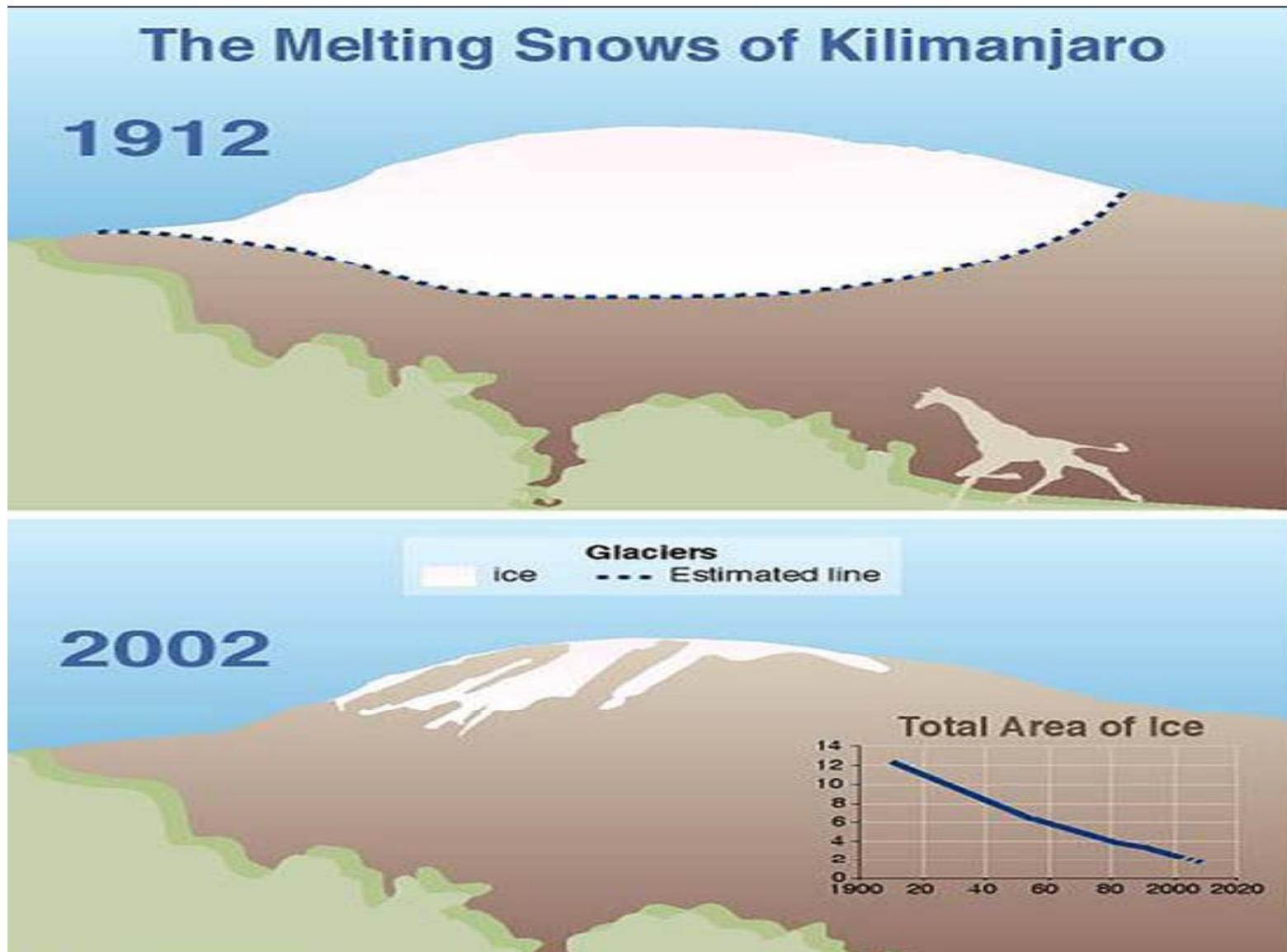
Maintaining old WRM strategies when change is intensifying

EXISTING	
<ul style="list-style-type: none"> • Drought and floods • Cyclones and windstorms 	<p>Sectors (production systems)</p> <ul style="list-style-type: none"> • Agricultural • Livestock • Trade and industry • Transportation and mobility • Population (poverty, economy) • Conflicts
HAZARDS	VULNERABILITY
<ul style="list-style-type: none"> • Climate Change <ul style="list-style-type: none"> • Pollution (air and water) • Allergens • U.V. radiation • Desertification • Small scale hazards: go unnoticed at national level but have high impacts at local level (flash floods, hailstorms, frost lightning, etc) • Weather related transportation accidents (in the context of rapid urbanization with increasing population) • Landslides due to changing rainfall patterns and migration to sloping areas 	<ul style="list-style-type: none"> • Food security <ul style="list-style-type: none"> • Food prod • Accessibility • Availability • Political stability • Conflicts • Those who lack knowledge of environmental conservation • Rain-fed agriculture • Soil fertility • Pastoral farmers (mobility) • Water availability • Bio-diversity
EMERGING	

