“ Water Resources Management within a Climate Change Context in Africa”

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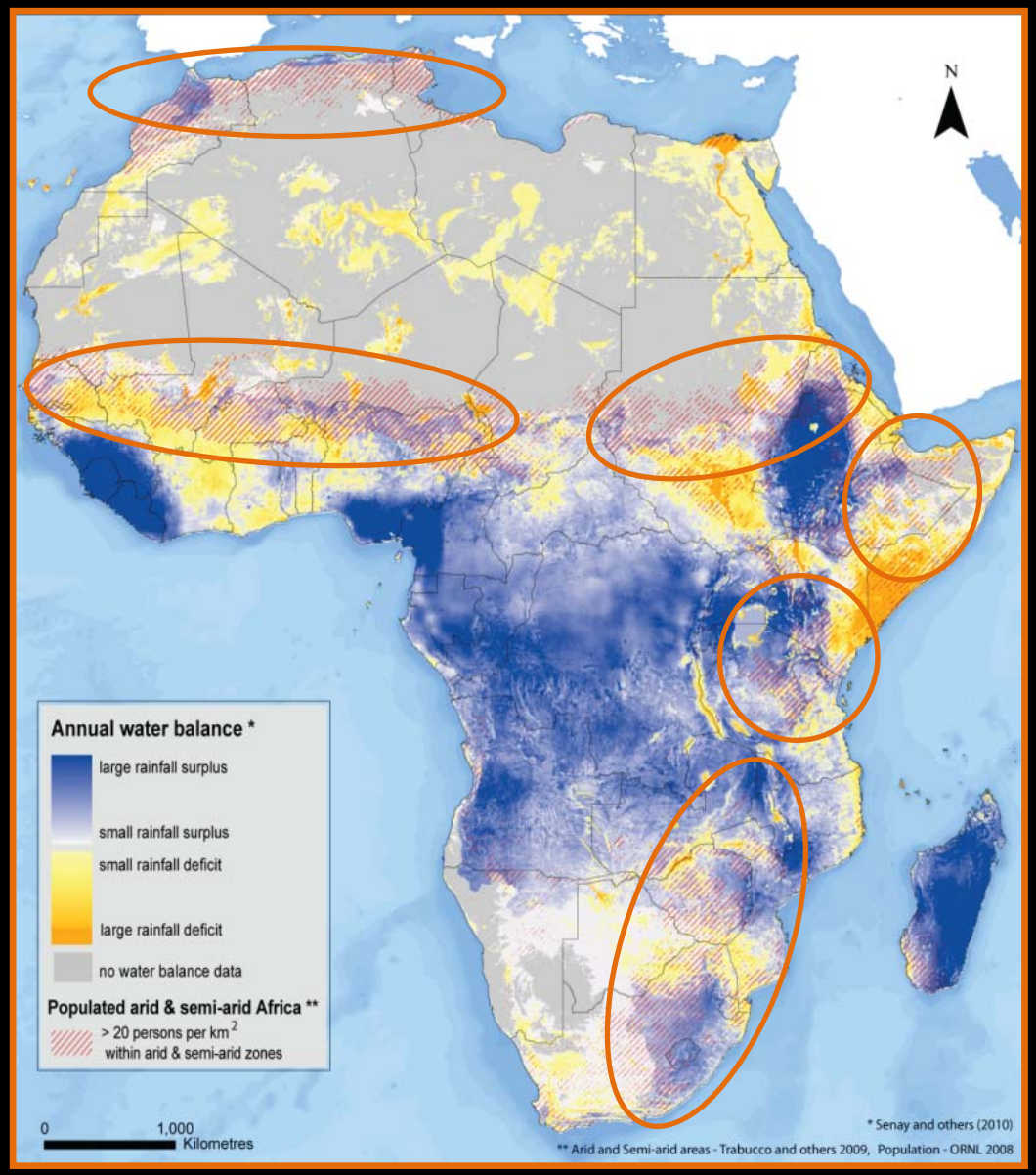
The nature of water issues in Africa is often contradictory:

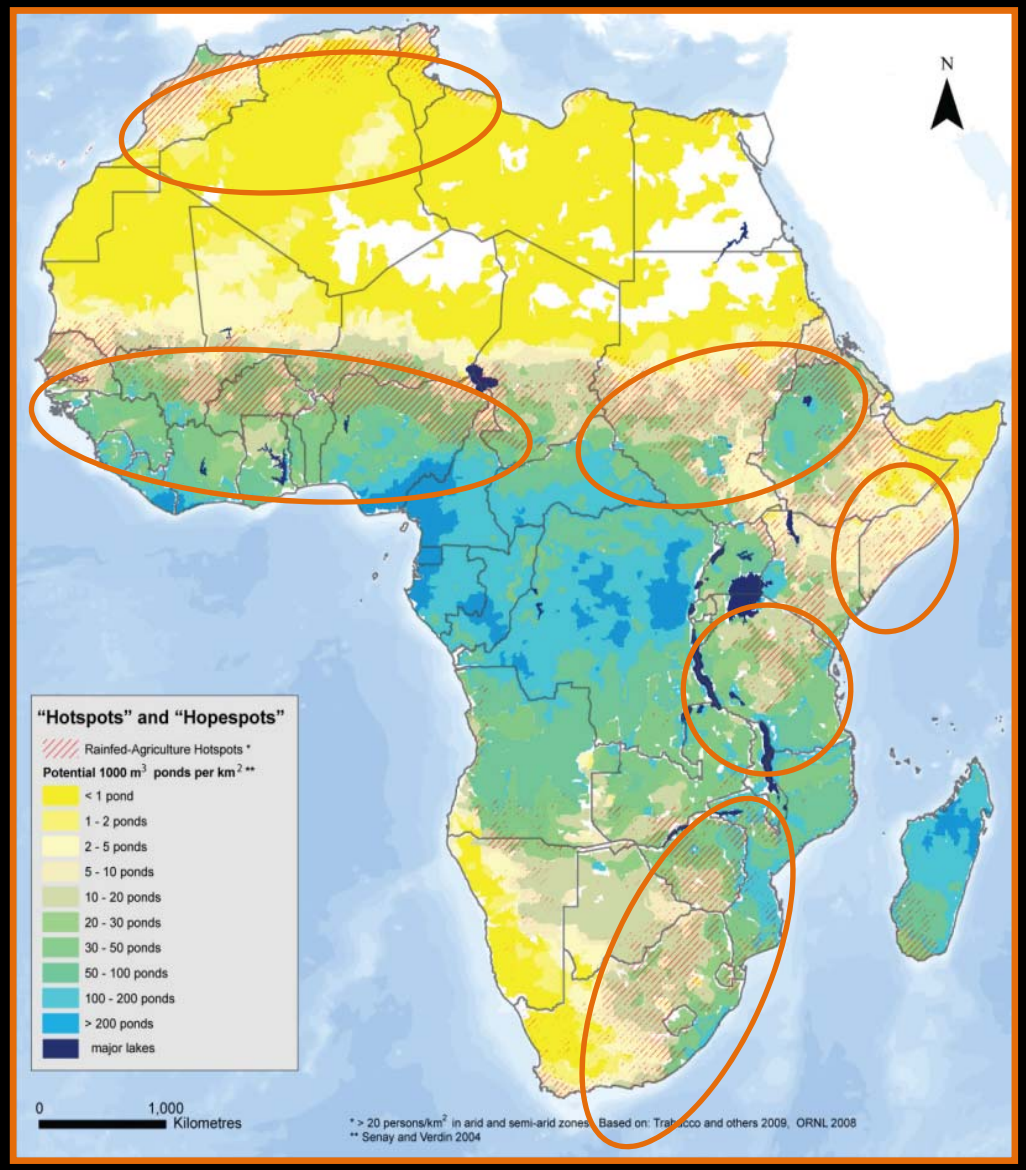
- Surplus and scarcity
- Under-development and overexploitation
- Challenges and opportunities

ANNUAL WATER BALANCE



Annual water balance is an estimate of the available runoff after evapotranspiration-water that is potentially available for harvesting

The red hatching overlaying the water balance map shows where population density >20 persons per km^2 coincides with areas defined as arid or semi-arid



Areas of population density >20 persons per km^2 that coincide with arid and semi-arid zones are potential hotspots of vulnerability for water-constrained rain-fed agriculture (red hatch marks)

Many of these areas have adequate runoff for filling small farm ponds, which can reduce vulnerability and improve food security

