Climate change and biological diversity: perspectives from sub-saharan Africa

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E.M. Mwangi
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Outline

- Climate, biodiversity, people of sub-saharan Africa.
- Implications of climate change to biological diversity and communities.
- Examples of responses to climate change and future of biological diversity.

Preamble

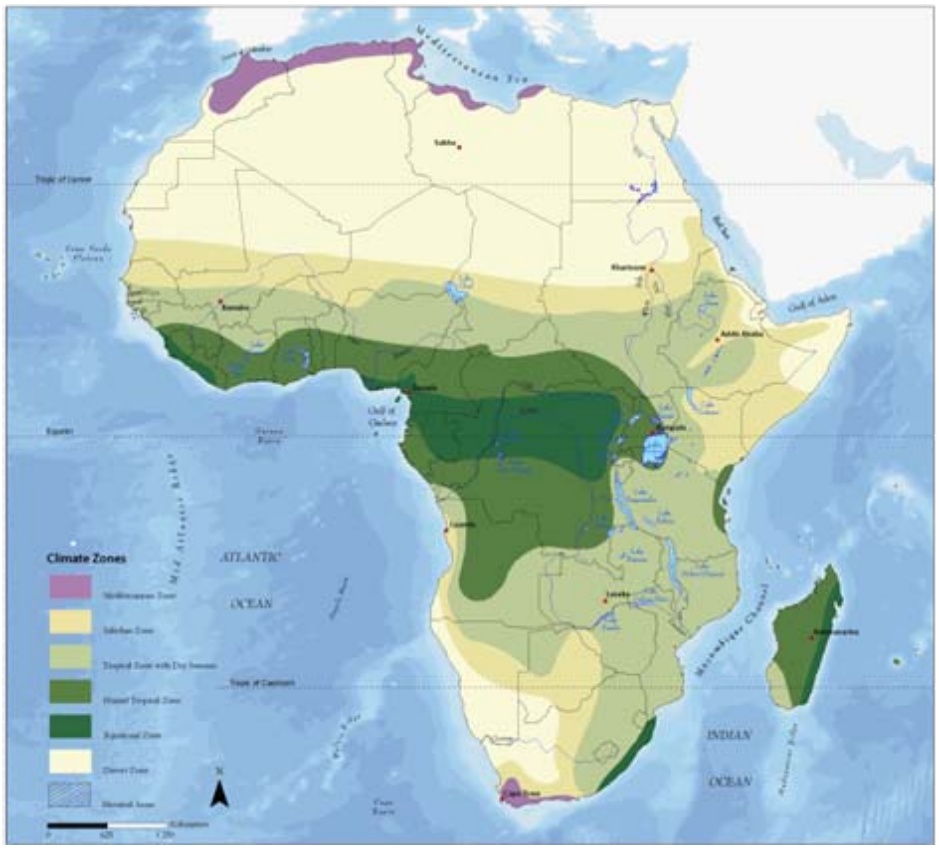
- Based on of 4 years of research and appraisal of environment and development projects.
- Draws mainly from experiences and insights from eastern, central and southern Africa.
- Distils findings and conclusions from a patchwork of activities supported by various organizations, hereby individually and collectively acknowledged.
  - ACC, AWF, IFAW, IUCN, UNDP-GEF, UNEP-GEF, USAID, WWF-EARPO, WWF-US

