

Ecosystem-Based Adaptation in Action: Six Stories

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Ecosystem-based Approaches to Adaptation:
From Concept to Action.

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Introduction

- Ecosystem-Based Adaptation (EBA)
 - Ecosystem services for reducing human vulnerability to climate variability and change
- What scientific evidence on EBA?
 - We need this evidence to move EBA from concepts to action
- Literature review
 - Peer-review papers on forests or trees and human vulnerability
- Six major stories emerged from the review

Forests and trees



Provisioning services

Regulating services

Six major stories

1. Products



2. Agriculture



3. Watersheds



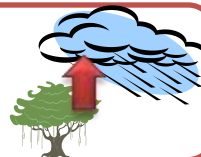
4. Coasts



5. Cities



6. Regional climate



Local
adaptation

Meso-level
adaptation

Regional
adaptation



1. Products

■ Forests and trees

- Provide safety nets for local communities coping with climate shocks
- Increase livelihood diversification (anticipatory strategy)

■ Examples:

- Honduras: smallholders sold timber to recover from asset loss due to hurricane Mitch (McSweeney, 2005)
- Tanzania: diversification with firewood, charcoal, timber, fruits etc. as adaptive strategy (Paavola, 2008)

■ Issues:

- Poverty trap? (out of the forest, out of vulnerability?)
- Sustainability of natural resources for adaptation
- Property rights and access





2. Agriculture

■ Trees in agriculture

- Maintain production under climate variability and protect crops against extremes
- Local shade cover, soil fertility & moisture, wind breaks, water infiltration

■ Examples:

- Malawi: agroforestry with *Faidherbia* & *Gliricidia*. At least modest grain yields during drought (Garrity et al., 2010) but also fodder and shade in dry season
- Mexico: Protection of coffee from microclimate extremes in Mexico: control of temperature & humidity fluctuations, also protection from storm & wind (Lin et al., 2010)

■ Issues:

- Trade-offs: production vs. resilience





3. Watersheds

- Forests in watersheds:
 - Regulate base flows (dry seasons), peak flows (intense rainfall), and stabilize soil (landslide risks)
- Examples:
 - Indonesia (Flores): Agrarian communities in the proximity of forested watersheds in Flores show lower impacts and higher profits during droughts (Pattanayak and Kramer, 2001)
 - Philippines: Cyclone damage linked to watershed deforestation (landslide, river overflows, flooding) (Gaillard et al., 2007)
- Issues:
 - Trade-offs between services (e.g. more regularity but less total water)
 - Not enough evidence, many studies based on common wisdom, controversies (e.g. floods and forests)





4. Coasts

■ Coastal forests

- Absorb and dissipate wave energy and stabilize coastal land
- Protection from tropical storms, sea level rise, floods and coastal erosion

■ Examples:

- India (Orissa): Cyclone protection. Villages behind mangroves suffered less losses of life, property and crops during 1999 cyclone (Badola & Hussain, 2005)
- Vietnam: Reducing dyke maintenance costs. Benefits of \$70–130 per ha/year (Das & Vincent, 2009; Tri et al., 1998)

■ Issues

- What level of protection from extremes?
- Where is the forest best positioned?





5. Cities

■ Urban forests & trees

- Regulate temperature and water for resilient urban settlements
- Services: Shading, evaporative cooling, rainwater interception, storage and infiltration

■ Examples

- Manchester (UK): Reducing urban flood risk. Trees can reduce volume of surface runoff (by 5 to 6%) (Gills et al., 2007)
- New Jersey (USA): Reducing “urban heat island” effect and heat stress. Areas with mature canopies are 2.7–3.3°C cooler than areas without trees (Solecki et al., 2005)

■ Issues

- Opportunity costs
- Studies almost only in developed countries





6. Regional climate



- Forests can influence regional climate:
 - Cooling effect through increased evaporation and cloud cover
 - Influence on precipitation: water pumping & rainfall recycling
- Examples
 - Amazon and West Africa: 40% of rainfall come from evapotranspiration over land (Ellison et al., 2012)
 - Sahel: Biotic pump effect of forests, facilitating movements of water vapor from the Gulf of Guinea to the Sahel (Makarieva et al., 2009)
- Issues
 - Controversies and lack of solid science
 - Multiple scales involved (local, regional, global)
 - => How policies could address this role of forests?

Conclusions

■ Scales and evidence on EBA



Local
adaptation

Meso-level
adaptation

Regional
adaptation

More evidence



More knowledge gaps
and controversies

■ A lot of the available knowledge (e.g. forest hydrology) should be revisited with a climate change adaptation lens



Thank you!

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