TOTAL RENEWABLE WATER RESOURCES

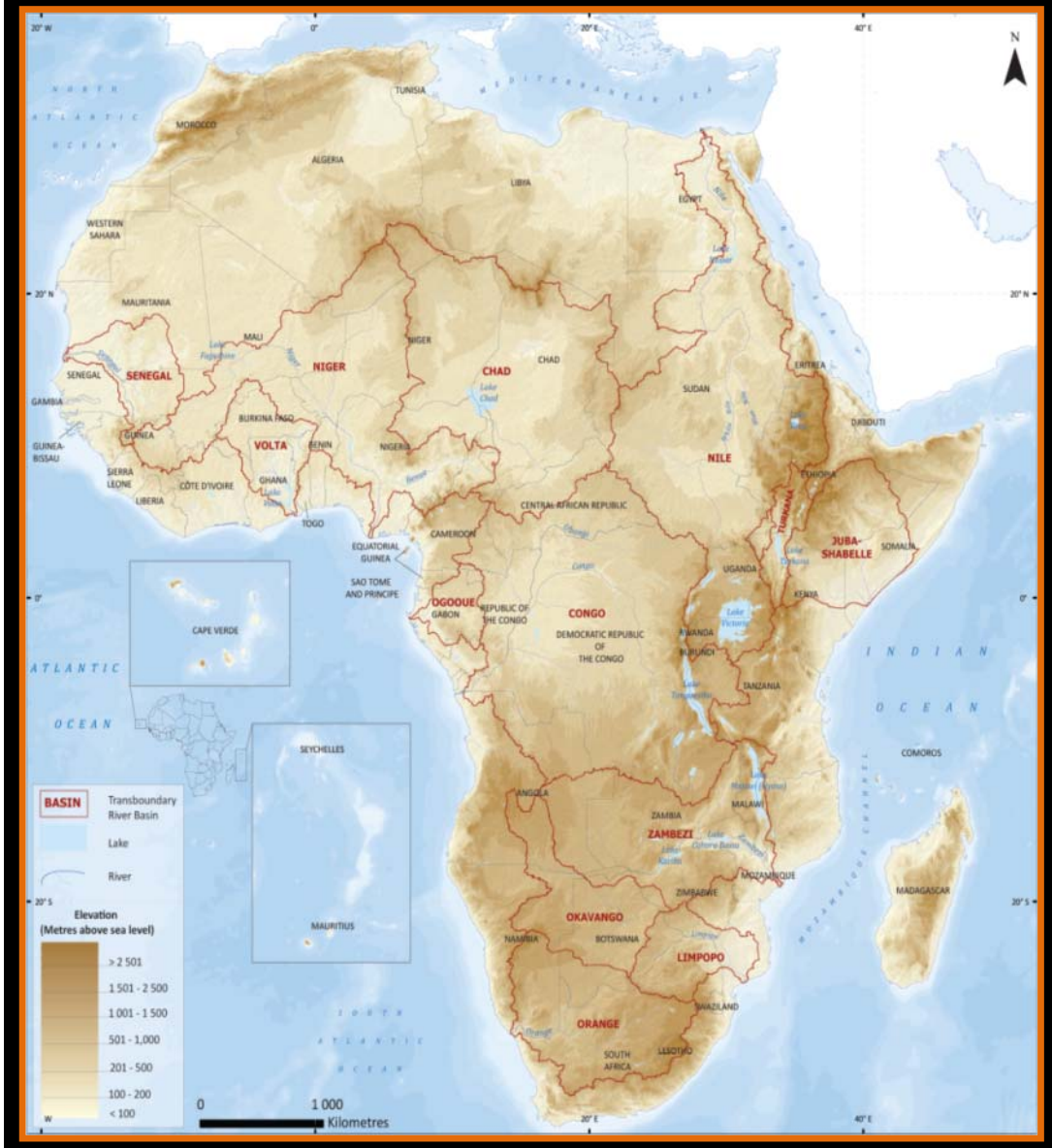
There are wide differences in natural water distribution within Africa's sub-regions and countries

SURFACE RIVERS & LAKE WATER BASINS

The continent's 63 international river basins

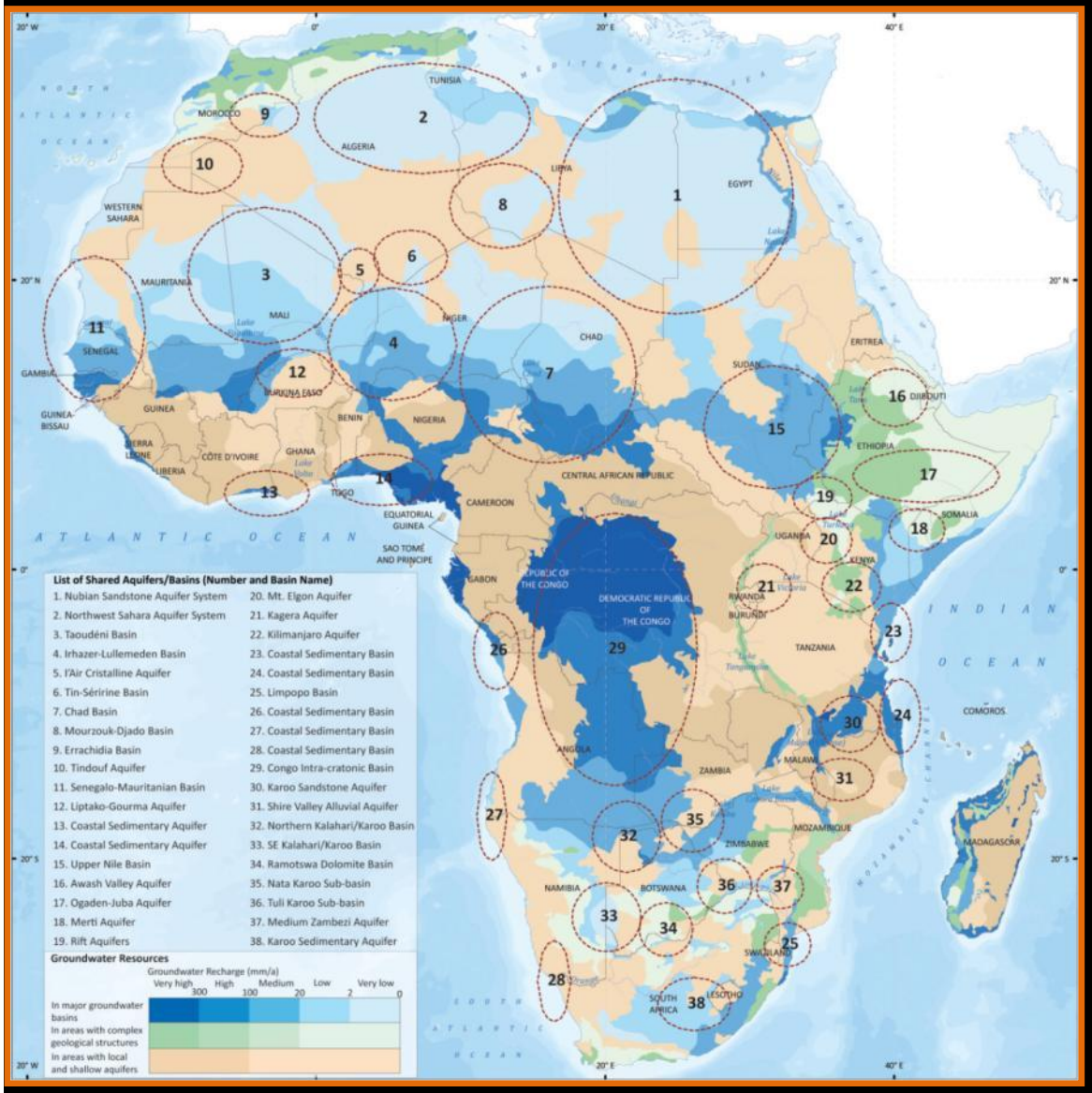
- Cover about 64 per cent of its land area
- Contain 93 per cent of its total surface water resources
- Are home to 77 per cent of Africa's population

MAJOR TRANSBOUNDARY RIVER and Lake BASINS



The major transboundary basins of Africa present a variety of challenges and opportunities to the people and countries who share them

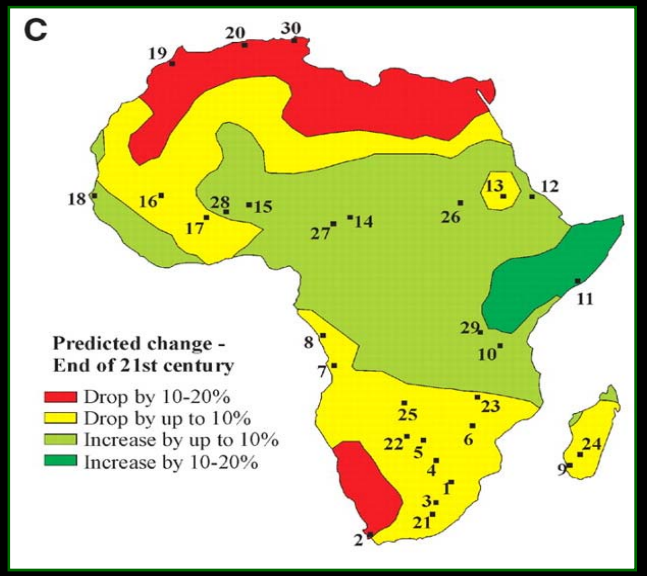
TRANSBOUNDARY AQUIFERS

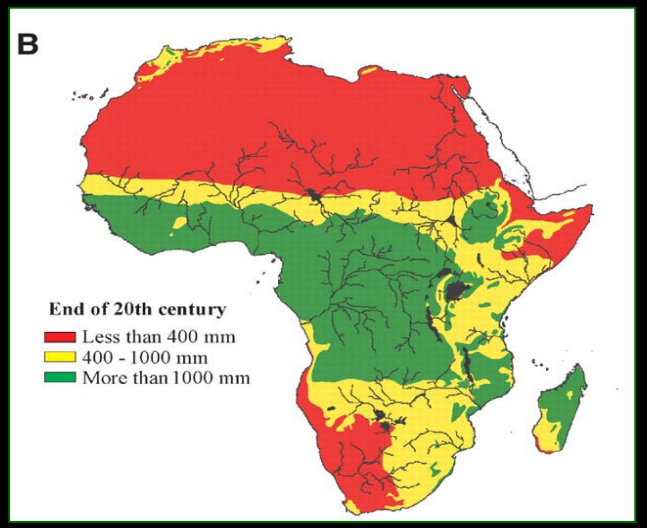


Just as there are internationally shared river basins, there are also internationally shared, or transboundary, water resources and aquifers hidden underground