Snapshot of Africa's climatic regions

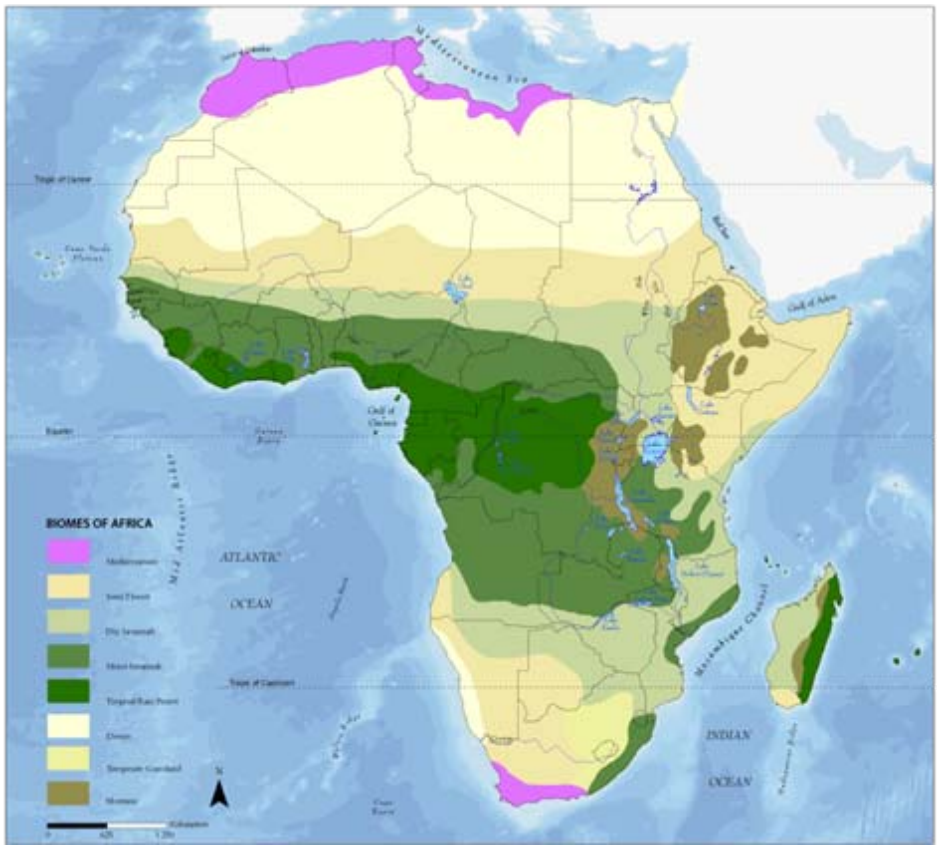
- Africa roughly divisible into five broad eco-climatic zones.
- On basis of mean temperature, rainfall and evapo-transpiration.
  - Equatorial lowland and montane forests.
  - Moist savannas.
  - Dry savannas.
  - Deserts and semi-deserts.
  - Temperate Mediterranean.
- There is a near one-to-one correspondence between Africa's climate and the distribution of living forms.

Africa’s climate and major biomes

Climatic zones



Major biomes



UNEP/GRID, 2008. Africa Atlas

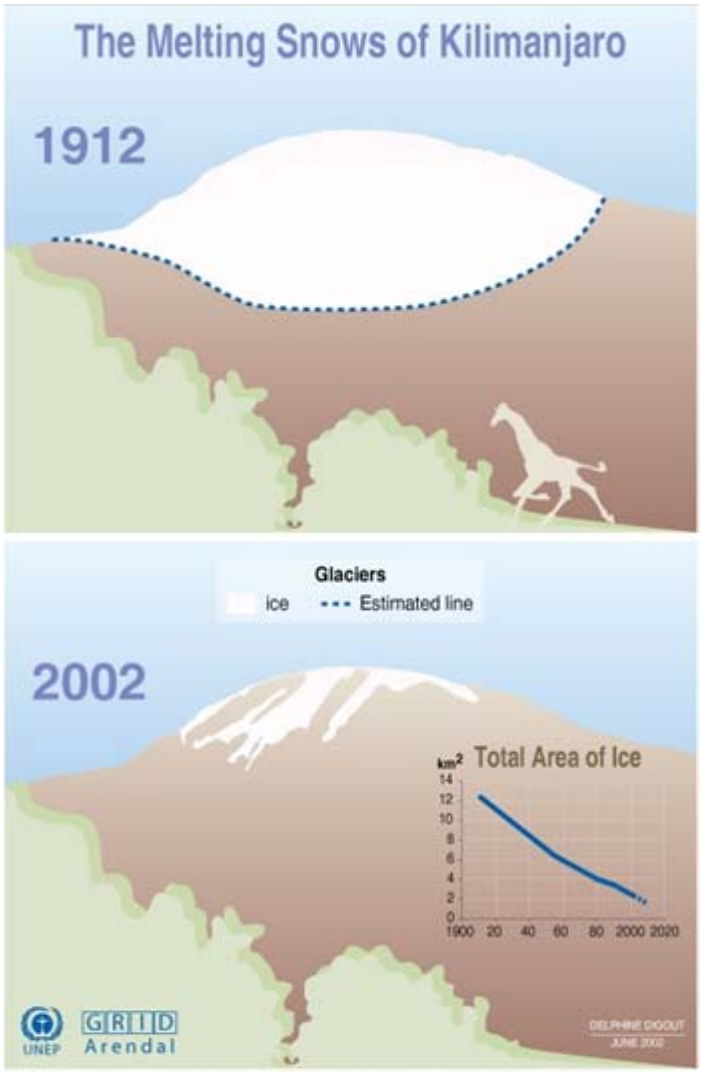
Africa's people and climate

- The cultures, livelihoods, social structures and have had an intricate link to climate throughout history.
- Cattle rearing in the erstwhile tropical savannas of what is now the Sahara - pushed out by factors that no doubt included serious climate change.
- Pastoralism itself developed as a dominant way of life in much of Africa in response to gradual climate change.
- Nearly all farming communities are wholly at the mercy of climate.