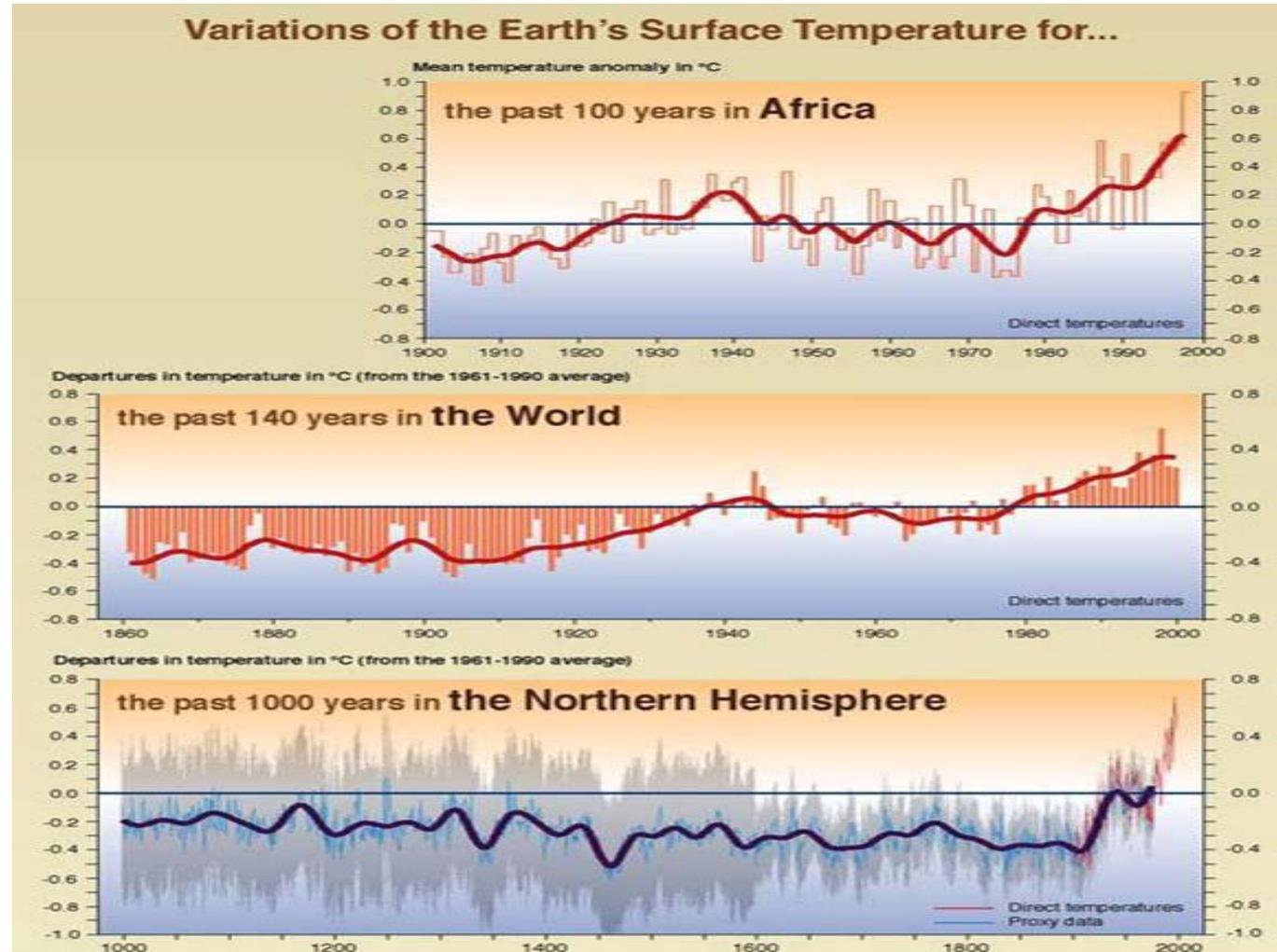
Change drivers may not be local



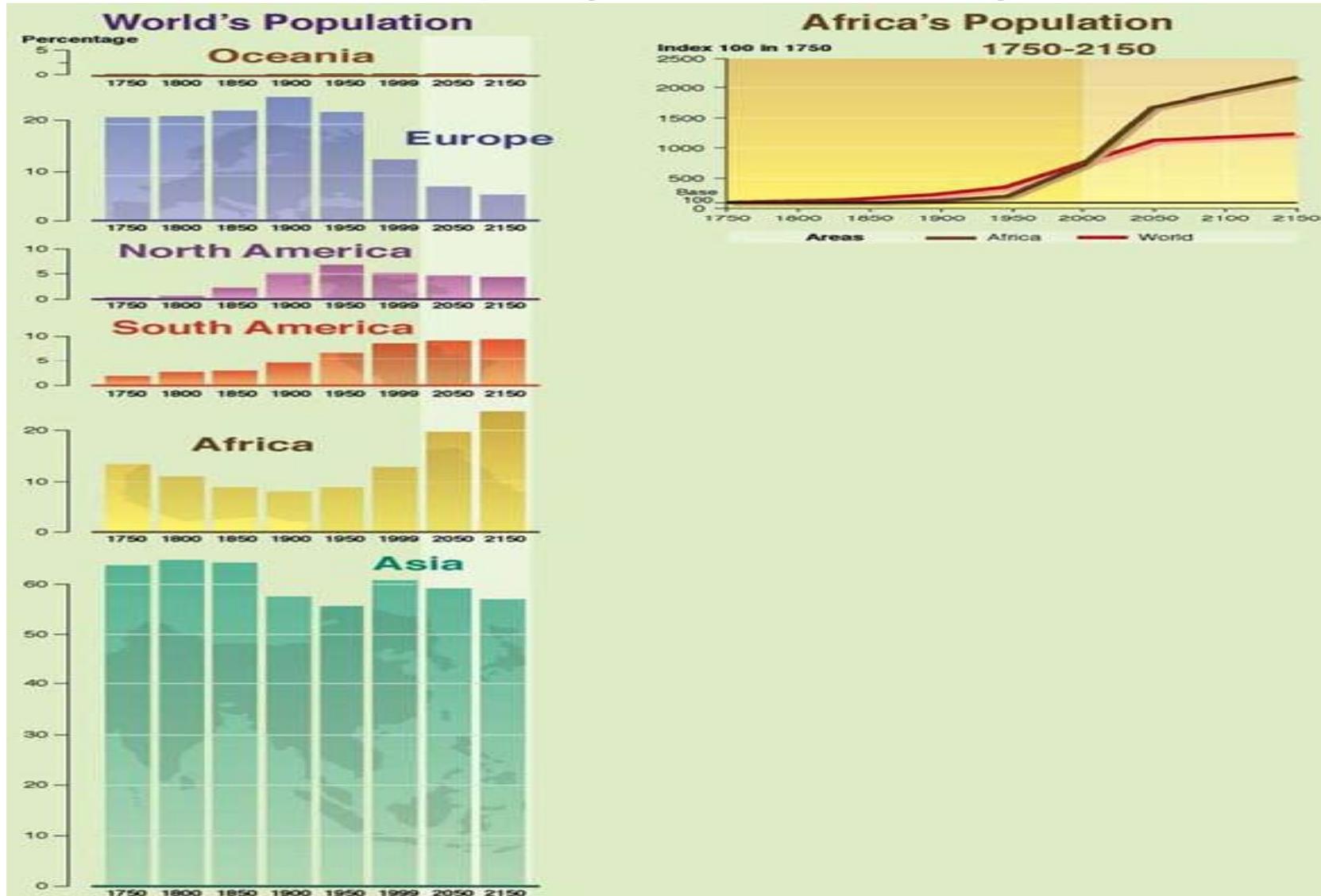
The change drivers may not be local



Climate change signal is highest in Africa



Natural change is reinforced by anthropogenic change



Climate Change Vulnerability in Africa



The vulnerabilities

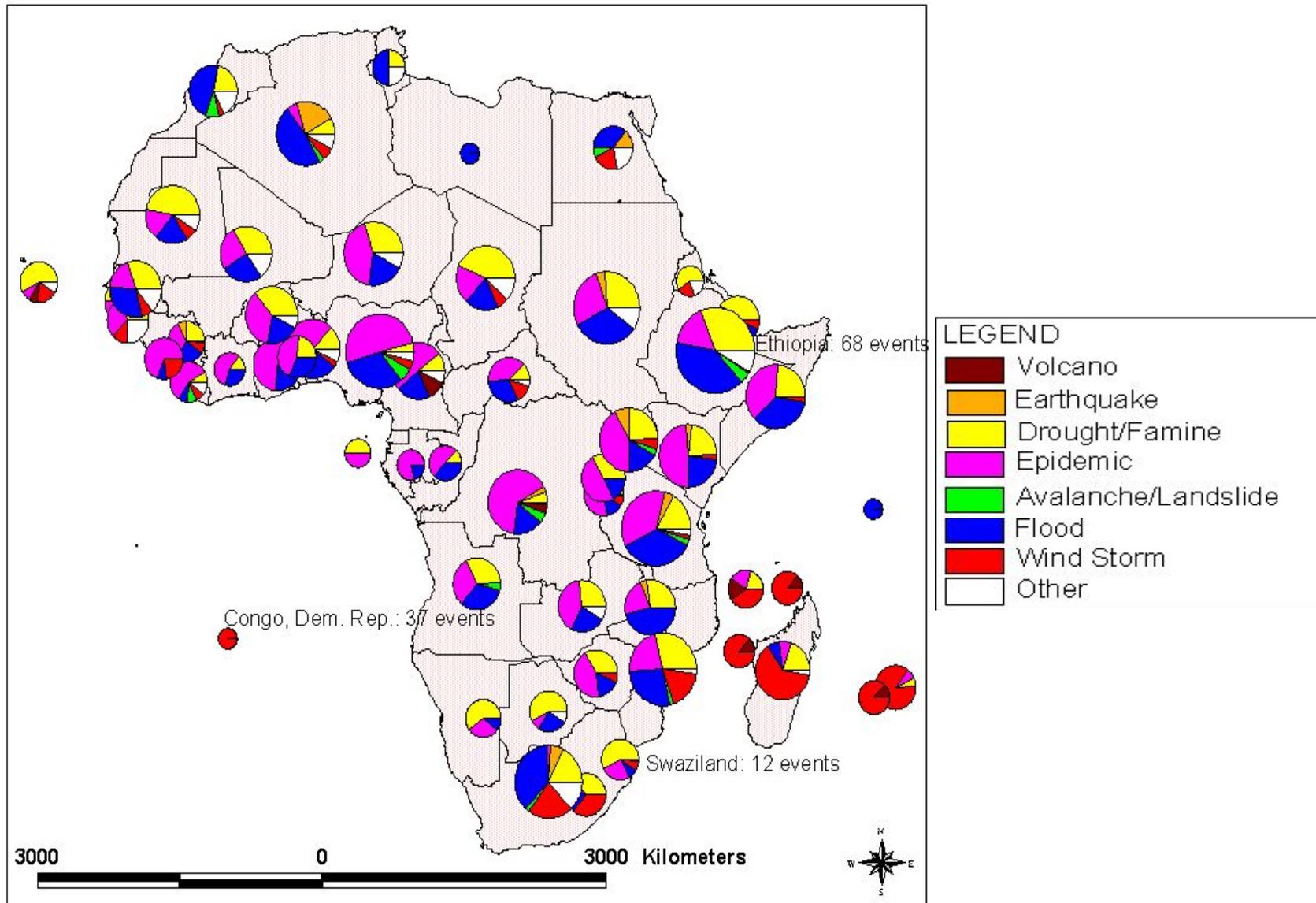
- | | | | | | |
|---|---------------------------------|---|--------------------------|---|--------------------------|
|  | Desertification |  | Deforestation |  | Spread of malaria |
|  | Sea level rise |  | Loss of forest quality |  | Impacts on food security |
|  | Reduced freshwater availability |  | Degradation of woodlands | | |
|  | Cyclones |  | Coral bleaching | | |
|  | Coastal erosion | | | | |