Climate Change and Water Resources

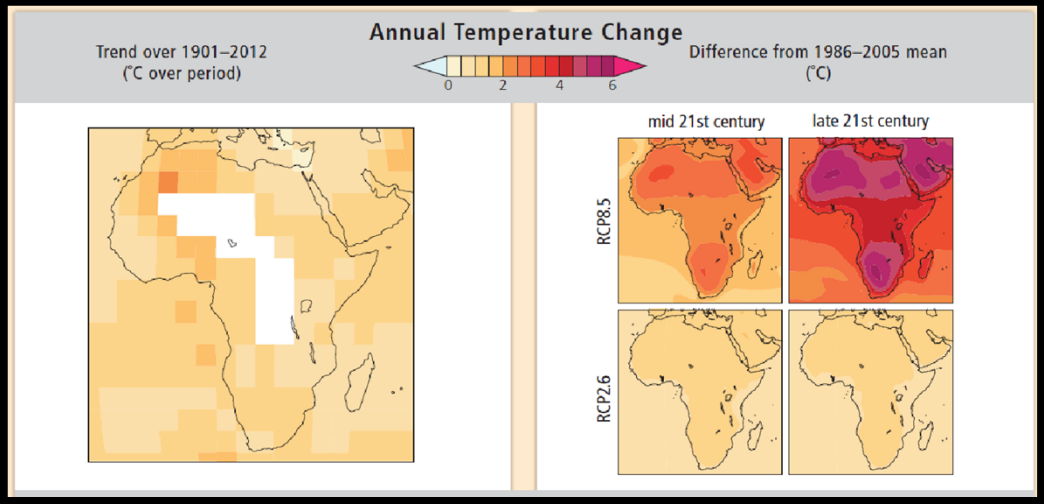
- Africa's water largely driven by climate
  - A 10% decrease In regions receiving 500mm per year would lead to 50% cut in surface drainage.
  - Rainfall and river flows in Africa display high levels of variability with consequences for management of water resources
  - 250m additional people exposed to water stress by 2020.



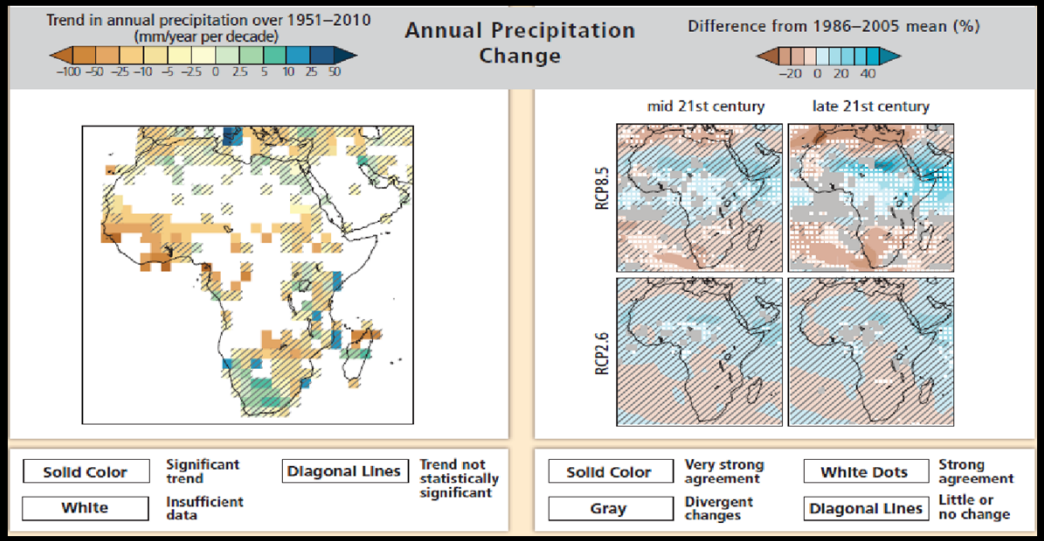


AFRICA'S CLIMATE CHANGE versus Water Resources

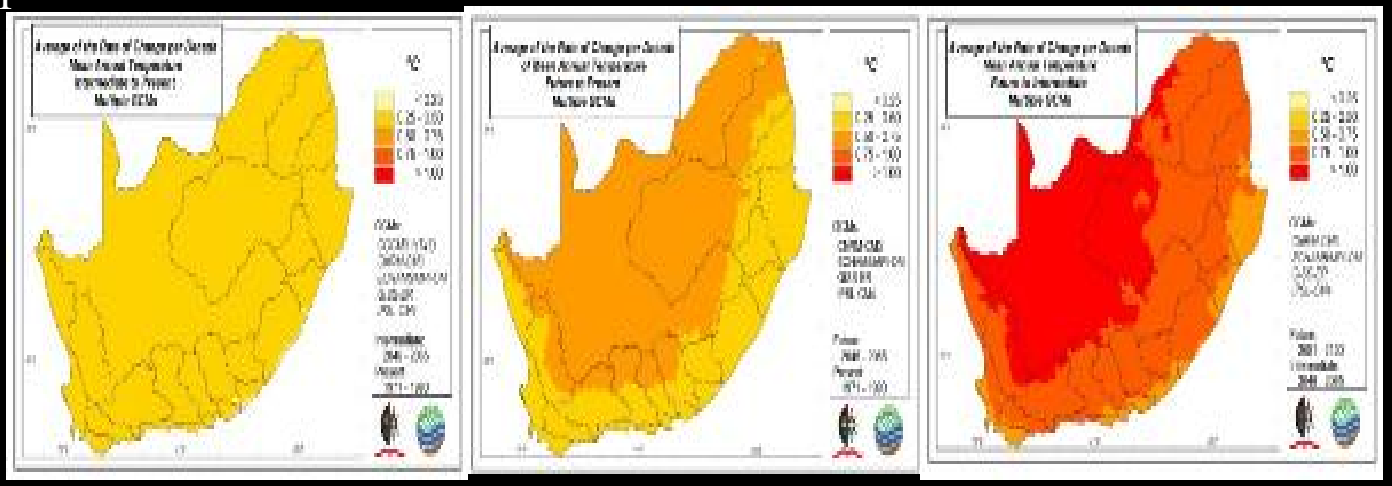
Large parts of Africa are subject to seasonally variable hydrology and geographically uneven distribution of water resources. This will be compounded by climate change, to which Africa is particularly vulnerable.

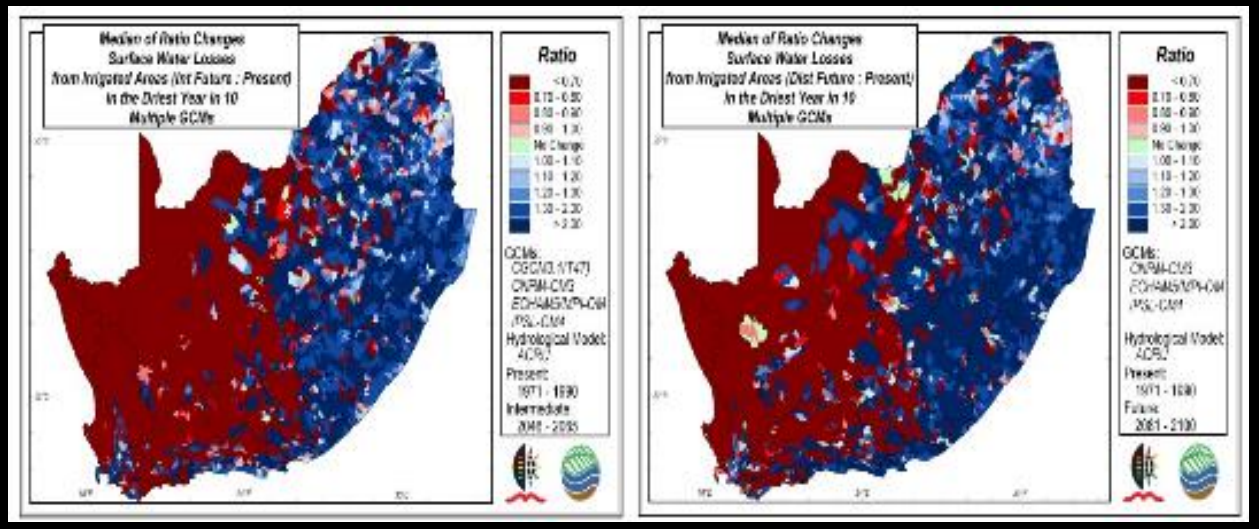


Climate change projections for Africa, like many climate projections, have large margins of uncertainty but there is a clear signal of warming



