

# Integrating Ecosystem-based Adaptation and Mitigation in Africa: Policy and Practice



Bruno Locatelli (CIRAD-CIFOR)



Keynote in Regional Session L1.1 Africa

CLIMATE-SMART  
**Agriculture**  
2015



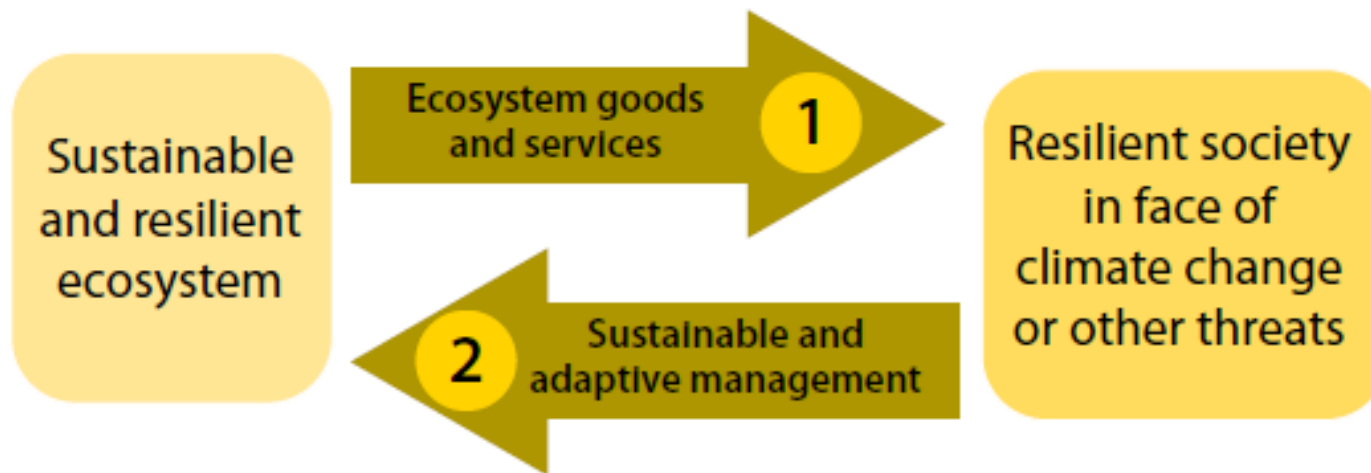
Global Science Conference

March 16-18, 2015  
Le Corum, Montpellier France

---

# Ecosystem-based Adaptation (EbA)

- “The use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change” (CBD, 2009)
- A human centered approach



(Locatelli B., 2011)