Sources: Anna Ballance, 2002.

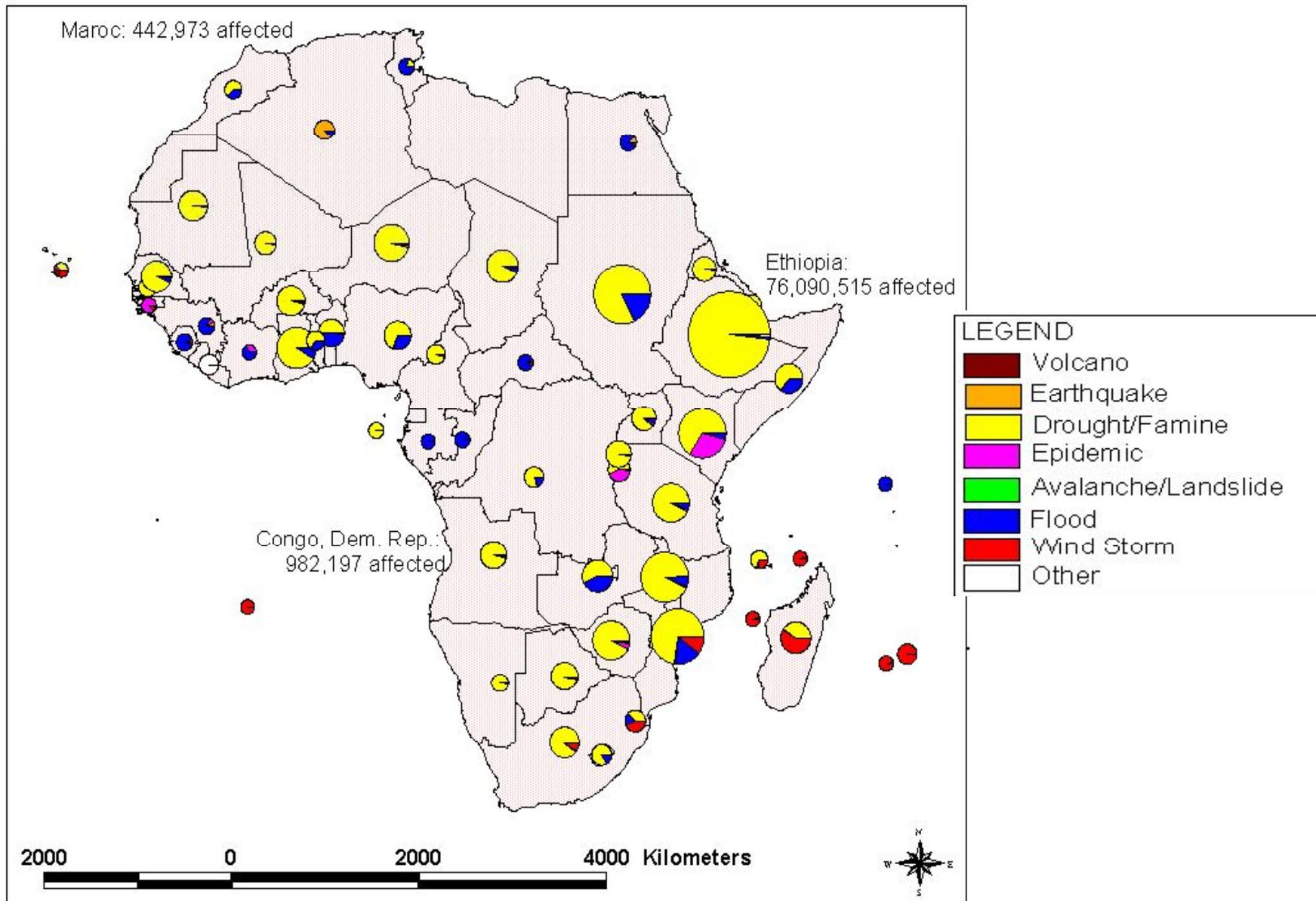
Natural change is reinforced by Poor soft and hard technologies & over-reliance on rain-fed system



