

Forest conservation in light of climate change

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by

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OUTLINE OF PRESENTATION

Definitions

Climate change in Africa

Forest conservation in light of climate change

- **Climate effects on trees and forests**
- **Forest conservation**
- **Conservation strategies under climate change**
- **The concept of climate refugia**
- **Resilience-Accommodation-Transformation nexus**

Is forest conservation possible in a changing climate?

WHAT IS FOREST?

Forest comes from a Latin word *forestis* (*silva*) literally meaning “wood outside”.

Historical England: Forest was defined as “an area, typically owned by loyalty, kept for hunting and having its own laws”.

In Middle English, Forest meant “ a wooded area kept for hunting “ and included all uncultivated land with or without trees.

WHAT IS FOREST CONSERVATION?

Conservatives :

Forest conservation in the context of protectionism

Counting trees and keeping natives out, where ever possible

Liberals:

Forest conservation is about good forest management that enhances and sustains tree and forest resources and, including sustainable utilization in support of livelihoods and socio-economic development.

WHAT IS CLIMATE CHANGE?

Climate change is a shift in climate, occurring as a result of human activities

Climate change is expressed as deviations from a regional climatology determined by analysis of long-term measurements, usually over a period of at least 30 years

IS CLIMATE IN AFRICA CHANGING?

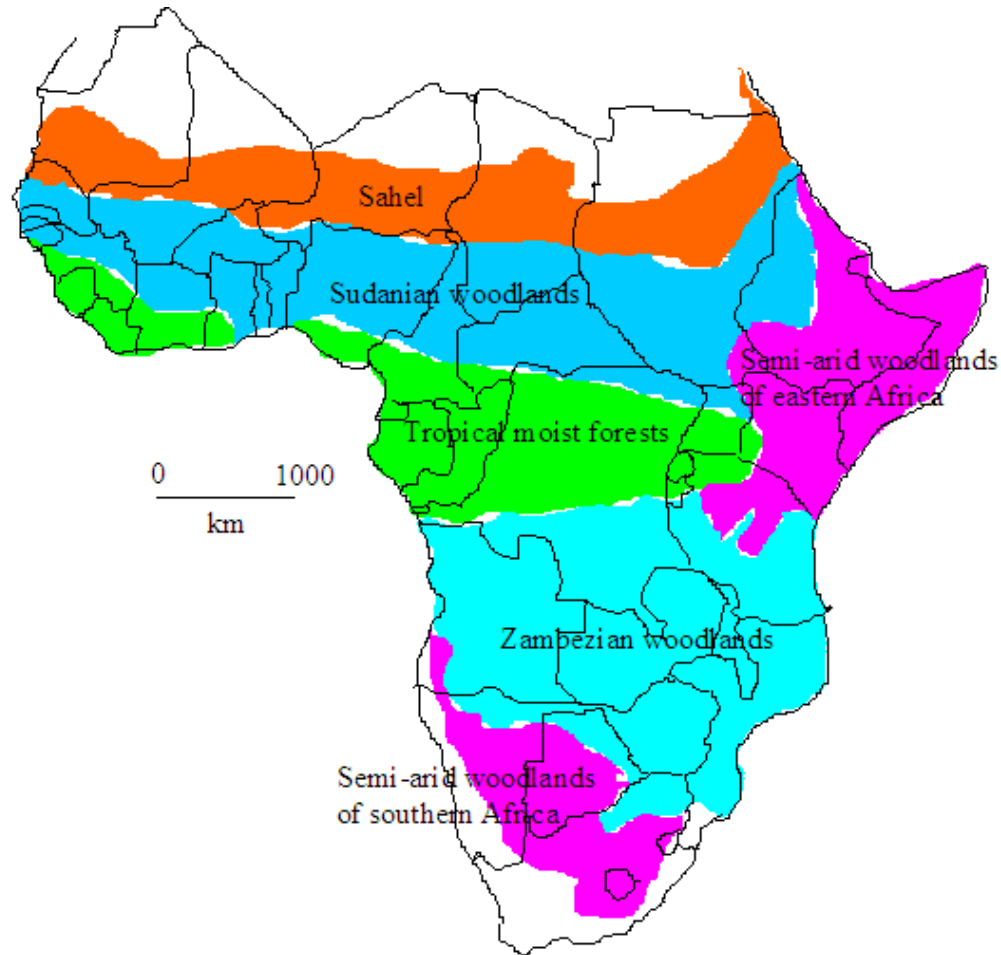
Yes! But its intensity and extent varies from eco-region to eco-region.

