Ecosystem Services and Climate Change: Towards integrated response strategies

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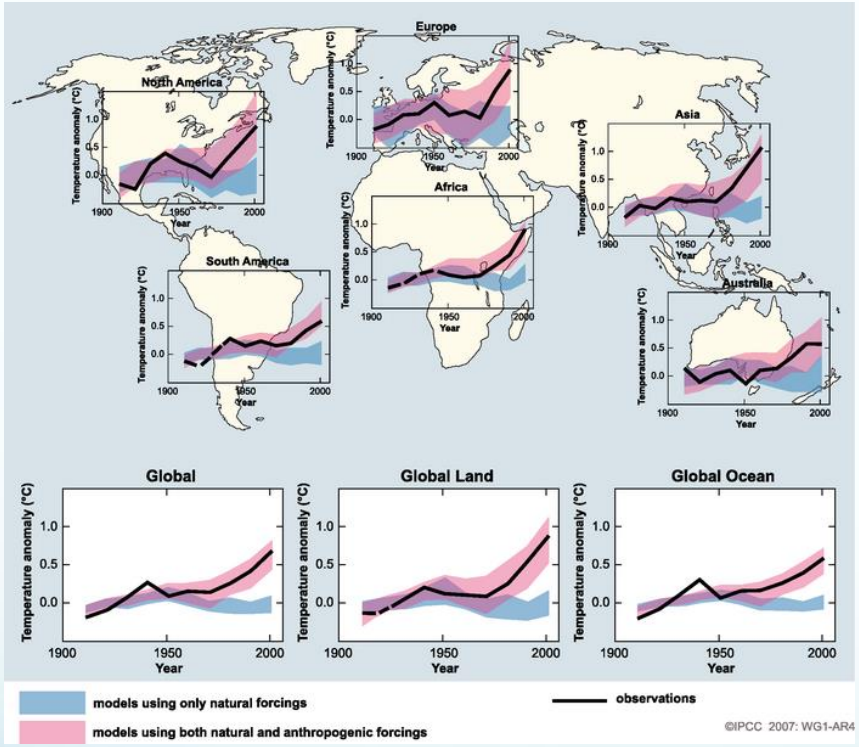
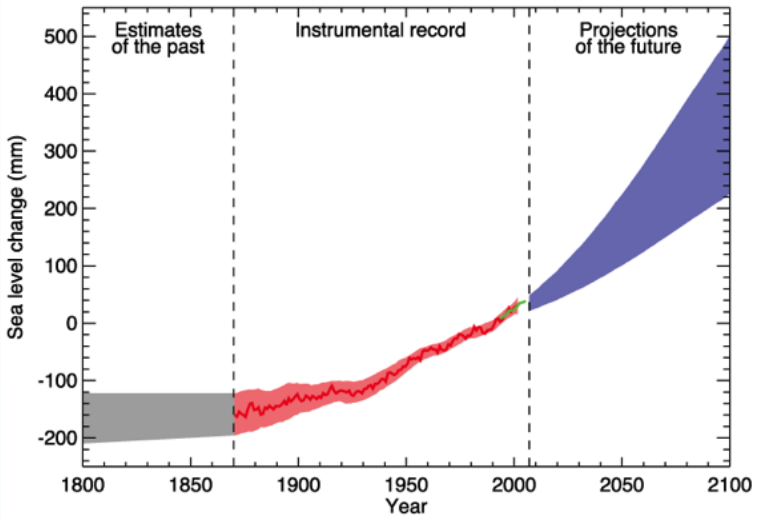
Climate Change

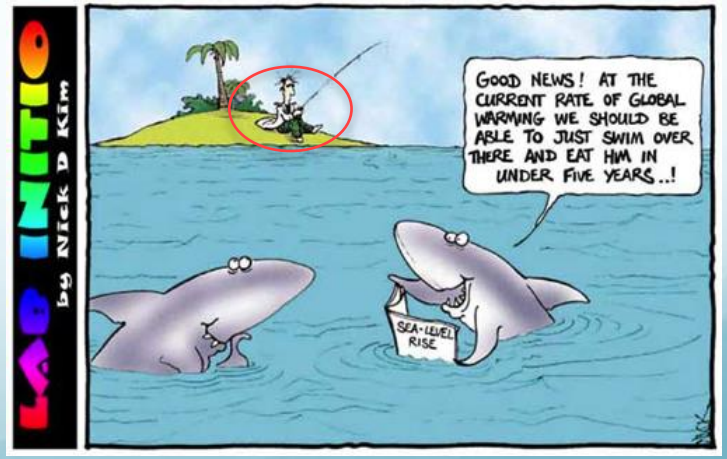
The warming effect



- Coolest future summers are hotter than hottest summers of past 50 years.
- (Diffenbaugh & Scherer, 2011).