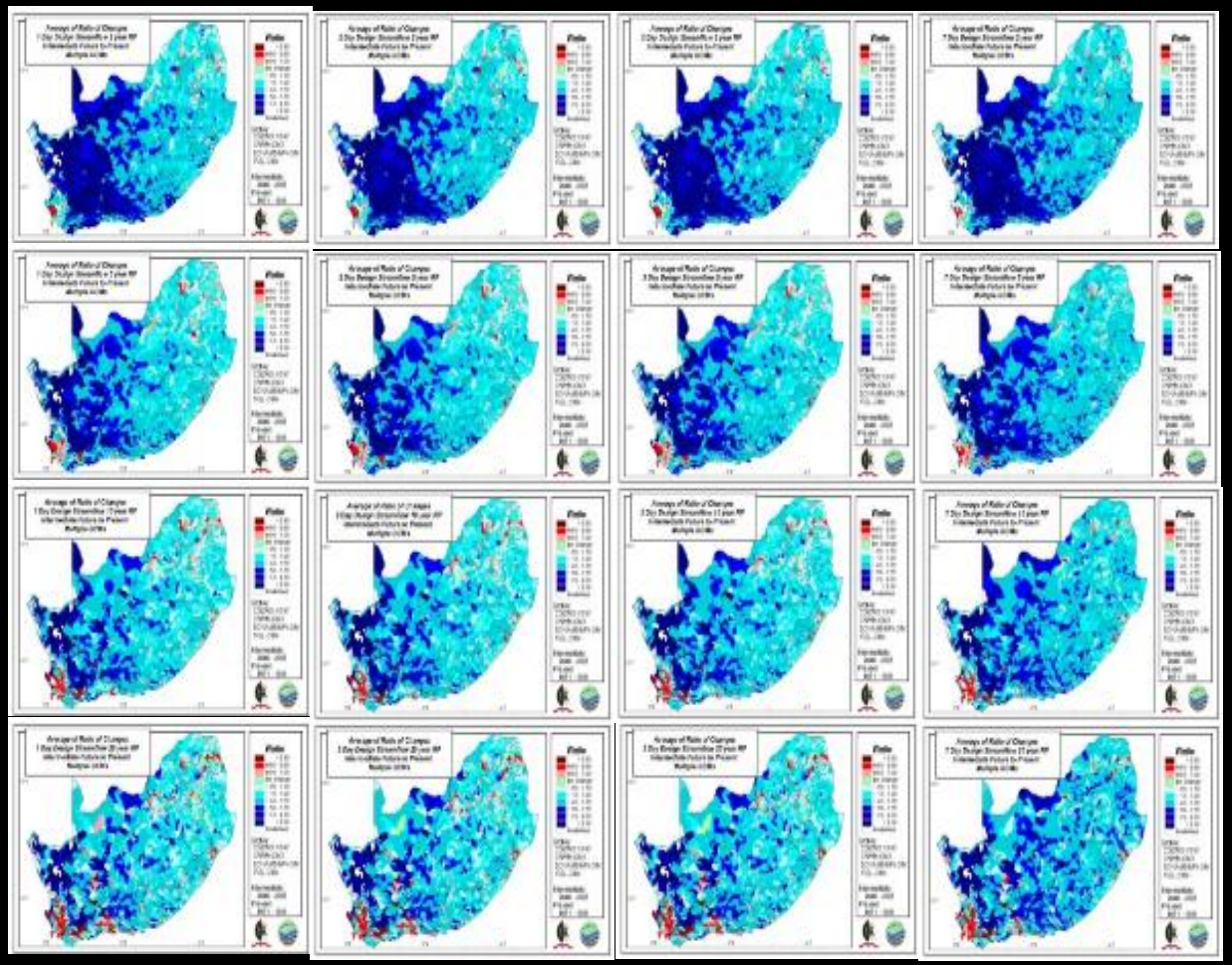
Average of changes per decade, using outputs from multiple GCMs, of mean annual temperatures between the intermediate future and present (left), the more distant future and present (middle) and the more distant future and intermediate future climate scenarios (right). Source is Schulze, 2011





Ratio changes of surface water losses from irrigated areas between the intermediate future and present (left) and more distant future and present (right) derived from ACRU model output of

Averages of ratio changes of intermediate future to present one day derived with the ACRU (Agricultural Catchment Research Unit) model from output of multiple GCMs.

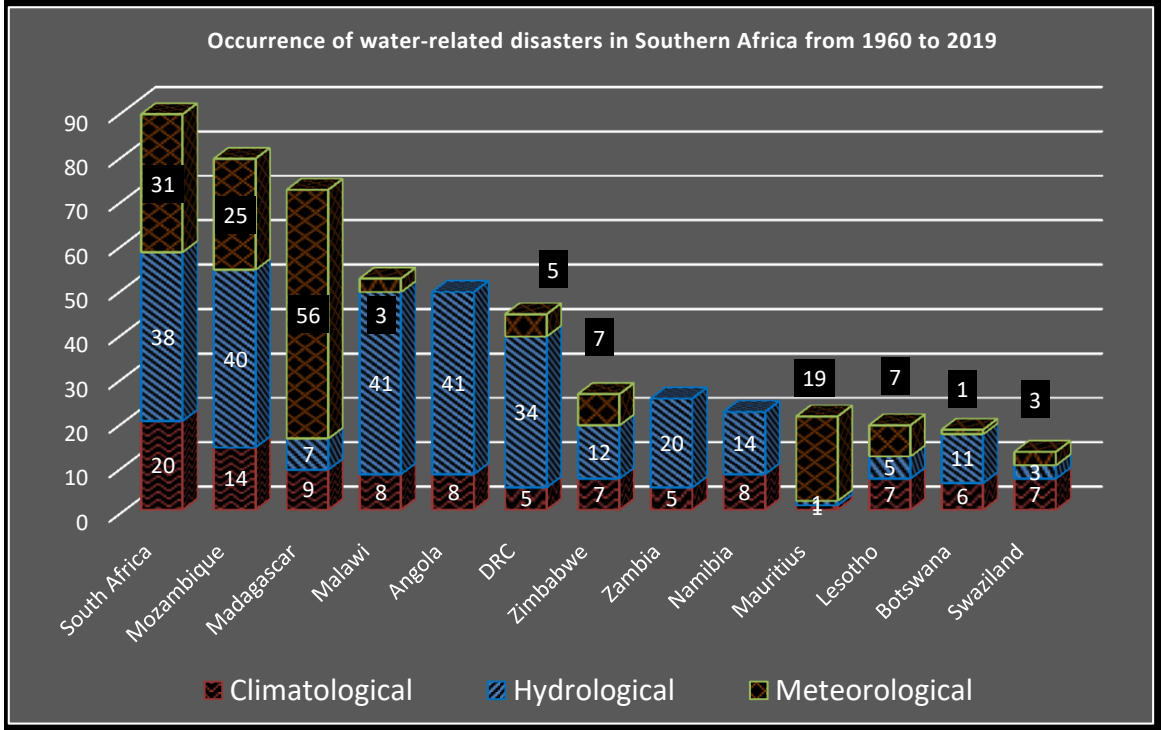


Projected ratio changes in design streamflows between the intermediate future and present are shown for durations of one, two, three and seven days and for 2, 5, 10 and 20 years return periods.