I distinguish 3 main eco-regions:

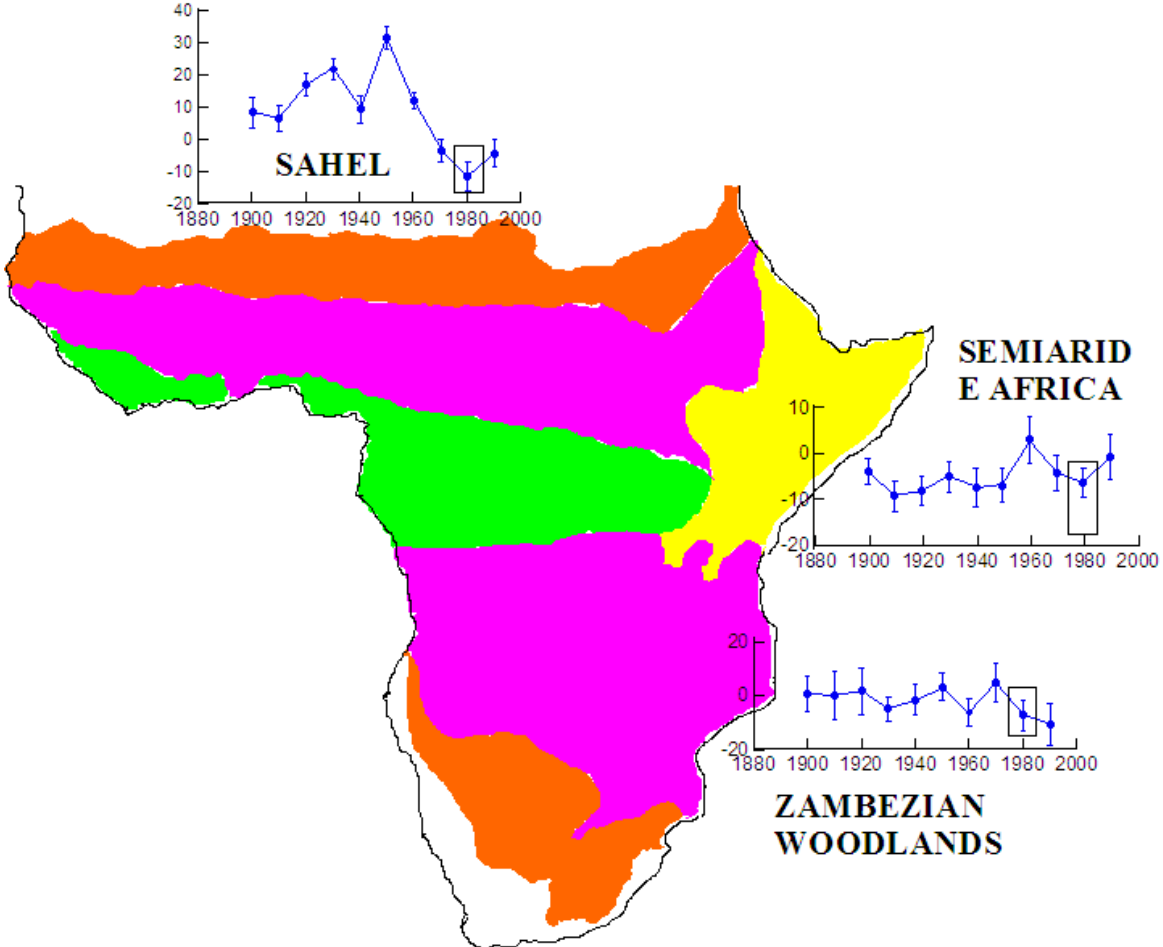
The Sahel, Woodlands & savannas and moist forests.

Woodlands & savannas are further divided into Sudanian, East African, Southern African (Zambezi) and southwest African.

ECOREGIONS IN SUB-SAHARAN AFRICA



WHAT ARE THE CLIMATIC TRENDS IN THESE REGIONS?



Precipitation: Future patterns

Fluctuations in decadal mean precipitation will continue into the future but extreme events (floods & droughts) are likely to increase in frequency and intensity.