---

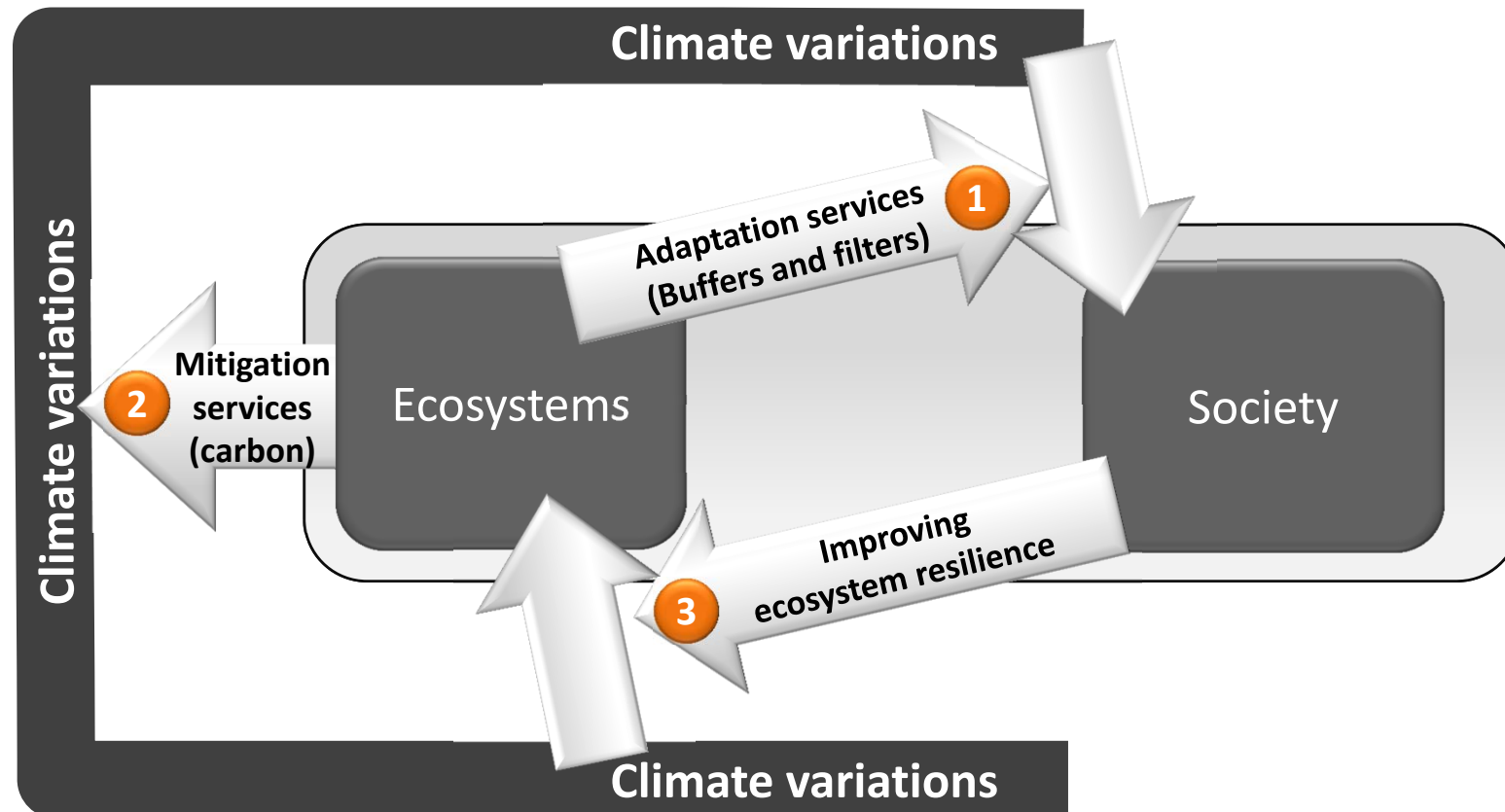


# Ecosystem-based Adaptation (EbA): how does it relate to this conference?



# Climate-smart ecosystem management

- 1 Ecosystems help people adapt (buffers and filters): EbA
- 2 Ecosystems mitigate climate change (carbon)
- 3 Management improves ecosystem resilience



# Ecosystem-based Adaptation (EbA)

- What scientific evidence?
  - We need this evidence to move EbA from concepts to action



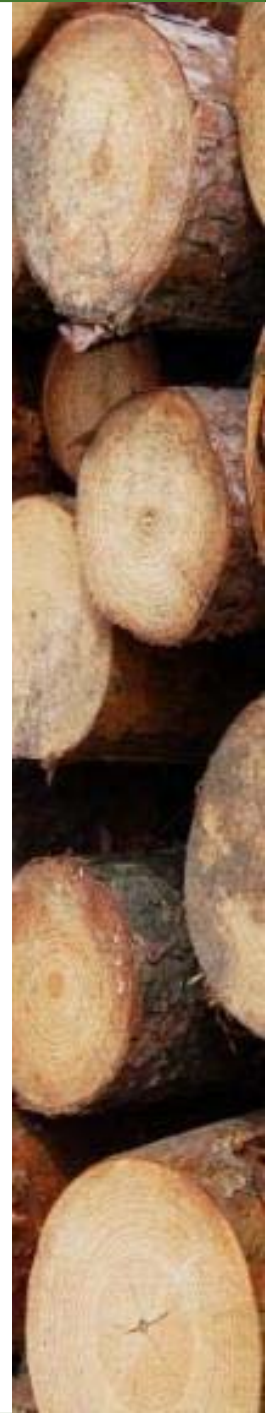
- Literature review
  - Peer-reviewed papers on forests or trees and human vulnerability to climate variations
- Six major stories emerged