Definition of Water related disasters

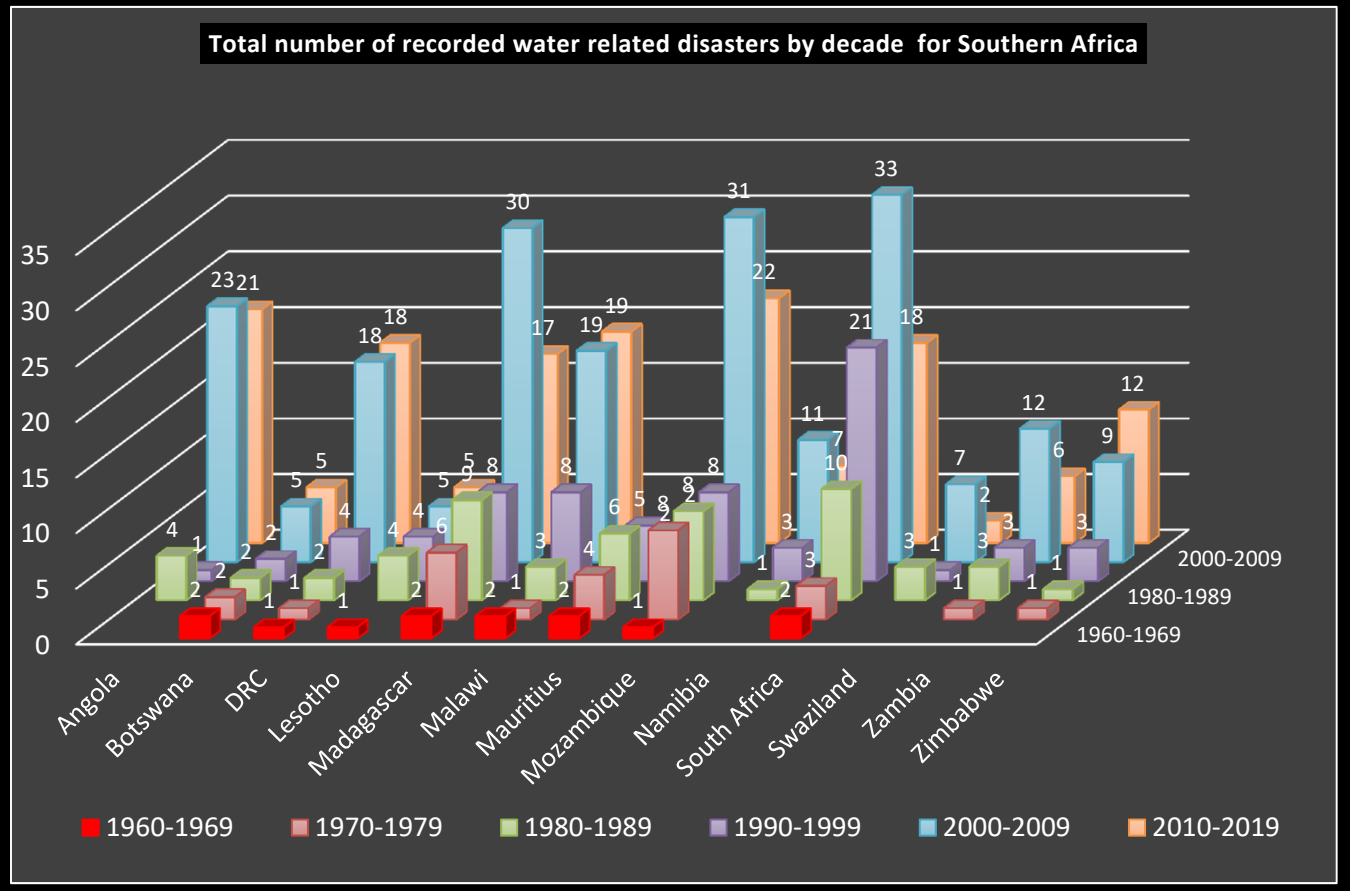
Disaster Subgroup	Definition	Disaster Main Type
Meteorological	A hazard caused by short-lived, micro- to meso-scale extreme weather and atmospheric conditions that last from minutes to days.	Extreme Temperature Storm
Hydrological	A hazard caused by the occurrence, movement, and distribution of surface and subsurface freshwater and saltwater.	Flood Landslide
Climatological	A hazard caused by long-lived, meso- to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal climate variability.	Drought Wildfire

Total number of recorded water related disasters between 1960 and 2019 for Southern Africa



Africa has the second highest number of extreme events after Asia and the highest number of hydrological extreme events

Trends in the occurrence of water related disasters for southern Africa by decade



The number of natural disasters in the last decade is in most cases equivalent to the total number of disasters in the previous 3 decades. It is therefore concluded that there is an increasing trend of extreme events in southern Africa.

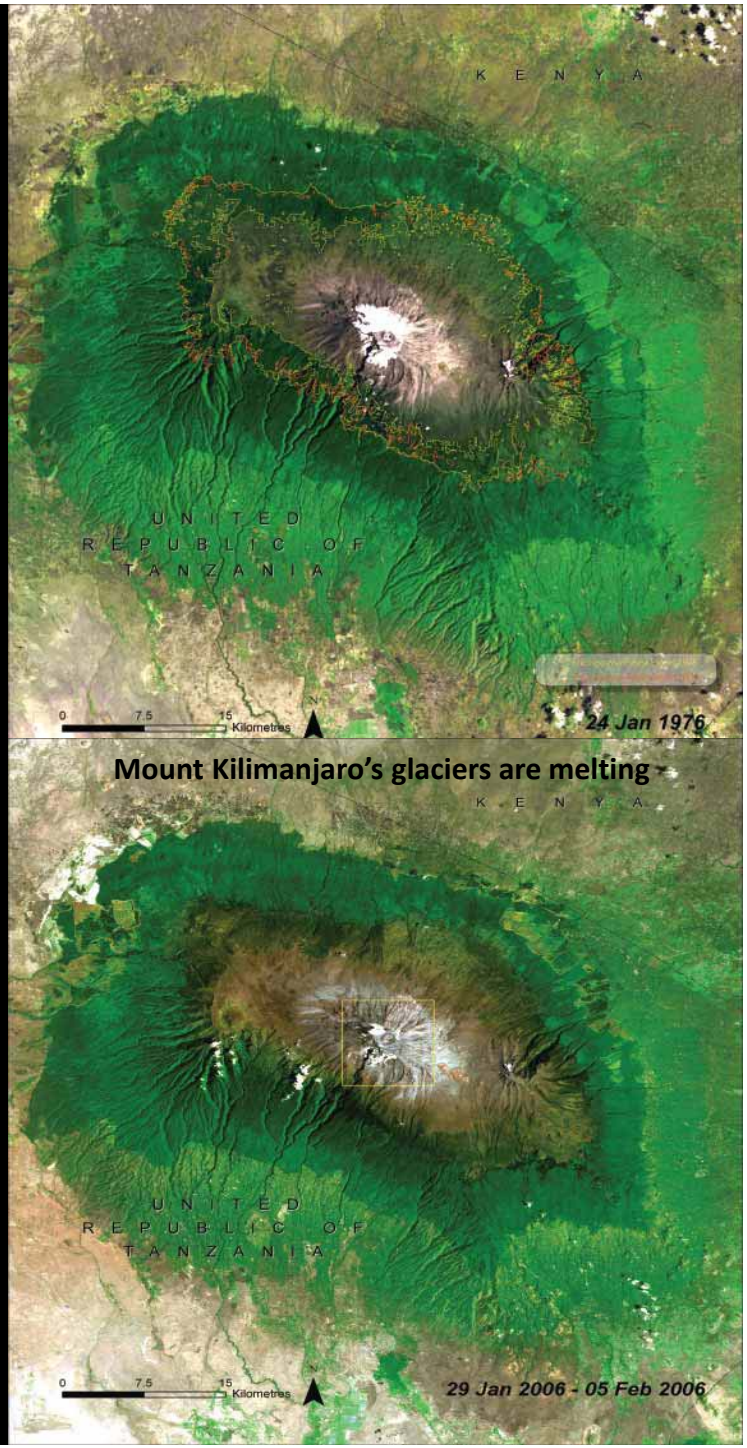
AFRICA'S WATER

CHALLENGES

NINE WATER CHALLENGES

CHALLENGE 8: *MANAGE WATER UNDER GLOBAL CLIMATE CHANGE*

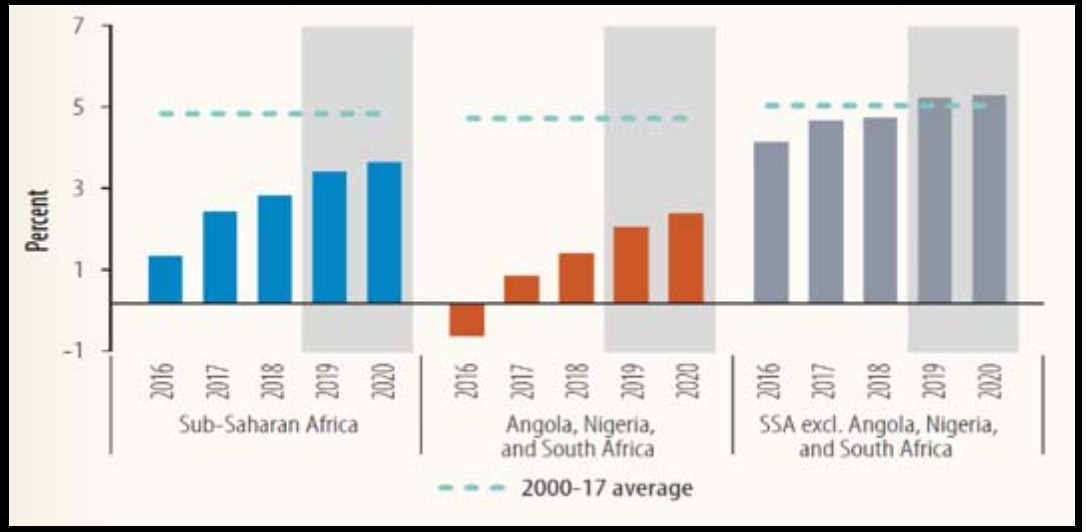
- *Global warming and its human cause are undeniable;*
- *Warming patterns in Africa are consistent with global ones;*
- *Africa is already subject to important spatial and temporal rainfall variability;*
- *Drought in Africa is common and some regions are becoming drier;*
- *Africa's repeated drought cycles kill thousands of people each event; and floods also occur regularly with severe impacts on peoples' livelihoods.*