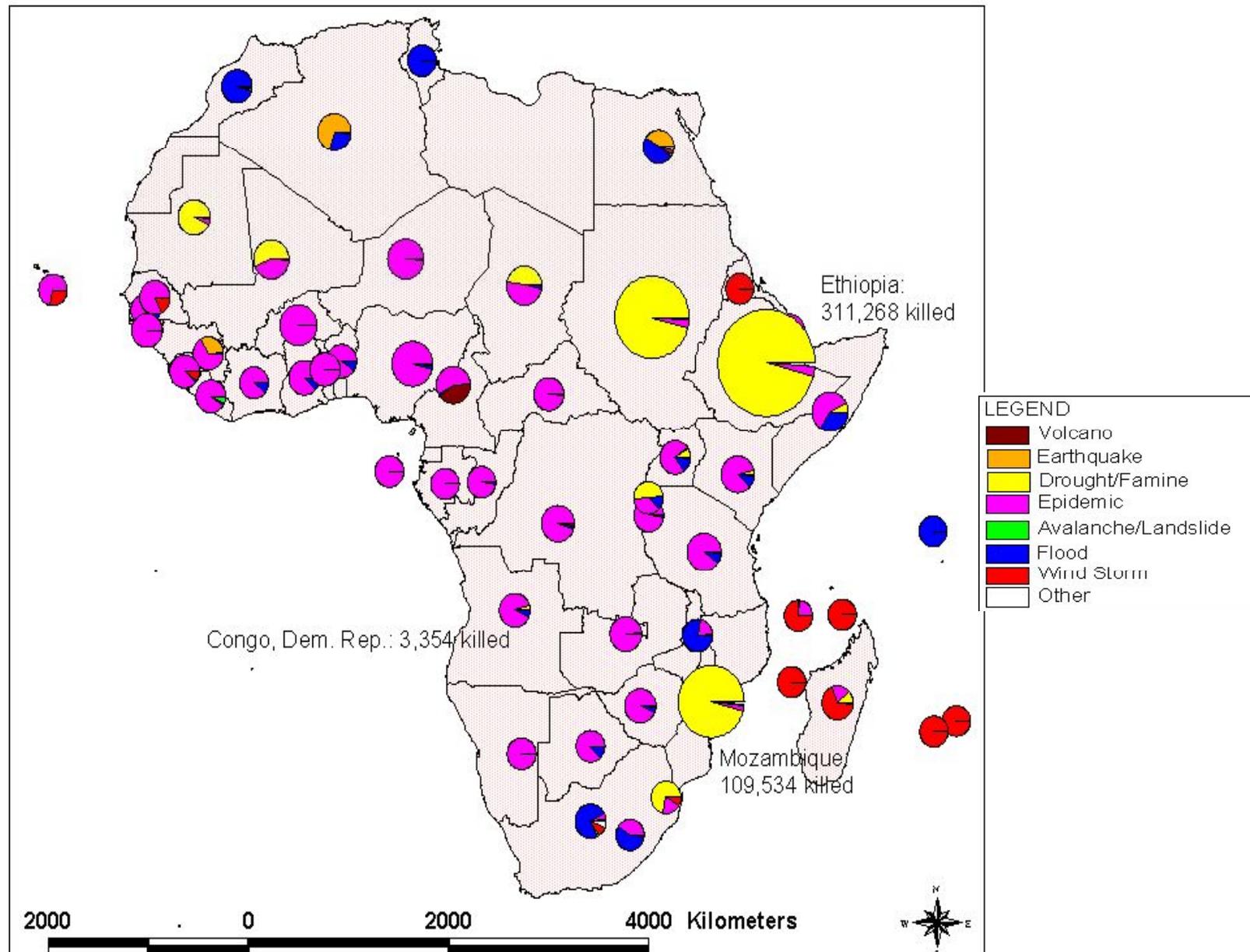
Distribution of natural disasters, by country and type of phenomena, in Africa (1975-2001)