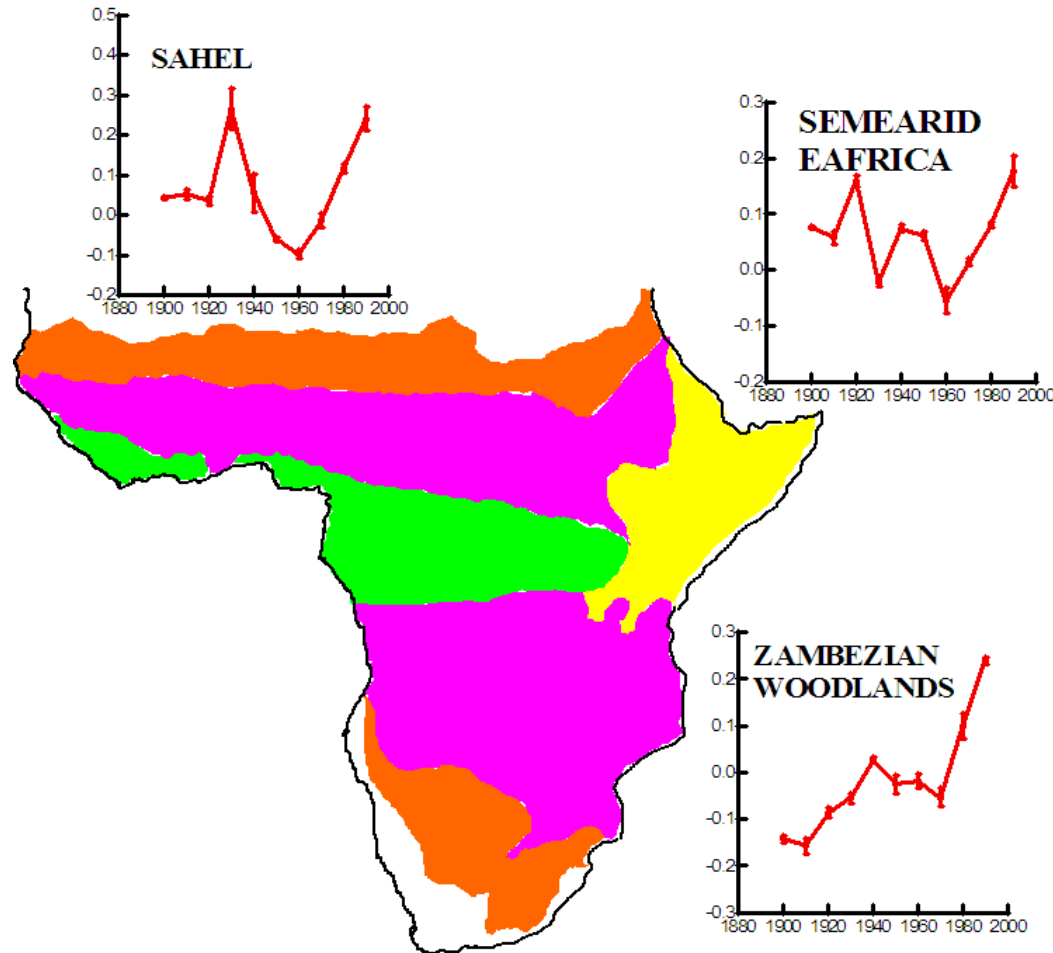
Model predictions of future precipitation patterns have been problematic due to large uncertainties partly because of the unpredictable behavior of El Niño Southern Oscillation (ENSO) and the role of deforestation in influencing regional precipitation.

Thermal patterns

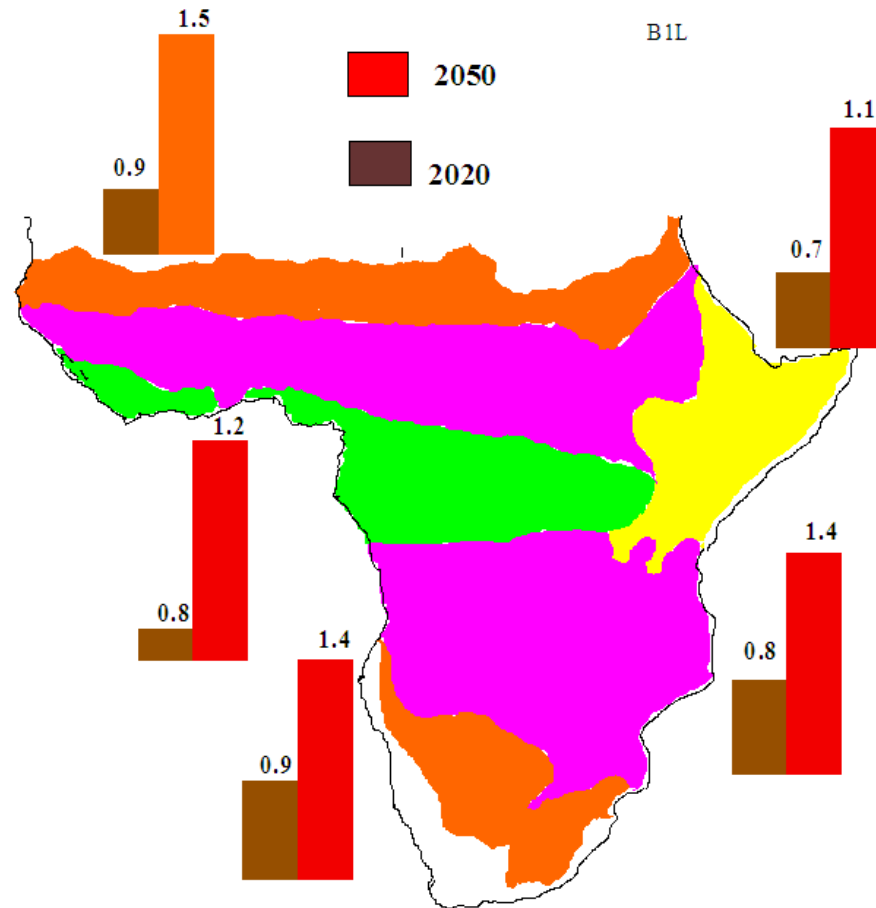
All eco-regions in Africa have been experiencing warming since the 1960s although the rate of warming varies among the eco-regions.

Model predictions indicate further warming in future.