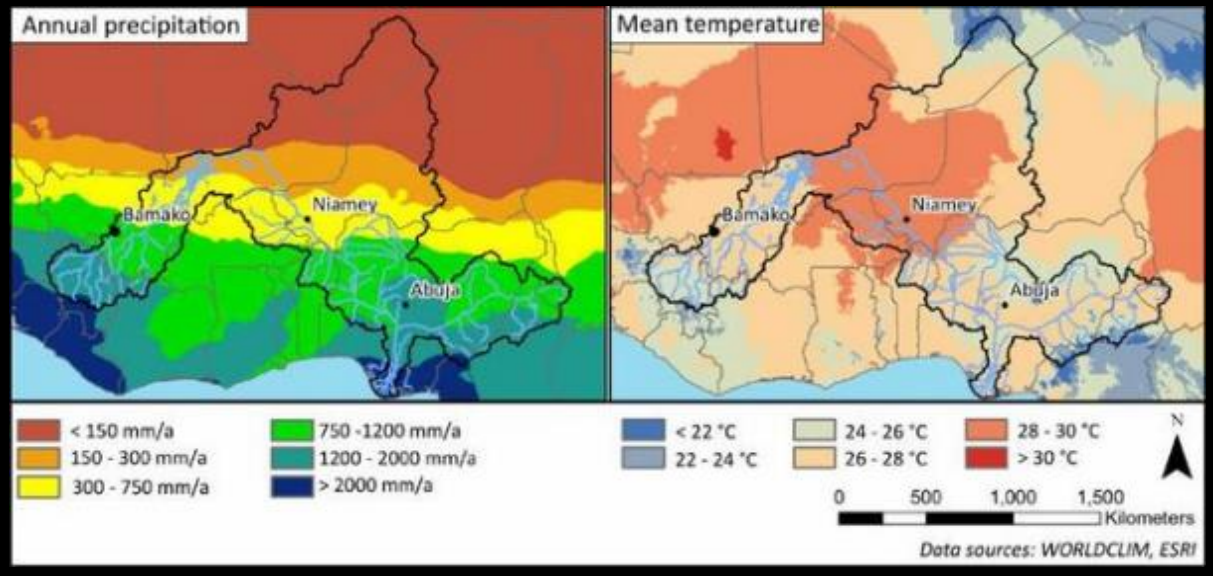


Mount Kilimanjaro's glaciers are melting

CHALLENGE 8: *MANAGE WATER UNDER GLOBAL CLIMATE CHANGE*

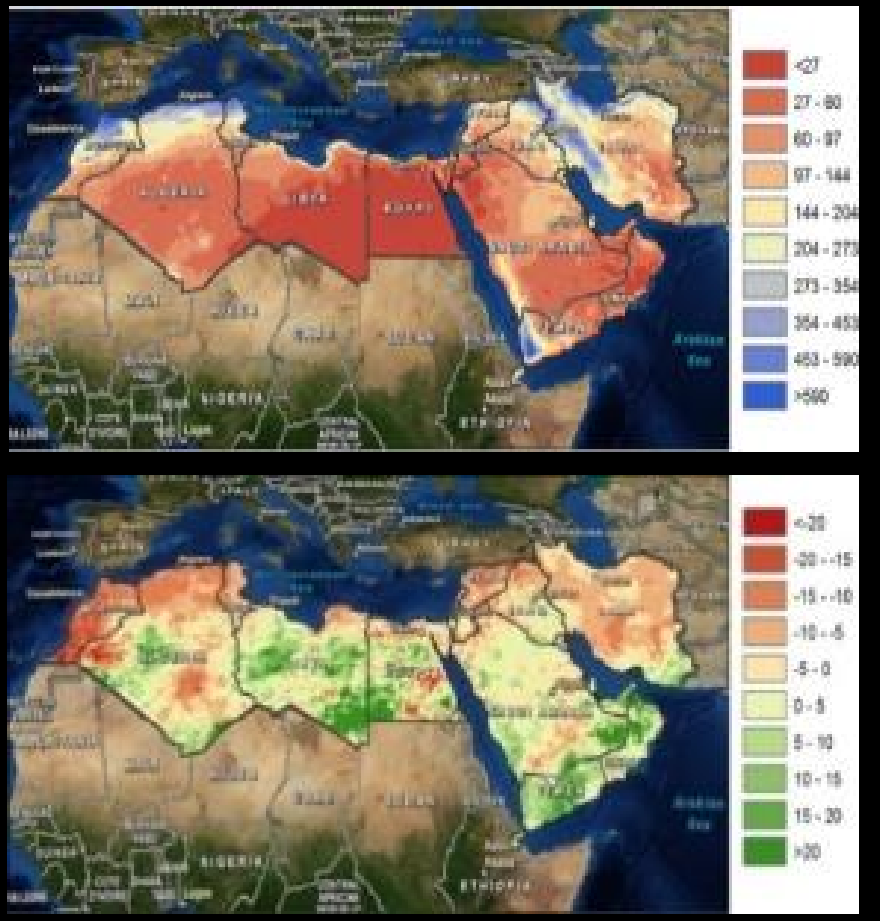
While pressures on Africa's unique ecosystems, population, and economy continue to grow, this situation will be further compounded by climate change, to which Africa is particularly vulnerable





CHALLENGE 8: *MANAGE WATER UNDER GLOBAL CLIMATE CHANGE*

Although climate change projections for Africa, like many climate projections, have large margins of uncertainty, it is clear that climate change is likely going to bring more frequent and more intense water-related disasters in many parts of Africa, a continent already prone to floods and droughts, with dramatic consequences for critical ecosystem goods and services, and, therefore, its population and its development.



Effects of climate change on water resources

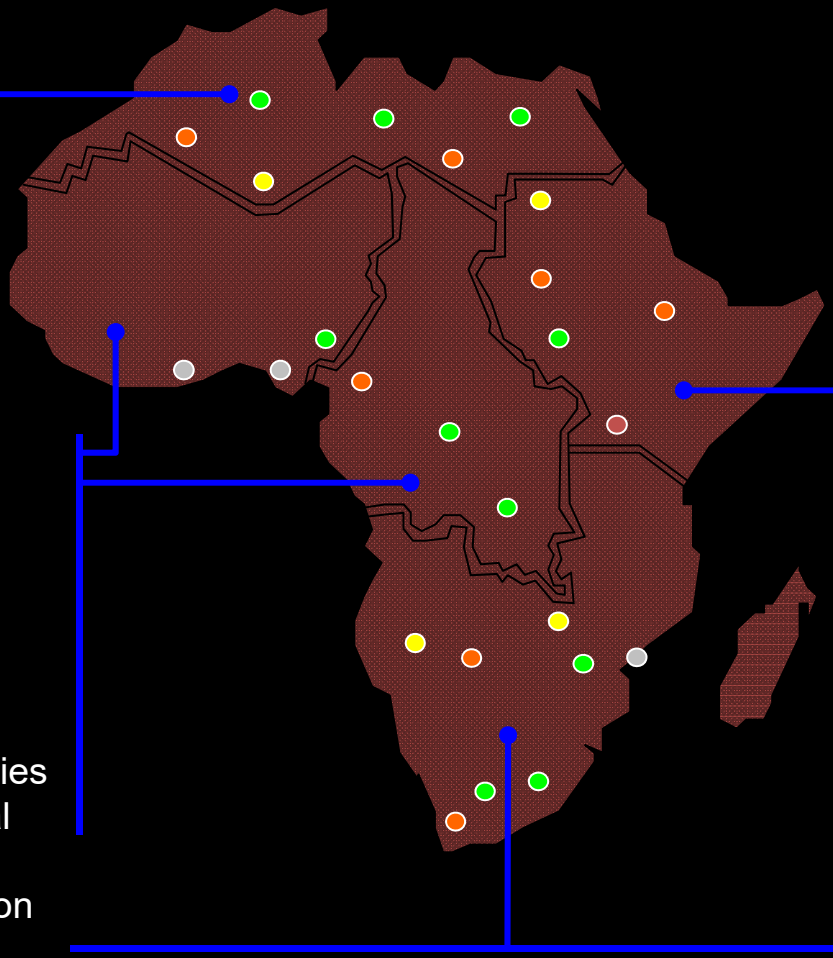
Climate change results in changes in:

- Run-off and recharge
- Temperature, humidity and wind
- System yield
- Start of rainy season
- Timing of high and low flows
- Intensity of rainfall events and flood patterns
- Groundwater recharge
- Drought patterns and periods
- Water demand

Climate change will significantly disrupt development plans of African countries

Droughts · Coastal flooding · Climate zone shifts · Water Scarcity

Current development issues may be worsened by climate change



North Africa
- Water stress may be worsened by increased desertification of semi-arid areas

West and Central Africa
- Low agricultural yields may be worsened by Ext. events (D or F)
- Fast-urbanising cities at rise from coastal flooding
- Forests Degradation

East Africa
- Rainfall may increase in some areas
- Expansion of vector-borne disease transmission zone
- Declines in fisheries in some major East African lakes