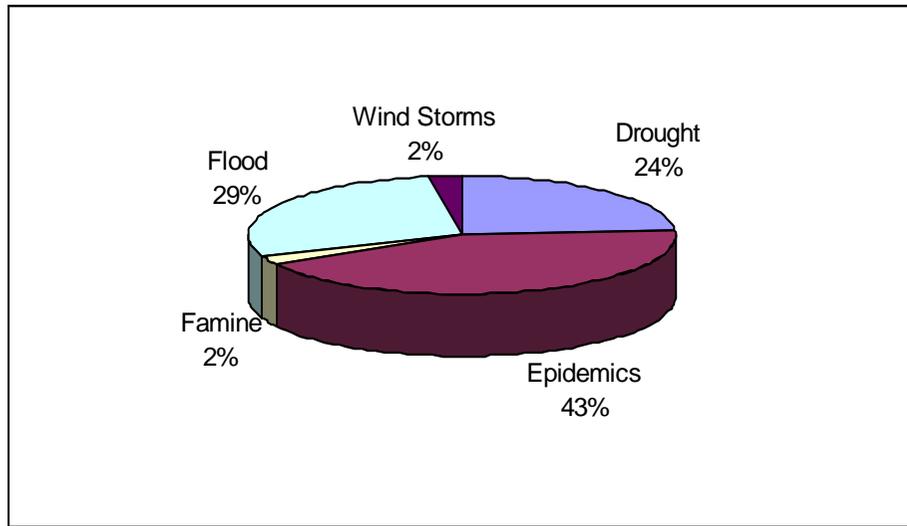
Distribution of people affected by natural disasters, by country and type of phenomena, in Africa (1975-2001)



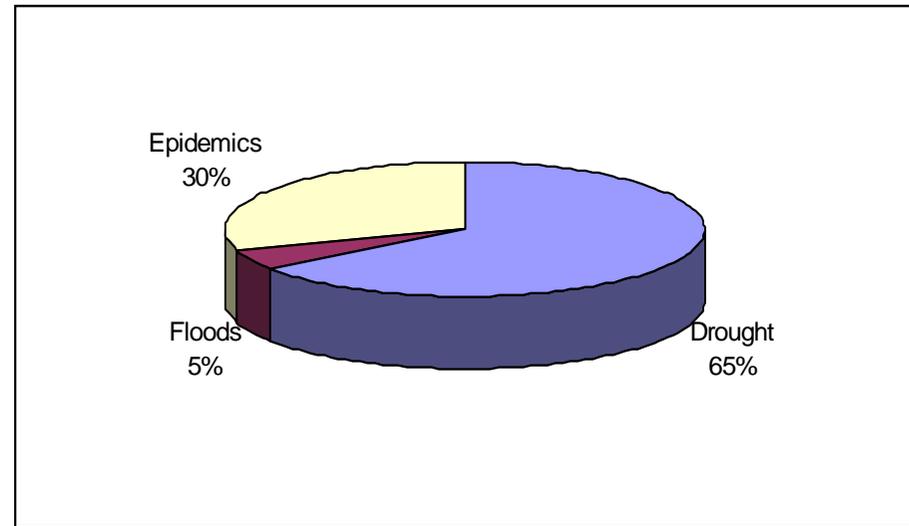
Distribution of natural disasters fatalities, by country and type of phenomena, in Africa (1975-2001)



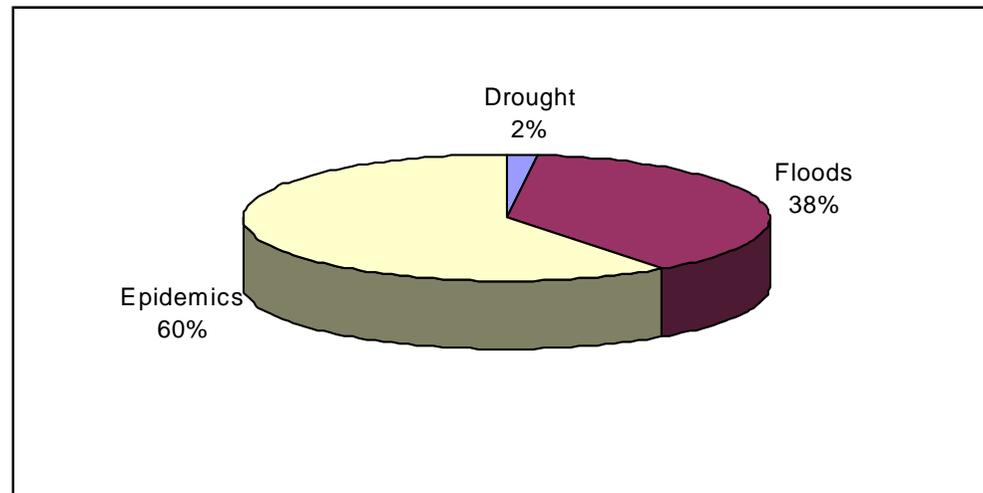
Hazards and Disasters – The Case of Kenya