All eco-regions have experienced significant warming from the 1960s onwards



B1 – LOW SCENARIO FOR 2020 AND 2050 (Hulme et al., 2001)



**IN THE FACE OF THESE CLIMATIC TRENDS
AND FLUCTUATIONS,**

**HOW CAN WE CONSERVE TREE AND
FOREST RESOURCES?**

Climate change affects

- ecosystem services,
- biodiversity,
- livelihoods and
- socio-economic development

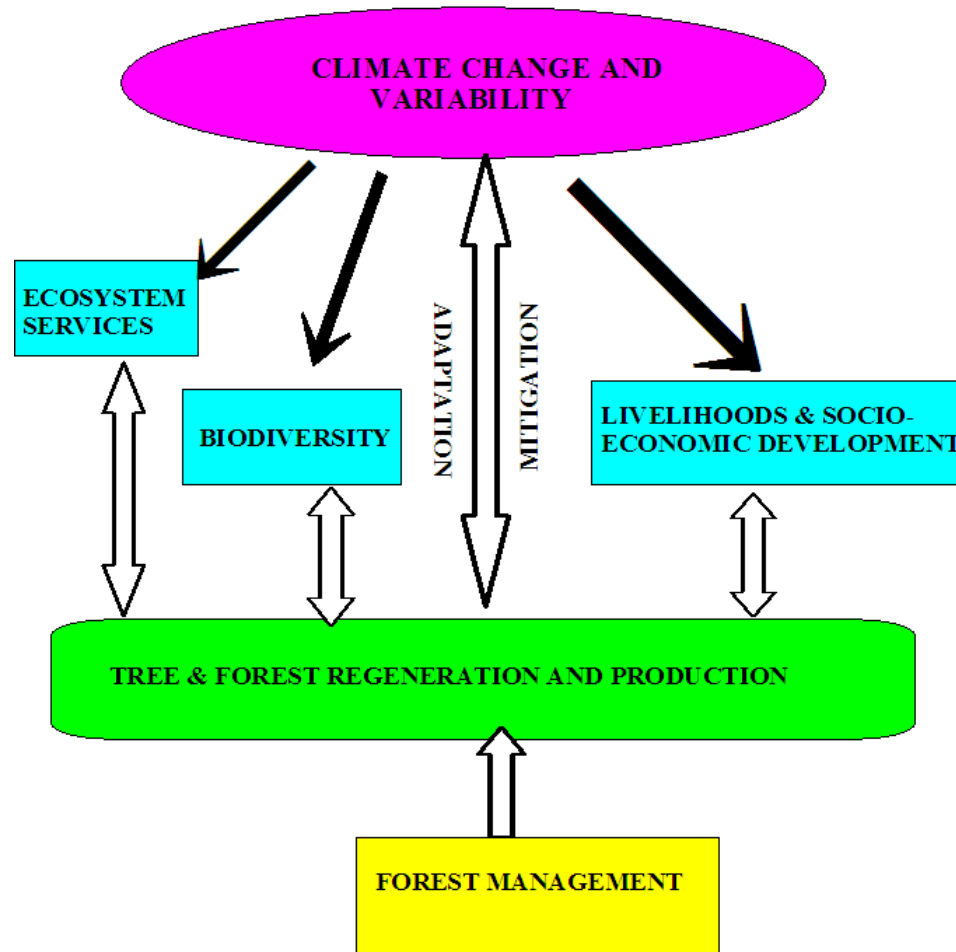
More importantly, climate change is and will affect tree and forest regeneration and production.