Past, present and projected trends

- Most of the continent warmed up by an average 0.7°C over the 20th Century.
- Recent projections (IPCC, 2007) indicate the possibility of warming by 0.2-0.5°C per decade.
- Land temperatures could rise by 1.4-1.6°C by 2050.
- Projections on mean seasonal rainfall are less well defined but:
  - a relatively modest increase in precipitation over the continent by 2050. In the Sahel, could be as high as 15% over the 1961-1990 average.
  - Exceptions are central-southern Africa and parts of the Horn where a 10% decline is expected.

Changing landscapes: melting snowy mountain caps

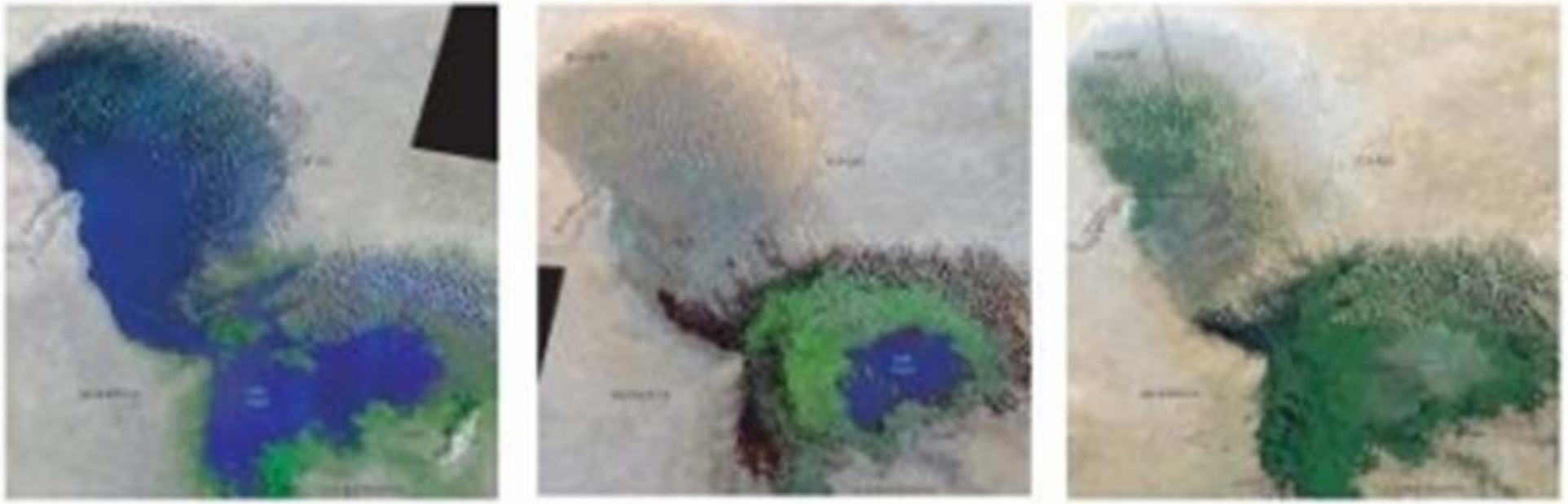


Sources: Meeting of the American Association for the Advancement of Science (AAAS), February 2001 ; Earthobservatory.nasa.gov.

- These represent the best indicators of climate change.
- Kilimanjaro: snowline down by >80% since the first survey of the summit in 1912.

Changing landscapes - shrinking lakes

- Lake Chad now 1/20th of its size 35 years ago.
- Lakes Tanganyika and Victoria have recorded similar declines.



Chad, 1972, 1987, 2001.

Photo credit: UNEP.

Implications for biological diversity and communities

- For most African ecosystems, lack of primary data limits the ability of climate change models to simulate the future.
- Despite some uncertainties, climate will impinge heavily on biological diversity in sub-saharan Africa and the lives of the people.
- Best indications in the more thoroughly studied ecosystems.
- Recent simulations of current vegetation patterns have revealed important trends.
- Response by animal species can be expected to closely reflect vegetation dynamics.