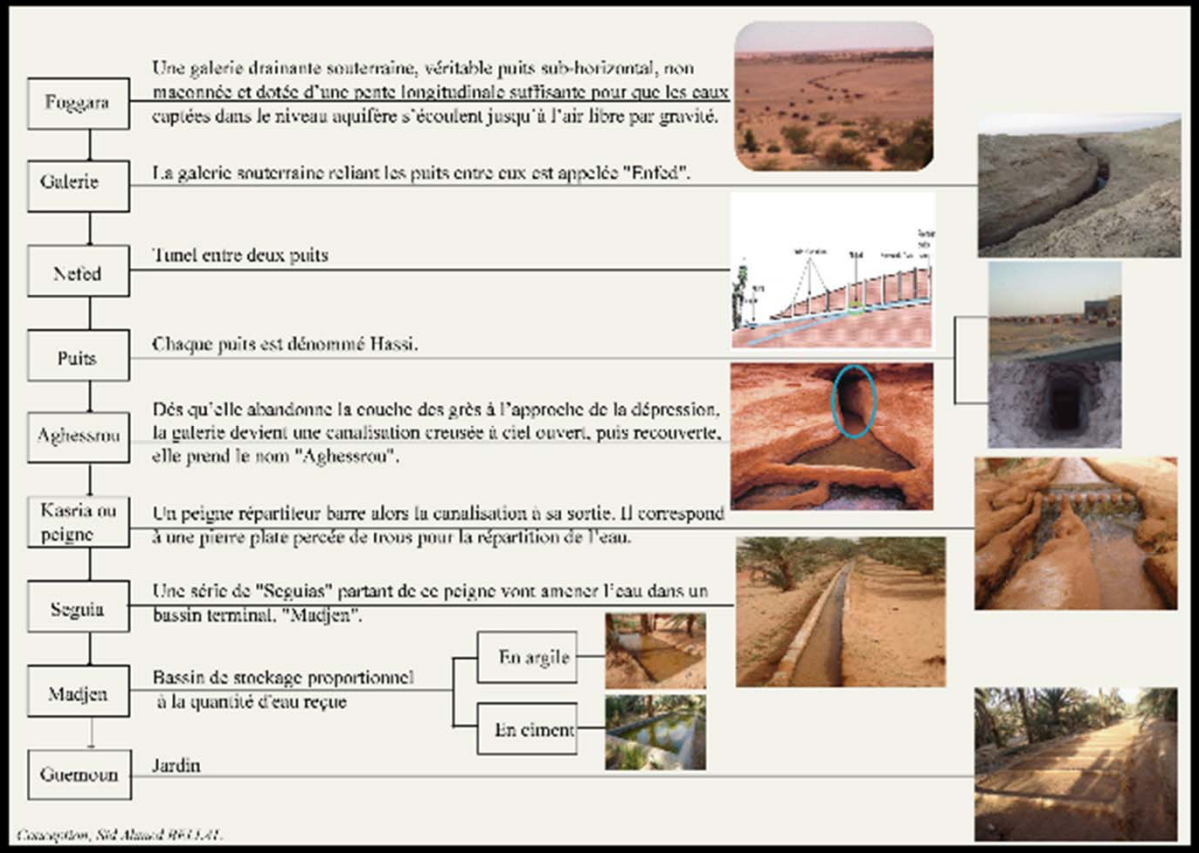
Southern Africa
- Heightened water stress in some river basins from droughts and changes in precipitation

Source: Project Catalyst

Among the solutions

- Adaptation and consideration of Mitigation opportunities that lead to improved management of land, water and forest ecosystems, among others…
- Maximizing on hydropower and renewable energy potential:
- Sub-Saharan Africa should review its outdated technologies and move forward with untapped hydropower, wind power, solar power, and other renewable sources of energy. The region has only utilized 8 percent of its hydroelectric power potential.

Some techniques of adaptation to climate change and water management



Stone rows

Zaï technique

Half-moon technique

Among the Solutions

- **Making adaptation and climate risk management core development elements.**

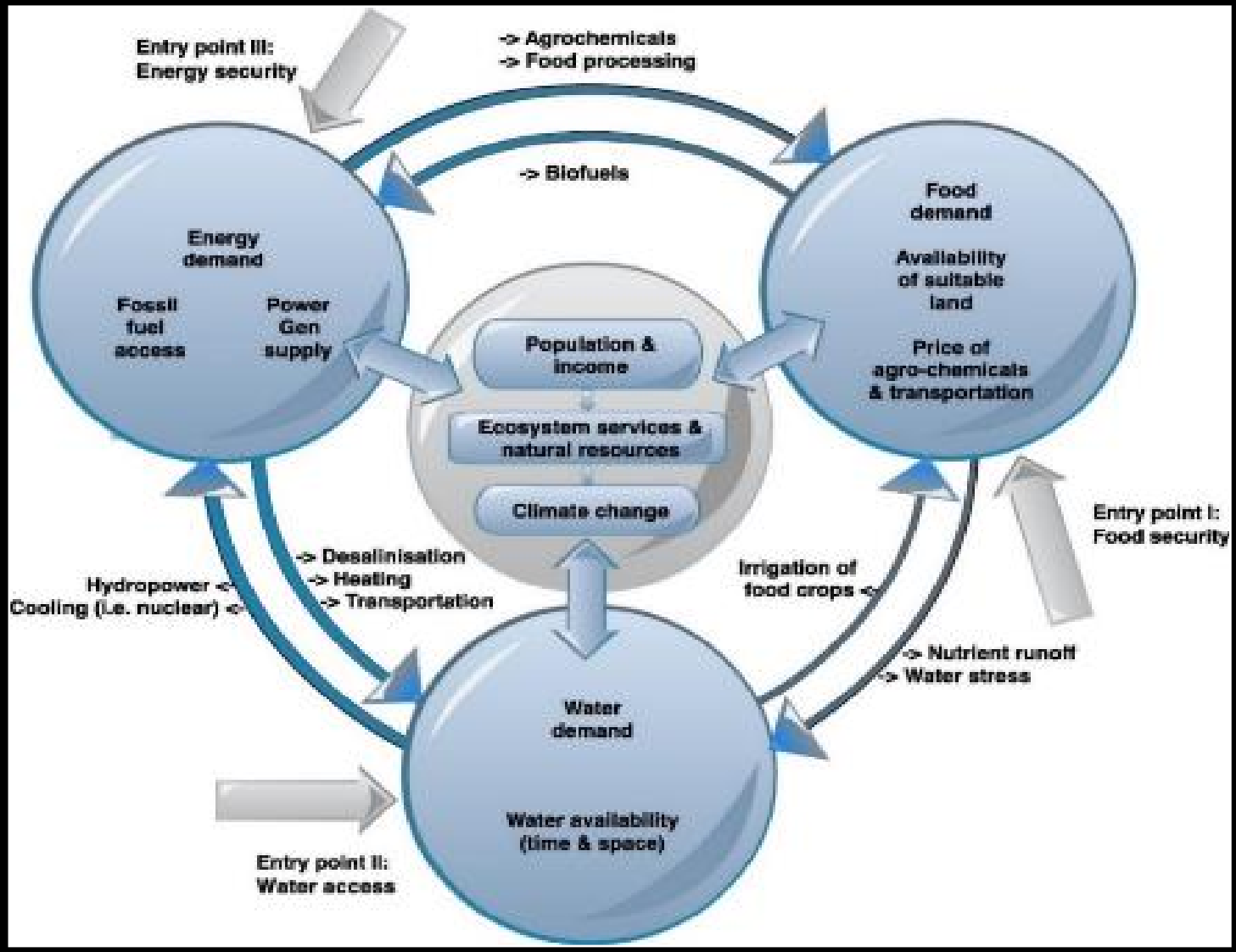
  While adapting to climate change and climate variability will push up the cost of development, for most African countries adaptation is fundamentally about sound, resilient development.

- **Taking advantage of mitigation opportunities.** Most Sub-Saharan Africa's mitigation opportunities are linked to more sustainable land and forest management, clean energy use and development (such as geothermal or hydropower) and the creation of sustainable urban transport systems.