But trees and forests also affect climate

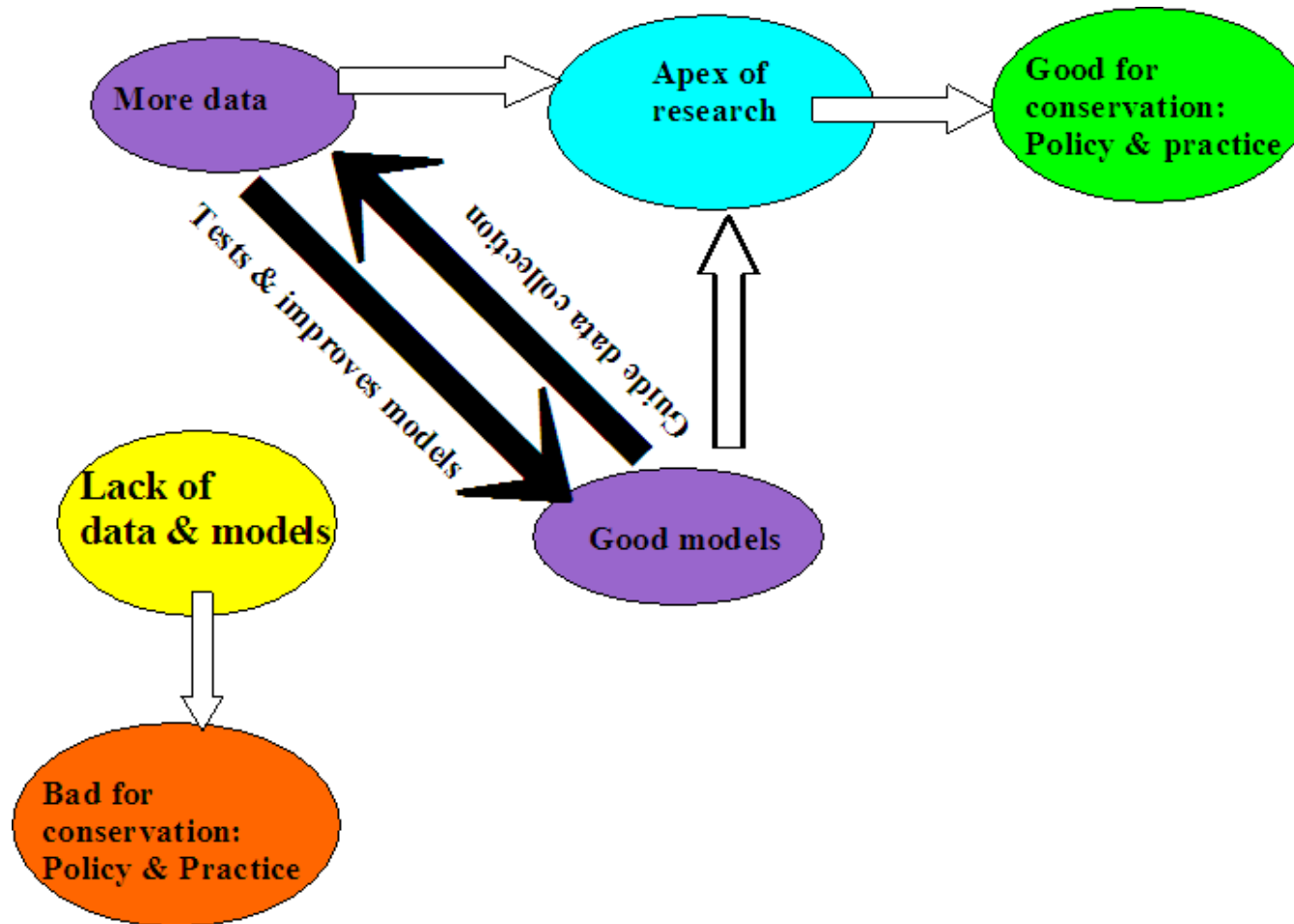
Forest conservation in the light of climate change has two important roles:

- 1. To assist trees and forests to adapt to climate change (Adaptation)**
- 2. To slow down climate change (Mitigation)**

INTERACTIONS BETWEEN CLIMATE CHANGE AND TREES & FORESTS



Good forest management stands on two pillars: Research and policy & practice



In a utopian sense:

Tree and forest conservation aims at saving all biodiversity and all ecosystem services.

In reality, due to limited resources, we need to prioritize conservation efforts.

To do this we need to set conservation objectives and direct efforts towards priority objectives.

Globally these priority conservation objectives have been guided by the IUCN Red data lists that categorize species by threat status.

The highest conservation efforts are directed at the most threatened species: those that are close to extinction and less effort is given to species that are least threatened.

The classification is based on the population size of mature or reproductive individuals in a species.

Here lies the devil in the detail.

THE IUCN APPROACH

This approach may not be appropriate in the light of climate threats to species.

Because in many cases it is the pre-adult stages that are most threatened by climate factors and therefore climate change.

California valley oak (*Quercus lobata*) (McLaughlin & Zavaleta, 2012)

The sapling stage is more vulnerable to climate change and whereas climate envelope modeling based on long-lived adult trees indicated that this species would have a wider distribution range,

Modeling using the sapling stage revealed a more constricted area of distribution. So the climate envelope for saplings was narrower and that regeneration would be restricted to areas around water bodies (habitat refugia).

Piliostigma thonningii at a Zambezian woodland site in central Zambia

Life history stage	Sensitivity to climate	Response variable	Response direction
Seed	High	Germination rate	Negative
Seedling	High	Mortality	Negative
Sapling	Very high	Radial growth	Negative
Tree	Low	Radial growth	Negative

IMPLICATIONS OF THE IUCN APPROACH

Without tree and forest regeneration there will be few or no trees and forests under the future climate.

By solely relying on the current IUCN approach for determining conservation status of species:

We will be conserving ghost trees and ghost forests consisting of giant tree zombies.

WHERE IS THE FUTURE TREE?

Based on National Geographic



CONSERVATION STRATEGIES UNDER CLIMATE CHANGE

Current conservation approaches under climate change include the following 11:

- 1. Reduce other pressures on biodiversity**
- 2. Increase the number of protected sites**
- 3. Increase the size of individual protected sites**
- 4. Provide buffer areas around protected sites**
- 5. Improve the functional connectivity between sites**
- 6. Protect / create potential refugia for species**
- 7. Maintain or increase the habitat heterogeneity at site and landscape scales**
- 8. Maintain species diversity within communities**
- 9. Protect natural processes**
- 10. Promote the potential for natural genetic exchange between populations**
- 11. Control invasive species**

How practical is it to apply these conservation approaches under climate change.