Implications cont'd

- A few but increasingly conclusive studies are beginning to bring out the best insights.
- Habitat shifts have been predicted for at least 80% of more than 5,000 African plant species.
- For at least 25% of these, complete significant losses could occur by the end of this century.
- In general, those ecosystems dominated by perennial, long-lived components of the vegetation (tree-dominated) will likely change more slowly than those dominated by relatively ephemeral or ecologically specialized species (grasses, succulents).

Ecosystems

- The moister savannas may become more sparse where precipitation is reduced during the growing season - as is expected to happen in central-southern Africa.
- The warmer and drier sahel already has a reduced growing season but conditions are destined to reverse.
- Ideally, species would migrate at different rates across the fragmented landscapes – but many barriers already stand in the way.
- The tropical rain forests and montane forests exist in a very narrow optimum temperature range and any increase would have measurable impact.

The quiver tree in south west Africa

- A detailed study in southern Africa found strong evidence of an emerging range shift that closely mirrors anthropogenic climate change.
- Fate of species similar to that of the Joshua trees in the US.

Photo: © Caroline Auzias

Animal life

- As is the case with plants, response would primarily follow an escalation of the existing aridity gradients.
- Species that depend on seasonal habitats (such as migratory herbivores that track changes in plant production) present a major concern.
  - The huge herds of migratory ungulates that distinguish the ecology of east and southern Africa are a case in point.
- A broad assessment of the sensitivity of large wild African mammal species has recently pointed to a westward range shift of species around the equator, and an eastward shift in southern Africa.

Protected areas

- Many PAs– the bastions, some have said, for biodiversity conservation would be affected by the expected range shifts.
- Indications are that impacts will be most strongly manifested in community composition.
  - National parks located in the drier zones are faced with species losses beyond that which can be compensated by influxes, resulting in overall decline in biodiversity.
- Those in the more mesic zones could potentially accommodate greater biodiversity.
  - Many of these are already increasingly under pressure from the spread of agriculture and human populations.
  - Discontinuity in migration routes would however restrict gains to those species or groups that can easily cross barriers.

The future of parks

- Many indications are for species impoverishment, especially for the landmark large mammals.
  - Broad swings in climate change would negatively affecting the role of parks as saviors of Africa's biodiversity.
  - Protected areas could therefore be derailed from meeting their original objectives, though the full implications are highly uncertain.

Adaptation – what are communities doing?

- Expanding opportunities: many communities are engaging in projects focusing on less development impacts, capable of withstanding and even thriving through climate change.
  - Ecotourism, sustainable household energy, small-scale energy projects.
- Adoption of technologically novel, and culturally unfamiliar household gadgets - such as parabolic solar cookers introduced by a project targeting Botswana, Kenya and Mali.
  - Upto 60% reduction of fuel-wood consumption achieved in trials on one highly dependent dryland community – Marsabit Kenya.
- Recent initiative has brought Madagascar, government, communities and foreign firms together to embark on sale of more than nine million tons of carbon offsets to help safeguard a wildlife-rich forest.
  - A major contribution to economic wellbeing while helping fight climate change.

Shompole eco-lodge, Kenya

New eco-lodge on a group ranch and domestic solar energy

Enhancing effectiveness and benefits of conservation programs

- New approaches and concepts to community-based conservation and development – landscape-level approaches, reduced state control.
  - Also presents the only viable way to 'expand' the PA network in light of current constraints.

Rise of community-owned conservancies

Rethinking the PA network

- Emphasis on new, more interlinked PAs and better incorporating community needs.
- For example, transboundary protected areas that incorporate people – a new fad all over the continent.
  - The Great Limpopo Transfrontier Park brings a total some 35,383km² under effective conservation and opens new livelihood frontiers for surrounding communities.
  - The Tridom, extending over Congo, Gabon and Cameroon covering some 141,000 km², ¼ of which is under protected areas.

Great Limpopo transfrontier park

Map credit: SANParks™ - Official Website

Surveys for a new reserve in the tropical forests of Cameroon

Great care being taken to involve local people.

Photo credit: Dr Jean Folack, CERECOMA, Cameroon

Alternative incomes

- Commercial extraction and processing of gums and resins - *Commiphora sp- Acacia senegal* in northern Kenya/southern Sudan.
- Adoption of non-traditional commercial crops – such as Aloe farming.
- Others include highly valued oil extracts from *Commiphora sp*.

Changing perceptions

- Reseeding of degraded pasture – like this attempt with Rhodes grass *Chloris gayana*, Laikipia, Kenya.
- Or developing tolerance for previously despised species – like this *Acacia mellifera* in flower at the peak of dry season in Samburu, kenya.

Acknowledgements

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- WWF-US