# 1. Ecosystem products and the adaptation of local communities

- Diversified products
  - Safety nets for communities (for coping with climate shocks)
  - Livelihood diversification (anticipatory strategy)
- Example
  - Tanzania: Forest products for consumption or additional incomes during dry spells (Enfors, 2008); diversification with firewood, charcoal, timber or fruits as adaptive strategy (Paavola, 2008).
- Issue
  - Poverty trap?





## 2. Trees in agriculture and farmers' adaptation

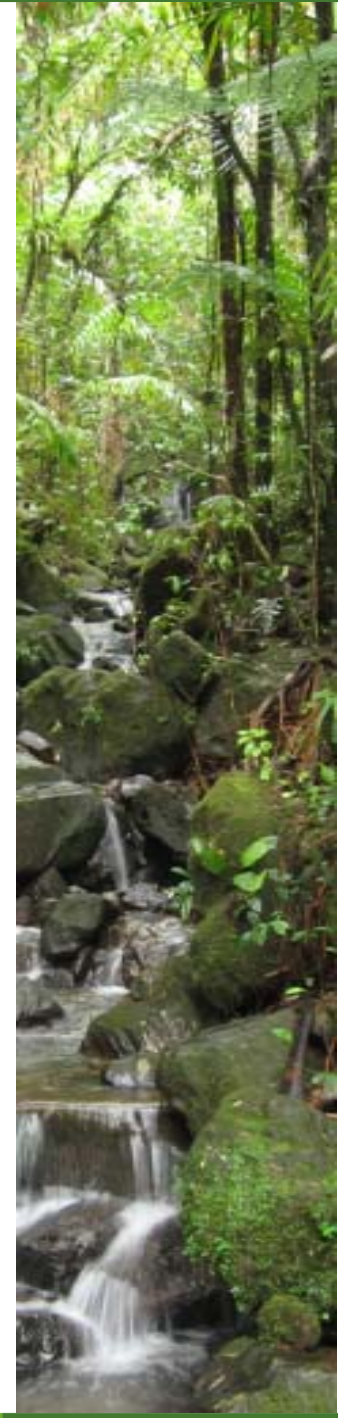
- Trees in agriculture
  - Maintain production under climate variability
  - Shade cover, soil fertility & moisture, wind breaks
- Example
  - Malawi: agroforestry with *Faidherbia* & *Gliricidia*.  
At least modest grain yields during drought  
(Garrity et al., 2010)
- Issue
  - Trade-offs production vs. resilience





### 3. Watersheds and adaptation

- Soil and vegetation
  - Regulate base flows (dry seasons) or peak flows (intense rainfall), stabilize soil (landslide risks)
- Example
  - Kenya: Watershed management for adaptation to climate change (van de Sand, 2014)
- Issue
  - Controversies (e.g. floods and forests)