Sea level rise





Source: http://thebritishgeographer.weebly.com/sea-level-change.html

We are responsible!

- **Only 5 out of 24,210 articles** reject Anthropogenic Global Warming.
- **Only 4 out of 69,406 authors** (1 out of 17,352 authors) reject Anthropogenic Global Warming.

- Search terms used: “global warming” or “global climate change” or “climate change.”
- Source of data: ISI Web of Science climate change related articles published in 2013 and 2014.
- http://www.jamespowell.org/index.html. Accessed 24-11-2015.

Can we do both effectively?

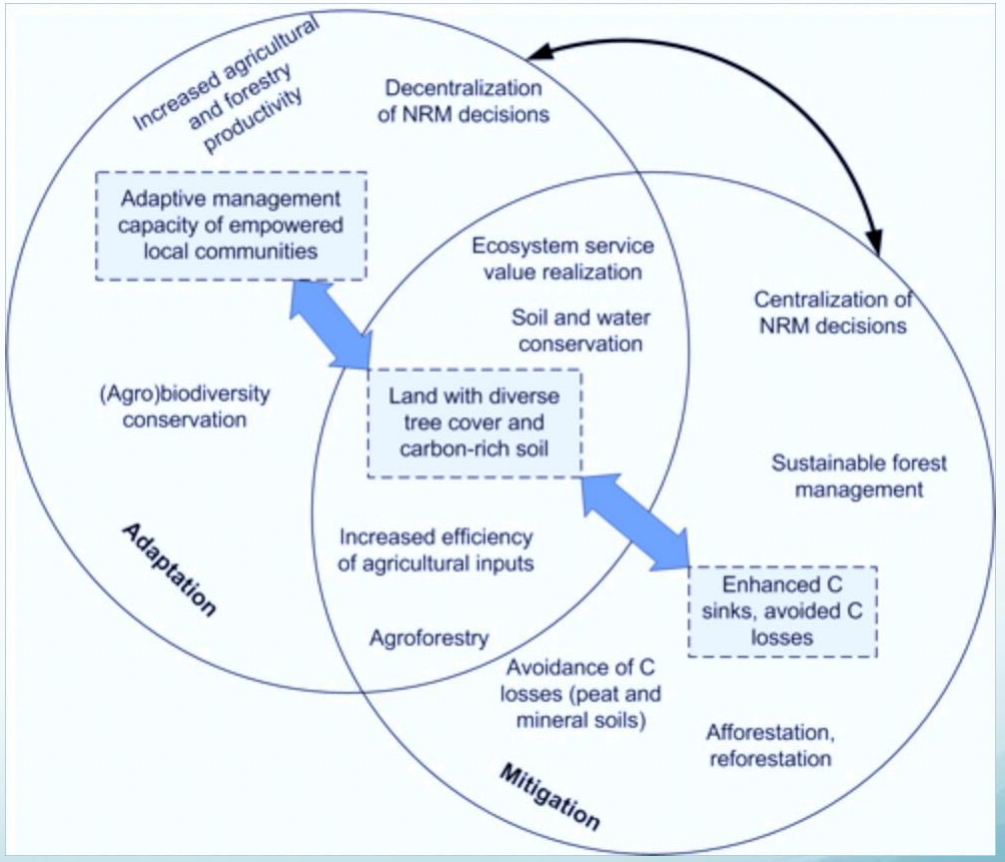
Adaptation

Mitigation

Ecosystem-based approaches provide a platform for jointly addressing A and M.

Ecosystem based approaches are relatively:

- **Cost effective**: depending on the choice of activities multiple outputs could be achieved.
- **Efficient**: both A and M can be addressed at a time.
- **Locally relevant**: Ecosystem based approaches connect with local communities.



Duguma et al 2014a, 2014b;
Van Noordwijk et al 2015

Most CC related policies, strategies, approaches and initiatives rely on ecosystems!

REDD+*

NAMA

NAPA

Bonn Challenge - FLR

Climate smart agriculture

REALU

INDC

Climate smart landscapes

Wetlands Restoration and Conservation (WRC)*

Improved forest management*

Afforestation, Reforestation and Revegetation (ARR)*

Avoided Conversion of Grasslands and Shrublands (ACoGS)*

* Typical AFOLU practices

Ecosystem services reduce exposure to climate change impacts!