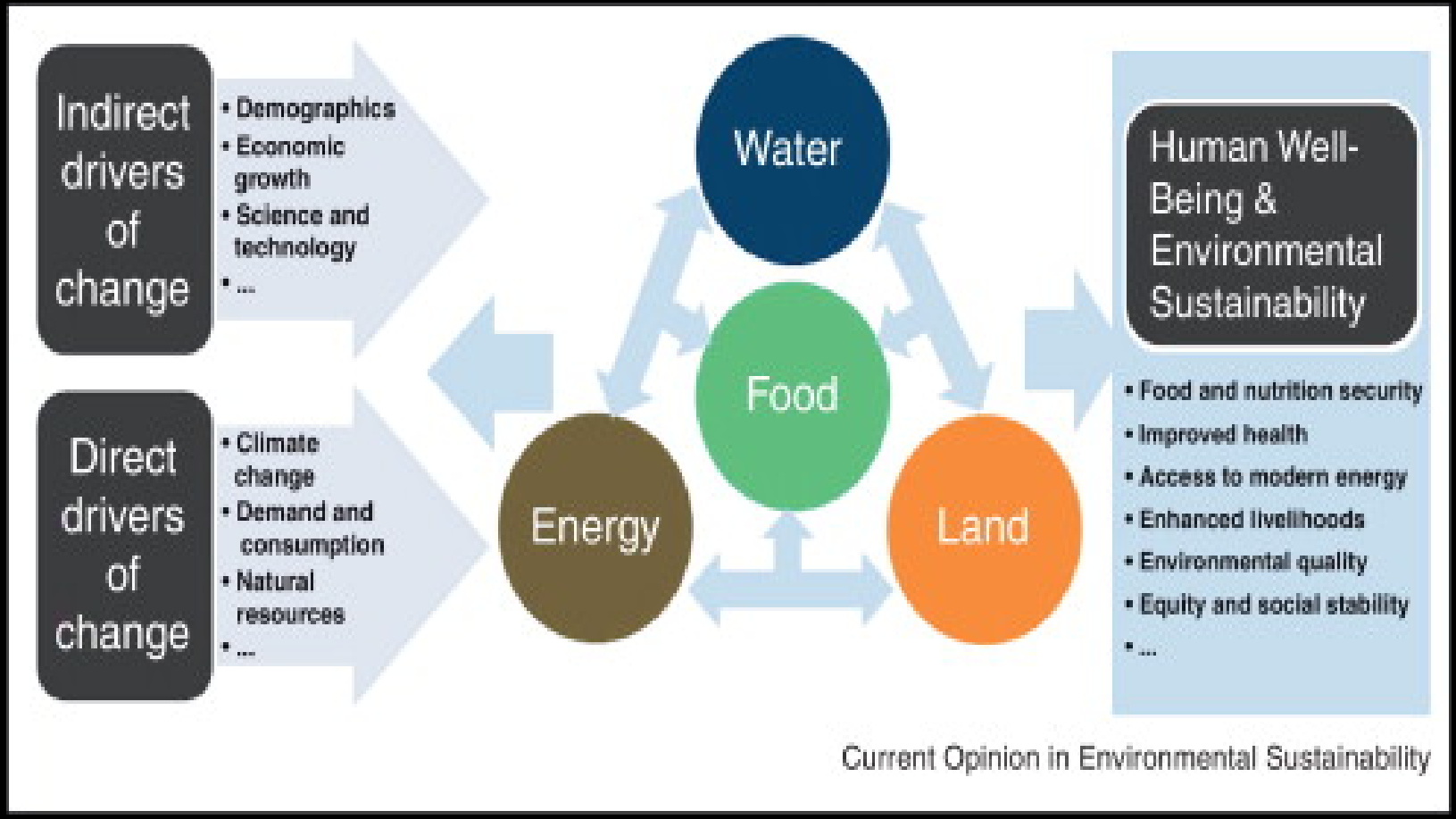
Among the Solutions

- A need for energy efficiency and renewable low-carbon technologies that require massive investments;
- Investing stimulus funds in sectors such as:
- Energy efficient technologies, including renewable energy;
- Sustainable agriculture with use of water efficiency technology;
- Sustainable management of natural resources, including ecosystems and biodiversity…..

The energy-water-food nexus



The extended water, energy, food and land nexus



Among the Solutions

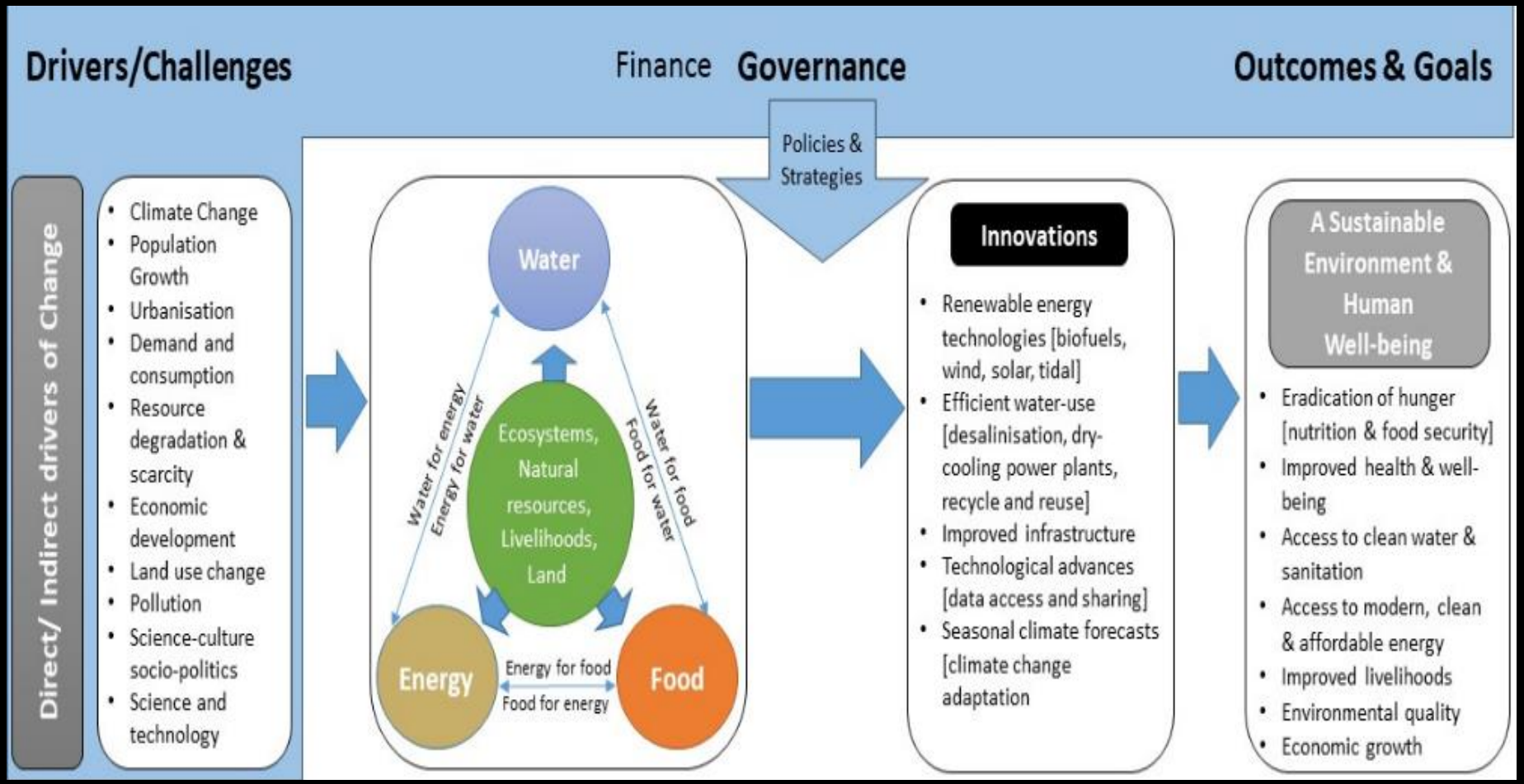
- **Managing Water.**

  Water resources can be managed better even in poor countries and among small farmers through a combination of new and existing technologies, including water conservation best practices, a development of climate-resilient crop varieties essential for food sources of growing populations in many developing countries, good information and stronger policies.

- **Protecting ecosystems.**

  Sub-Saharan Africa has some of the most important biodiversity, both terrestrial (for example, Fynbos biome in Southern Africa) and aquatic (such as Lake Victoria). Forest, grassland, coastal, freshwater, and agricultural ecosystems provide food, clean water, storage of atmospheric carbon, biodiversity, and tourism opportunities. Climate change will weaken these ecosystems, already stressed by overfishing, creeping desertification, deforestation .

A Proposed WEF nexus framework for South Africa with particular emphasis on Sustainable Development Goals (SDGs)



Conclusion

The approaches mentioned above depend on improved science and information-sharing, particularly across vulnerable transboundary basins and aquifers. A major African challenge is the weakness of models to predict climate change at the local level. Better modelling capacity is critical to ensure management options and investment decisions are based on scientifically-sound information. Defining the current state, identifying emerging trends, and anticipating possible futures and resulting vulnerabilities and risks also requires appropriate monitoring systems to provide necessary data at the appropriate scales.

With adaptation as an additional development challenge, substantial increases in financing to African countries are needed to improve land and water management systems, their capacity to adapt to the climate change, and to enhance their resilience to its impacts. A range of new and innovative financing options are therefore required, including governmental and private sources, from developed countries.

Future solutions will require a global collaborative effort, particularly from the industrial countries that are responsible for most GHG emissions since 1850, but also from countries that are now major contributors to GHG emissions. In this regard, wealthier developed countries, and major current GHG-emitting countries, must take the lead by:

•Reducing their own GHG emissions, and meeting and/or exceeding the internally-agreed emission targets;

•Meeting their financial commitments made at Global meetings and summits;
•Developing carbon pricing and phasing out perverse subsidies of all sorts;
•Implementing relevant measures to improve access by the poor to water, food and energy; and
•Reviewing existing, and developing new, trade policies that support both development and technology transfer, accompanied by training and capacity building, in developing countries, Africa in particular.

Overall, cutting vehemently the emissions where they come from, while addressing the impacts of global warming in most vulnerable zones is a must. The choices are therefore unequivocal; no matter what policy is in place; the sense of shared actions cannot rule out the sense of responsibility in emissions.

To conclude, there is an urgent need to act now to avoid severe climate change risks and impacts on water resources and human livelihoods, while also saving the species that would likely be lost on an African continent that will soon be 2 °C warmer than pre-industrial levels. The call must therefore be: ***Let's Act Now!***

Thank you