## 4. Coastal adaptation

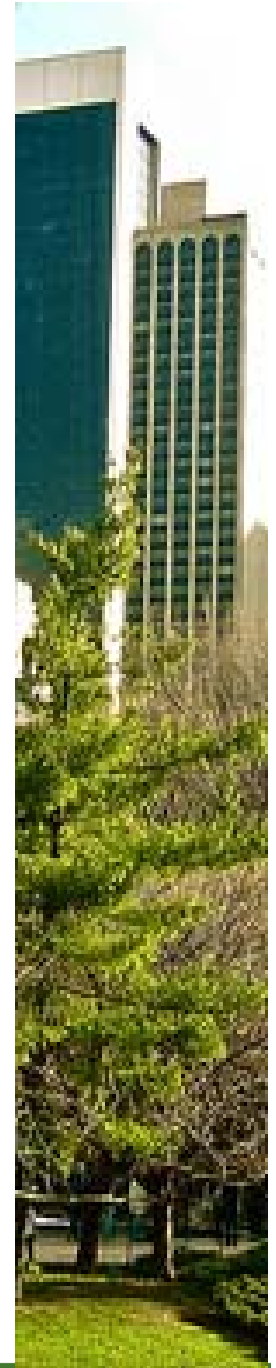
- Mangroves and other coastal ecosystems
  - Absorb and dissipate wave energy, stabilize coastal land
  - Protect from tropical storms, sea level rise
- Example
  - Zanzibar (Tanzania): Coastal vegetation restoration proposed for reducing vulnerability of coastal communities to climatic events and erosion (Mustelin et al., 2010)
- Issue
  - What level of protection from extremes?

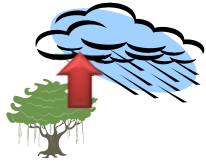




## 5. Urban adaptation

- Urban forests & trees
  - Regulate temperature and water for resilient urban settlements
  - Reduced effects of heat waves on population
- Example
  - Niger: trees minimize adverse climate impacts in cities (Herz, 1998)
- Issue
  - Opportunity costs