Prevalence of different types of hazards in Kenya

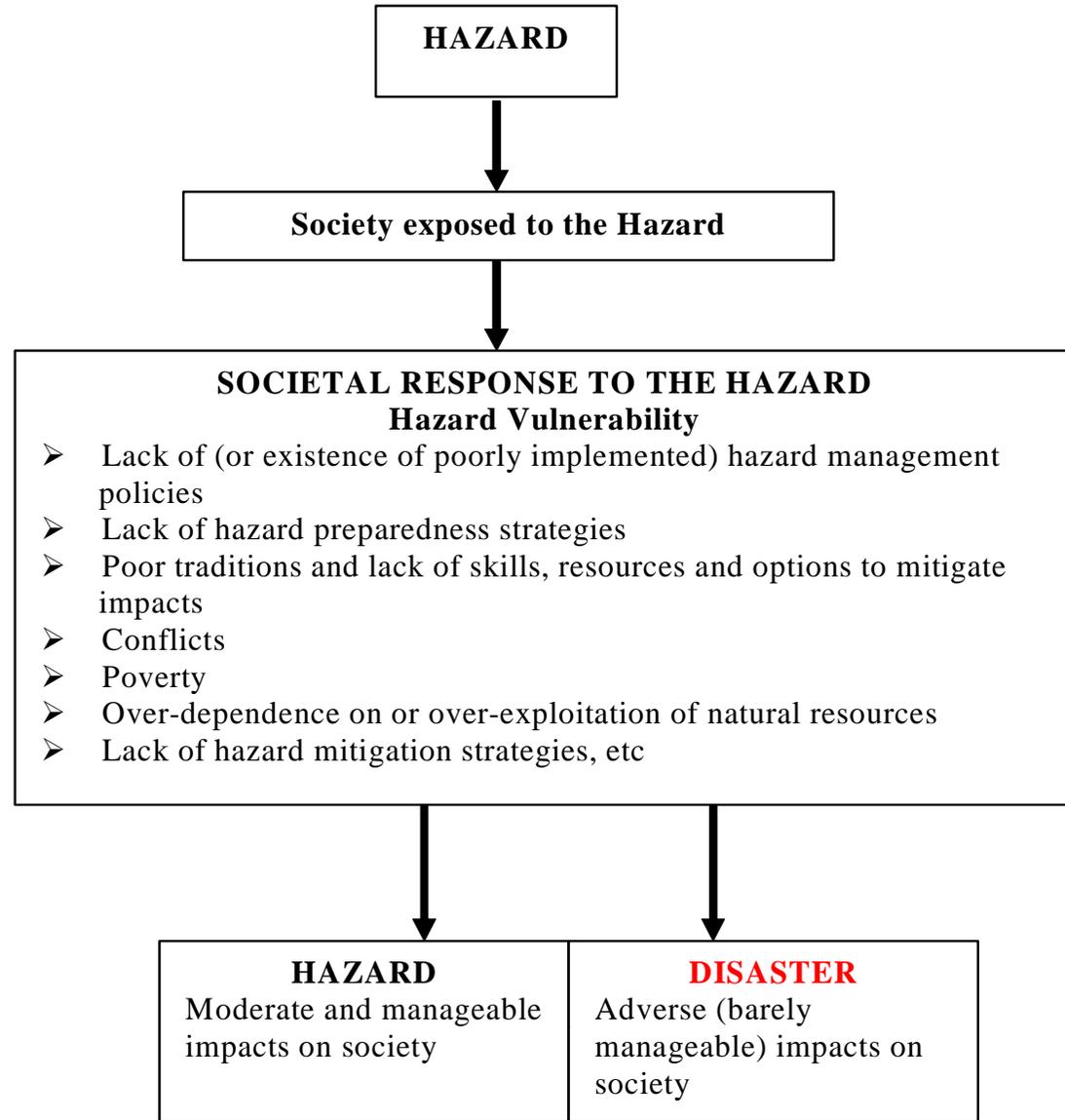
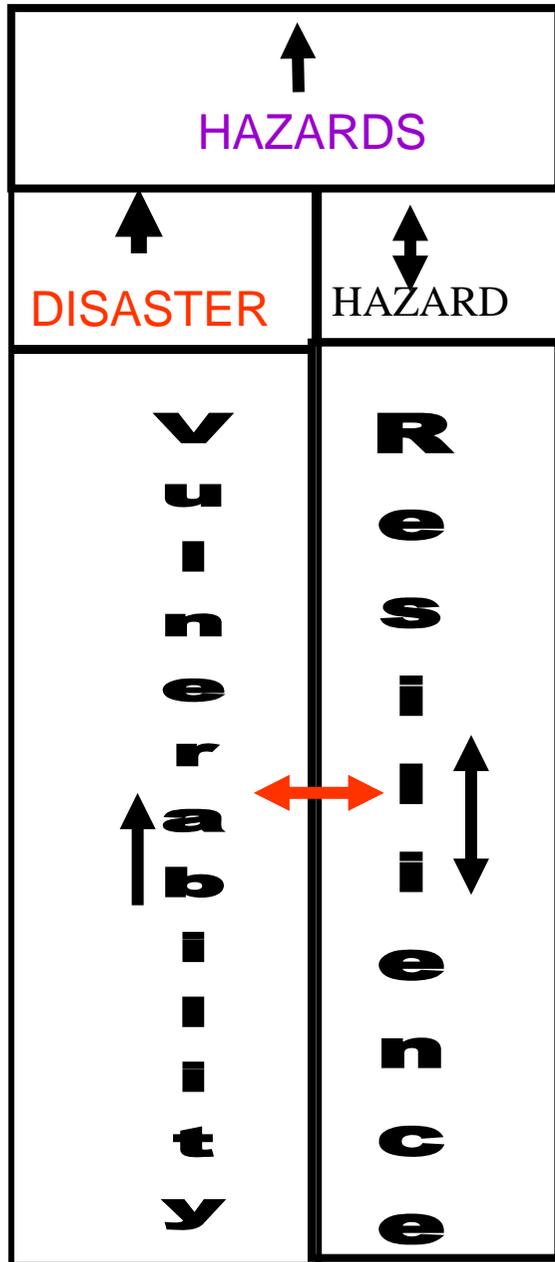