Ecosystems	Roles in addressing climate change related impacts
Mountain forests	• Stabilize snow reducing the risk of **avalanches** • Protect against erosion and increase **slope stability** by binding soil together; preventing **landslides** • Reduce risk of **floods** by increasing infiltration of rainfall and delaying peak floodwater flows • **Water recharge and purification**, **drought** mitigation
Wetlands and floodplains	• Control **floods** in coastal areas • Reduce the speed and volume of **runoff** after heavy rainfall
Mangroves and Coral reefs	• Absorb (low-magnitude) **wave energy**, reduce **wave heights**
Drylands	• Vegetation in drylands ameliorate the effects of **drought** and control **desertification**. Trees, grasses, and shrubs conserve soil and retain moisture.

Uy, N., & Shaw, R. (2012). The role of ecosystems in climate change adaptation and disaster risk reduction. *Ecosystem-Based Adaptation*, *12*, 41-59.

Ecosystems deliver ecosystems services that enhance adaptive capacity!

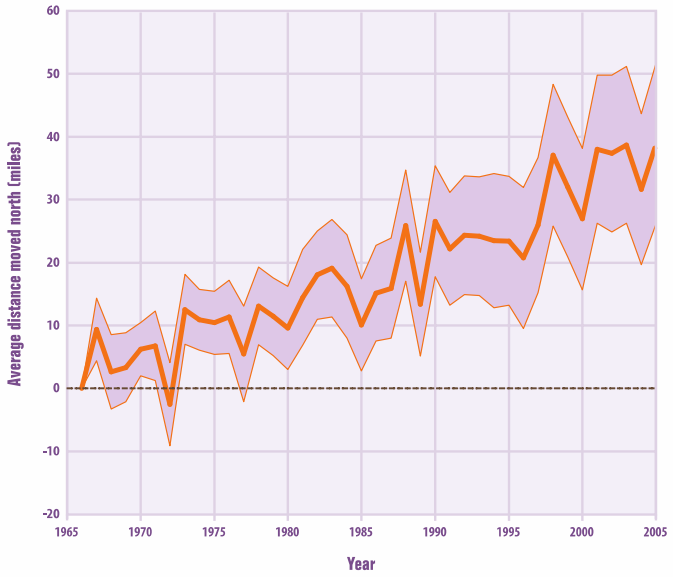
Generic indicators for adaptive capacity (IPCC)	Roles of ecosystems
Income	▪ NTFPs collected and sold from forest ecosystems. E.g. Fuelwood, honey, forest foods, bush meat ▪ Fish and other sea foods ▪ Income from tourism
Health	▪ Medicinal plants (traditional medicines) ▪ Medical therapies ▪ Ingredients for pharmaceuticals (*Prunus africana* trees) ▪ Biodegradation of toxic chemicals e.g. microbial degradation ▪ Provision of nutritious foods
Education	▪ Easily accessible goods and service that spare time for women to engage in education ▪ Source of materials for building schools, etc.

Despite their roles for addressing CC, ecosystems are also prone to CC impacts!

Climate change affects ecosystem structure, functions and processes:

- Pollination
- Migration behaviours
- Habitat quality
- Biodiversity
- Microbial activity
- Nutrient flow and dynamics
- Hydrology
- Wildfire and insect outbreaks

Northward Shift of Bird Migrations, 1966–2005



Source: National Audubon Society. 2009. www.audubon.org/bird/bacc/techreport.html

Hundreds of species of birds in North America are wintering farther north in recent years.

Grimm et al. (2013). The impacts of climate change on ecosystem structure and function. *Frontiers in Ecology and the Environment* 11: 474–482. http://dx.doi.org/10.1890/120282

So what can we do?

Sustain: sustaining the existence of intact ecosystems and maintaining their potential to deliver ES is paramount.

Rehabilitate: If ecosystems are degraded/ being degraded, rehabilitation could enhance A&M roles.

Facilitate: CC affects even intact ecosystems. Innovation is crucial.

Concluding thoughts

- To make climate change actions sustainable and effective, promoting sustainable ecosystem management is crucial.
- Exposure to CC related disasters may increase and adaptive capacity may decline if ecosystem degradation is not addressed.
- There is a strong need for a system level adaptation e.g. looking at socio-ecological systems.

Thank You!

World Agroforestry Centre

ASB Partnership for the Tropical Forest Margins

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