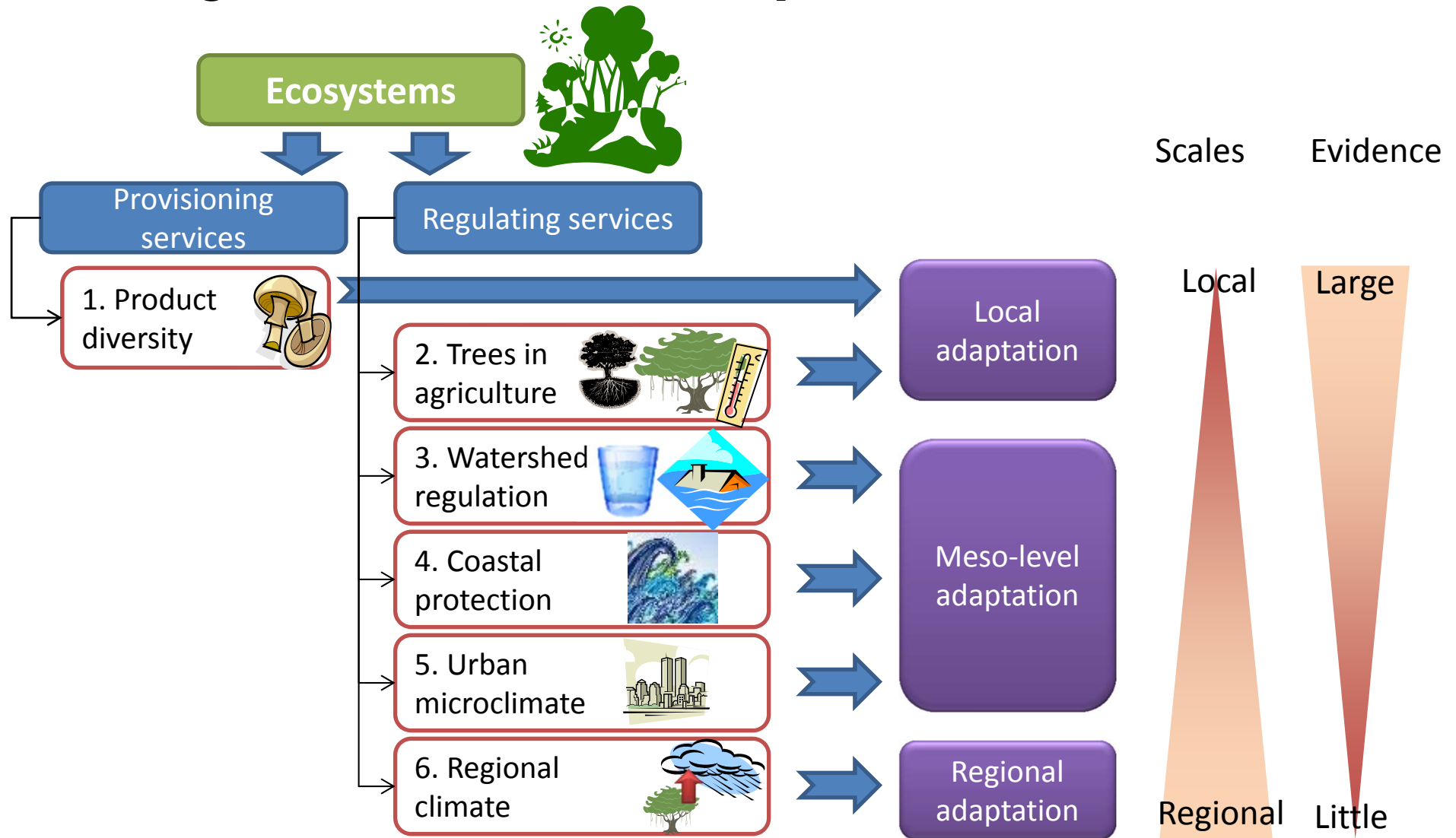


## 6. Regional climate

- Forests can influence regional climate:
  - Cooling effect through increased evaporation and cloud cover
  - Rainfall recycling & atmospheric water pumping
  - Distant connections
  
- Example
  - Congo basin: major source of moisture for rainfall in the Sahel (van der Ent, 2010)
  
- Issue
  - Complexity



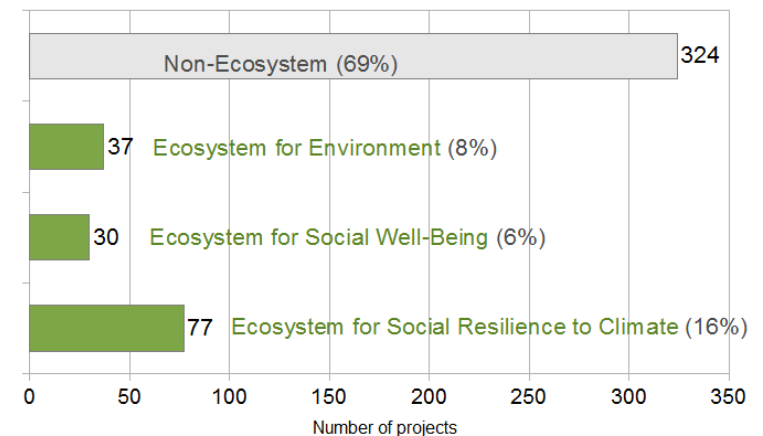
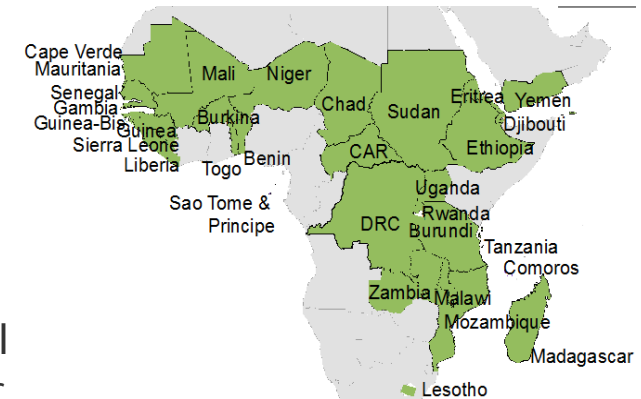
# Ecosystem-based Adaptation: Six stories