For us to use these approaches we need to first understand the functional traits of the species, especially knowledge about how species respond to climate factors.

How practical is it to apply these conservation approaches under climate change.

On the basis of responses to climate factors, species can be classified as:

Insensitive or neutral: These species will most likely persist under climate change.

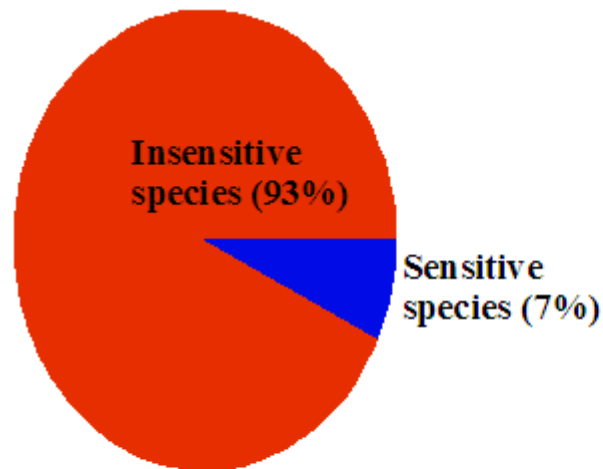
Sensitive: these species can be divided into two groups.

Adaptors: These species will not only persist but also increase demographically and expand spatially.

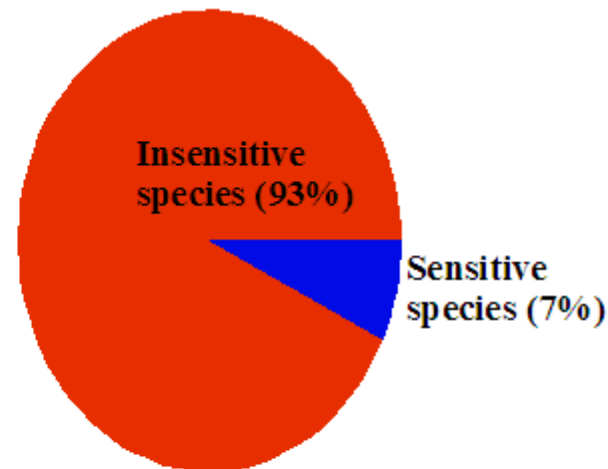
Vulnerable: These species will fail to adapt and therefore become extinct.

Brachystegia (miombo) woodland in Zambia

Results also depend on the response variable used in the screening process.

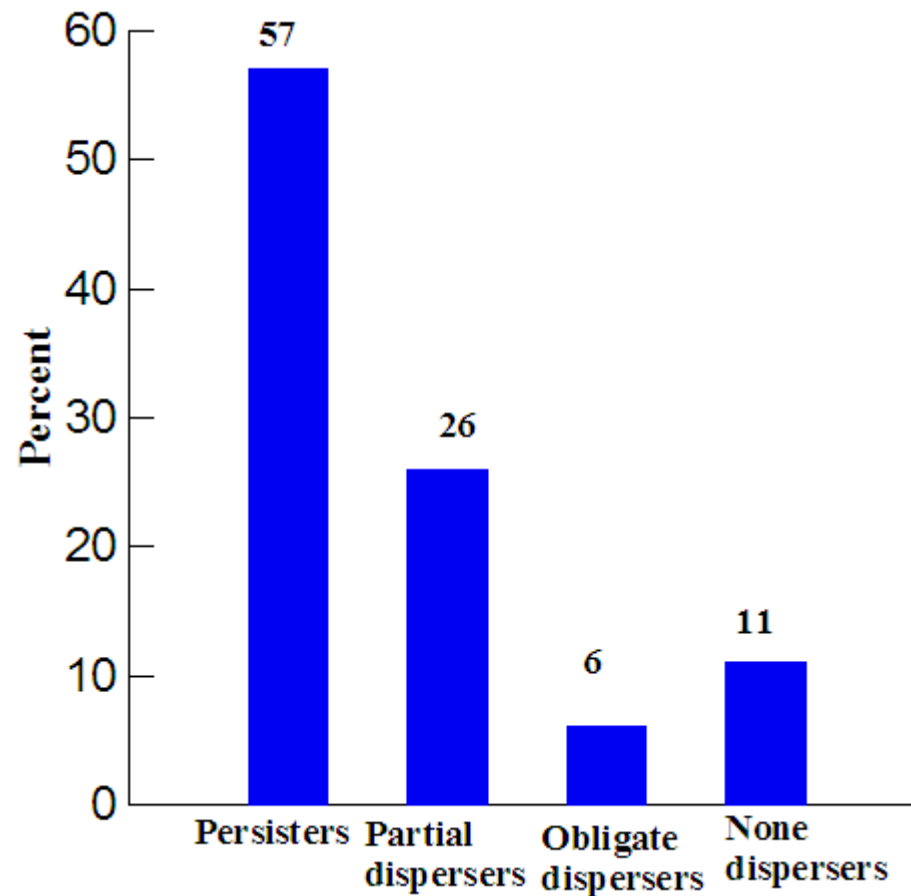


Negative Sensitivity
Reduced stem growth rate
for *Uapaca kirkiana*



Postive Sensitivity
Increased fruit production
in *Julbernardia globiflora*

Another study in South Africa focused on the dispersal traits among species of the Proteaceae in the Cape Floristic Region and came up with the following spectrum (Williams et al., 2005):