People AFFECTED by the different types of hazards in Kenya

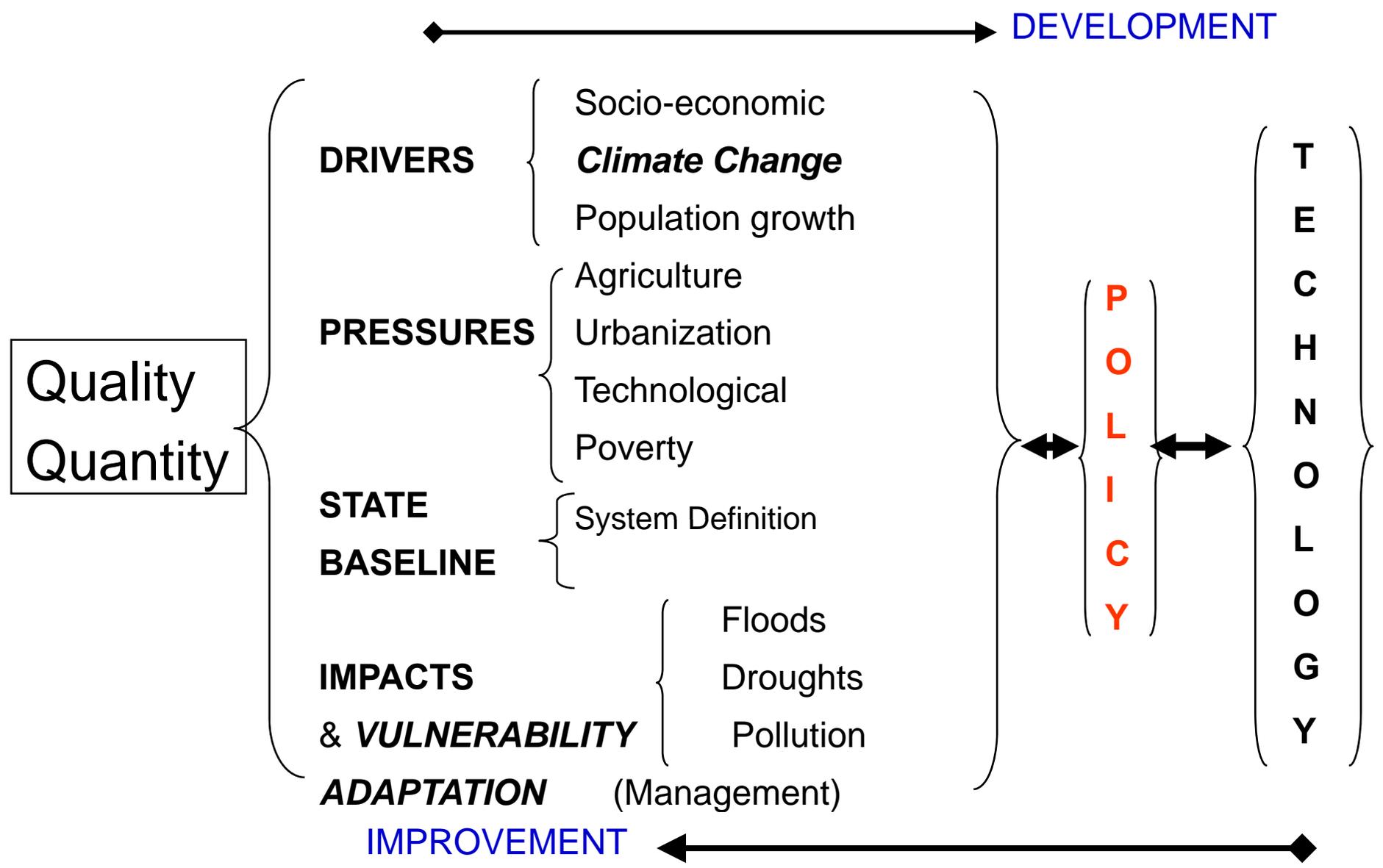


People killed or affected adversely (DISASTERS) by the different types of hazards in Kenya

VULNERABILITY, RESILIENCE, HAZARDS AND DISASTERS



WATER RESOURCES MANAGEMENT



Strategic Options

- Sharing
 - IWRM
 - To target poverty eradication and promote economic integration
 - To ensure that initiatives can in a move from planning to action, etc
- 
- **Intended to reduce the vulnerabilities BUT very weak in Africa**
 - **Poor Political commitments**
 - **Non-collaborating researchers**
 - **Quick implementation of policies without supervision and follow-ups**
 - **Usually externally driven**

IWRM in Africa – Call for change for change of attitudes and approaches