# EbA in policies in Africa

- National Adaptation Programmes of Action (NAPAs)
  - 68% of NAPAs make reference to ecosystem services
    - Ex. in Lesotho: "Forest resources play a critical role in the **vulnerable zones**; in particular for **fuel wood**, prevention of **soil erosion**, **income** generation, **scenery** for tourists attraction, building material, **forage** and **shelter**."
  - 16% of proposed projects are EbA
    - Ecosystem-based projects usually combine **ecosystem** measures with **non-ecosystem** measures
    - **Regulating services** (soil, water, hazards...) considered more frequently than other services



# Example: Lake Faguibine in Mali

- Context:
  - Drastic ecological transformation after the lake dried
  - New forest (Acacia and Prosopis)
  - Livelihoods shifted from agriculture or fishing to forest and livestock



January 3, 1974, & December 26, 1978



March 17, 2005, & September 28, 2006

---

# Adaptation in Lake Faguibine

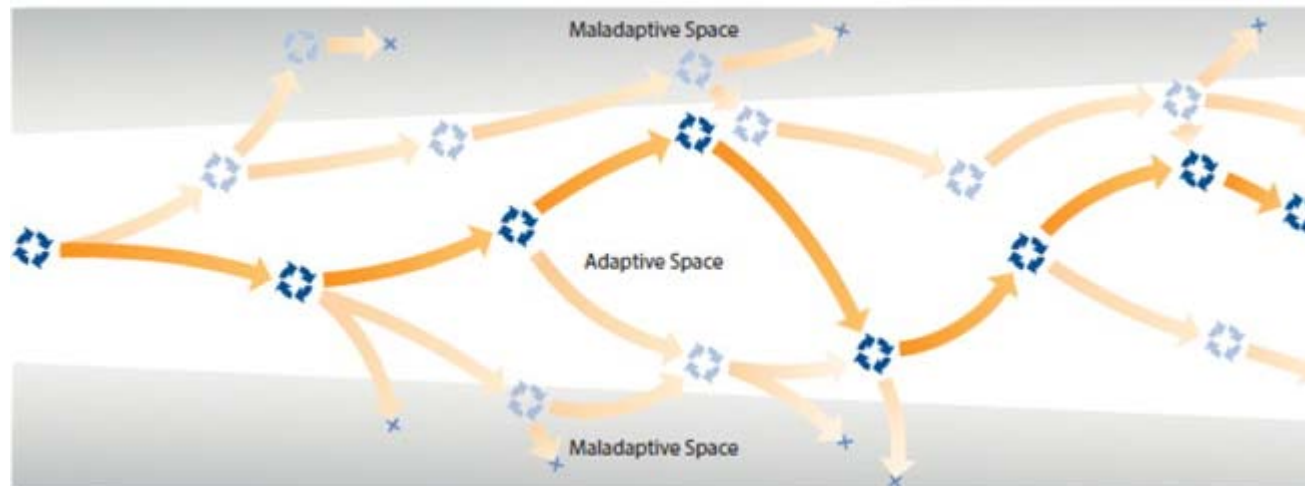
- Different views on possible adaptation options
  - From local communities:
    - Local committees for resource management, institutions and rights, livelihood diversification
  - From national and subnat. stakeholders:
    - Technology and infrastructure (e.g. clearing the canals, refilling the lake)



# Adaptation in Lake Faguibine

## ■ Adaptation options

- EbA (improved forest management)  
*versus* infrastructure (dam and canals for refilling the lake)
- Issues:
  - For EbA: Forest resource sustainability, rights, livelihoods
  - For infrastructure: water supply sustainability under future climate, equity and power