In adaptation planning for biodiversity conservation,

it is important to know which species are likely to benefit from a particular conservation approach

THE CONCEPT OF CLIMATE REFUGIA

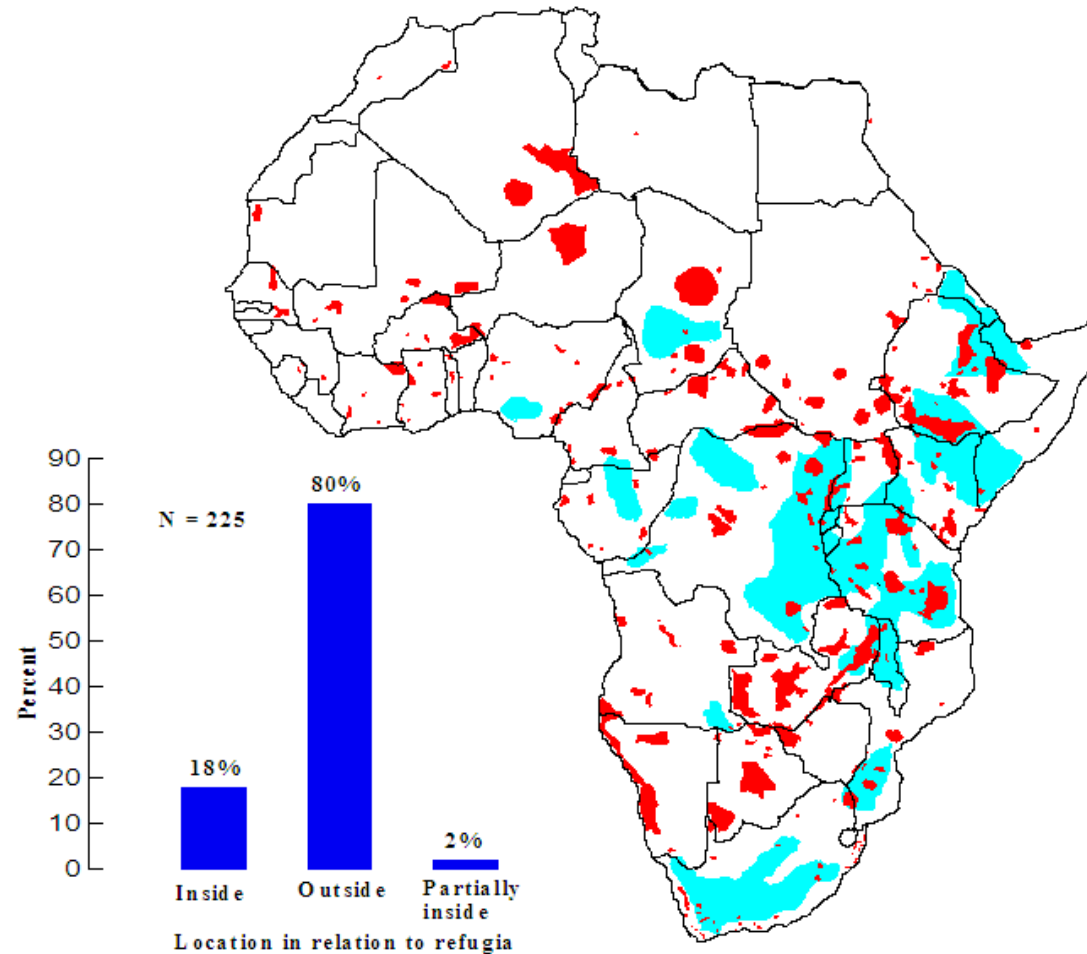
The philosophy of the climate refugia is that vulnerable species in a changing climate can survive and persist in habitats that will remain favourable under climate change or that they can migrate to the remaining favourable habitats.

But with so much habitat fragmentation under way, unless such refugia are in existing protected areas, it will not be easy for such species migrate to safety.

Hence the call to expand protected areas or create migration corridors.

In this context, let us go back to the 1980s when Africa was drying up and test the climate refugia approach to biodiversity conservation.

Distribution of wetter areas in the 1980s and large protected areas . Based on Nicholson (2001) and WCMC (1997)



To expand protected areas to include the favourable habitats in a skeptical socio-political environment will be a feat of Nobel Prize winning proportion.