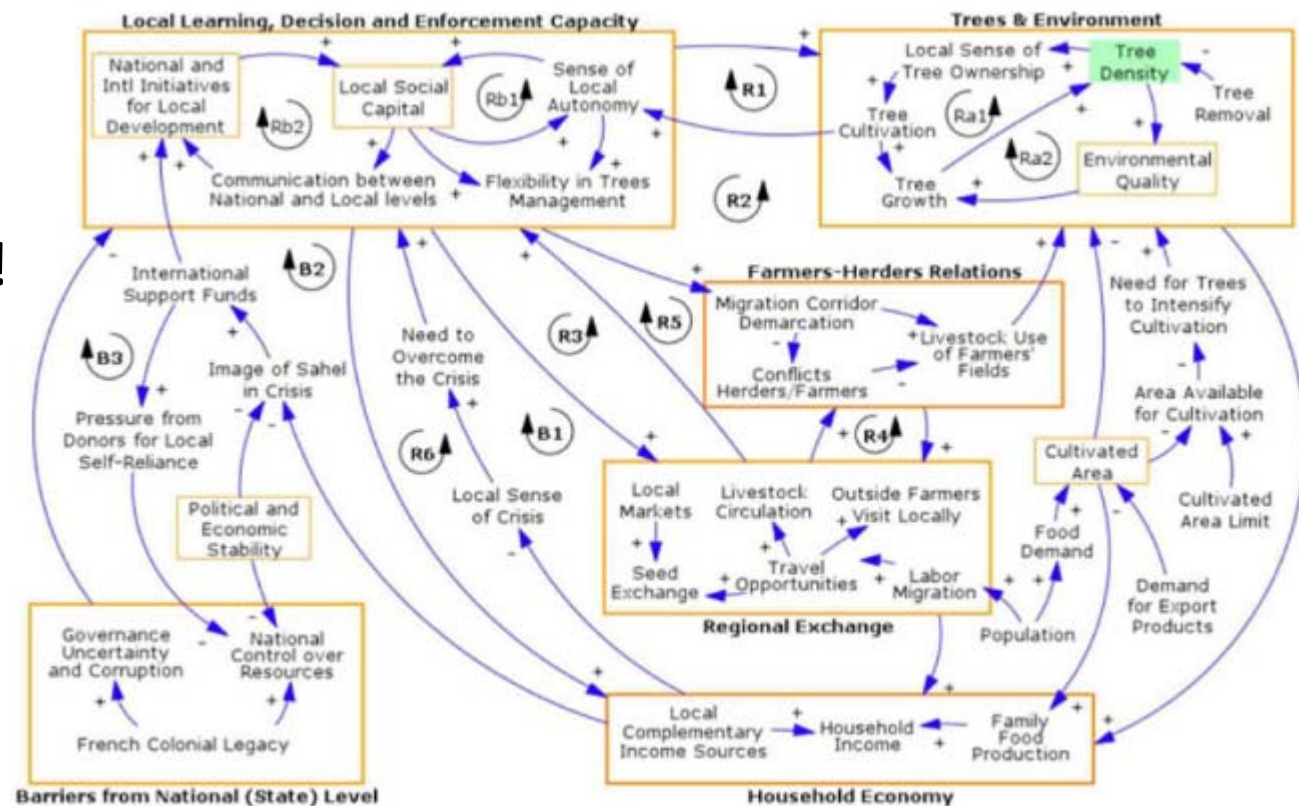
- Uncertainties (e.g. future water availability)?
- Multiple stressors (e.g. conflicts)?
- Tipping point, regime shift: what indicators (e.g. migration)?
- Equity: who wins, who loses?



# Example: Farmer managed natural regeneration in Niger

- Transformative process
  - Role of land and resource rights
  - EbA should provide immediate and long-term solutions
  - Interventions at different scales and levels needed

No one-size-fits-all!