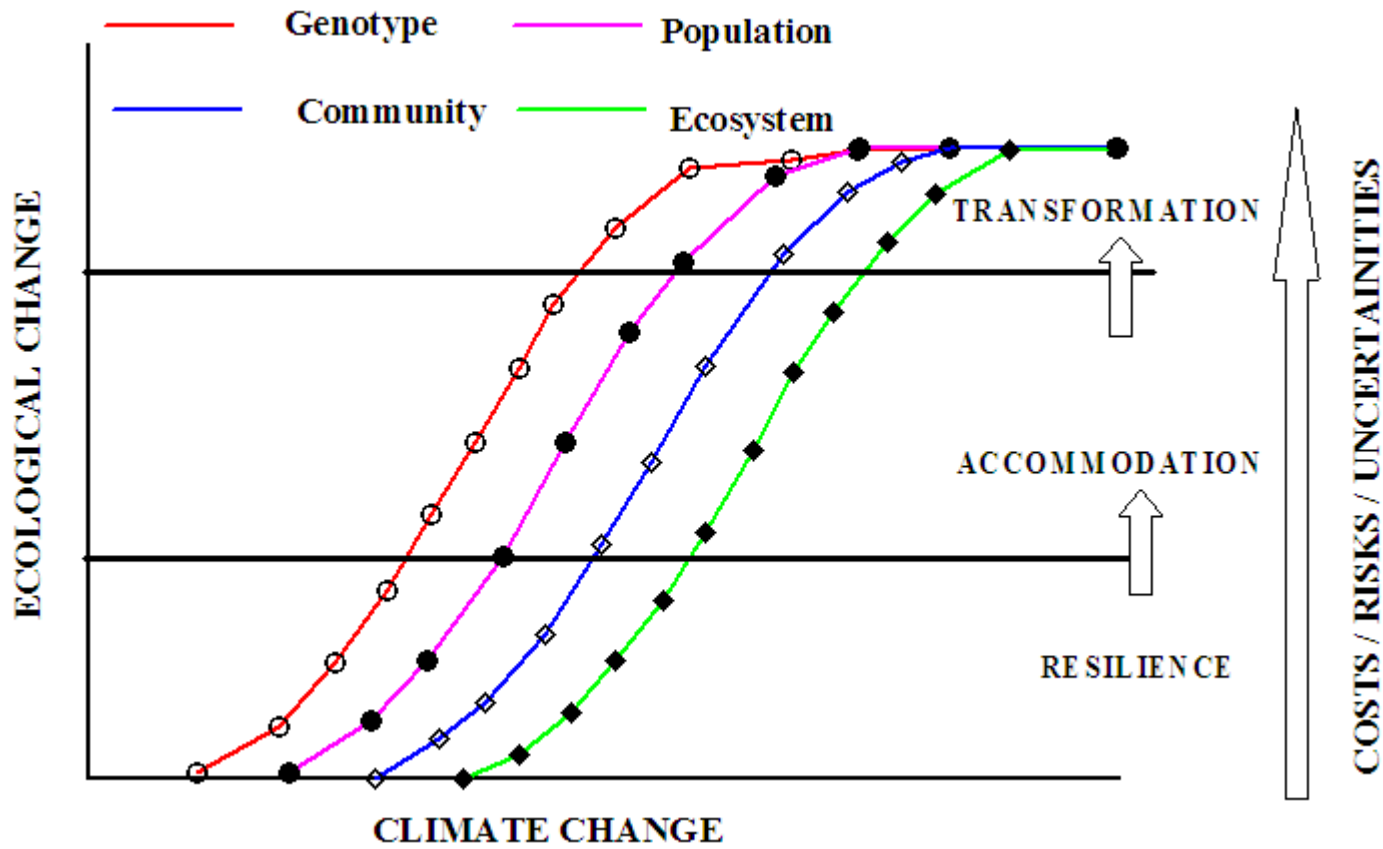
And yet, these are the challenges that conservationists will have to deal with.

This also calls for the intensification of conservation efforts within the existing protected areas that will supposedly remain favourable in the light of climate change.

This means that where adaptation is failing due to the intensification of climate change

We should resort to higher level conservation strategies.

The Resilience-Accommodation-Transformation Axis of Conservation



The three successive levels of conservation effort:

Adaptation: natural or aided leading to resilience

Accommodation: Don't fight it if you cannot win; work within the changed climatic circumstances

Transformation: Make the habitat suitable. For example, erect barriers to protect mangroves from complete submergence due to sea level rise. Or transfer water from wetter areas to drier areas to save mesic species.

But be aware that costs, risks and uncertainties increase along the this conservation axis: from adaptation to accommodation to transformation.

But if we have to bail-out the biodiversity in distress, we will have to take these risks.

**If Noah saved
biodiversity in his Ark;
Why can't the modern
world do it?**

Finally let me attempt to answer the question:

Is forest conservation possible under climate change scenarios?

I think to a large extent, Yes!

But it will take more good research, better policies and better conservation practices and perhaps the most difficult link in all this, more human and financial resources.

I thank you
Asante sana