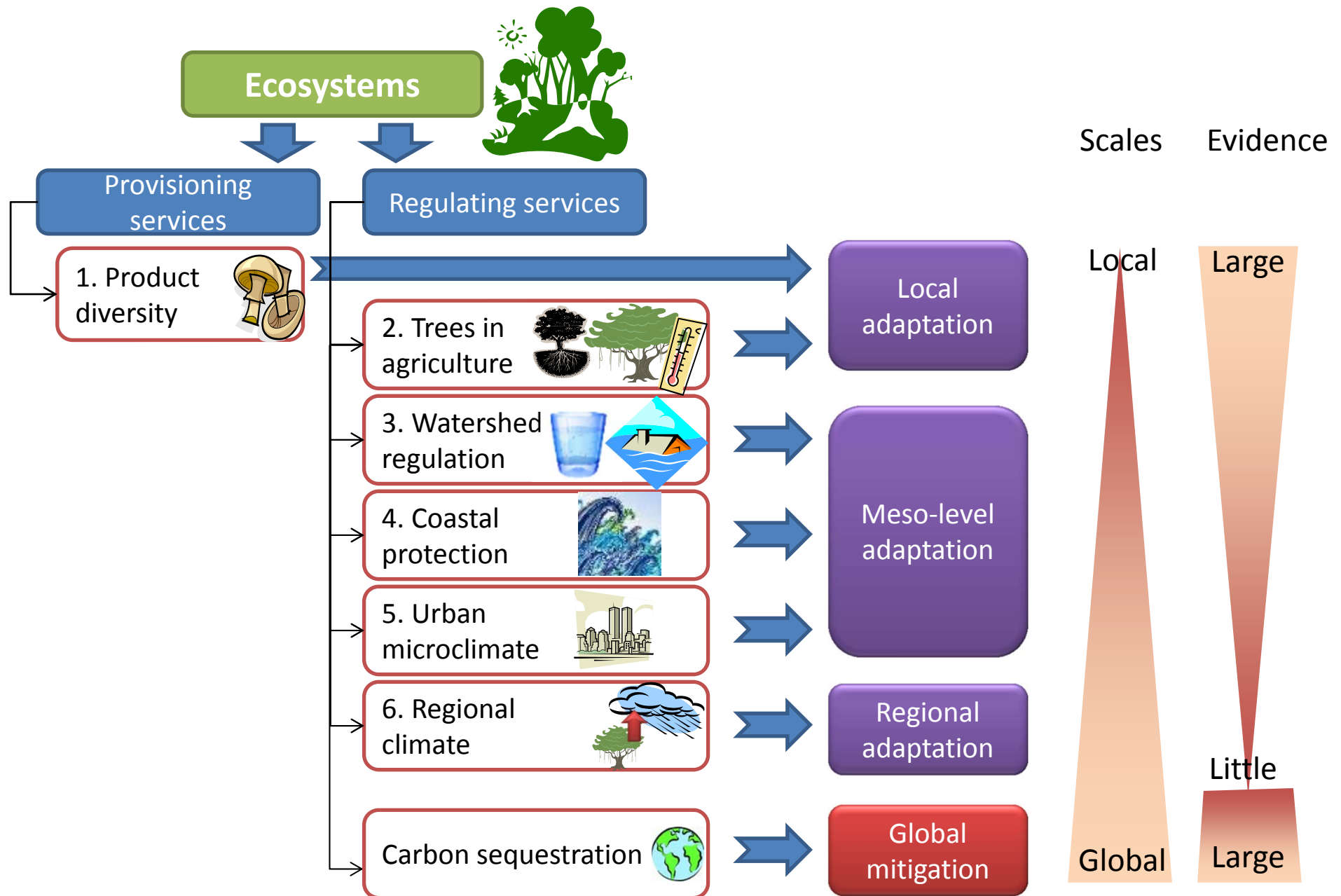
(Sendzimir et al. 2011.  
Ecology and Society 16)

# Comparison of EbA vs other adaptations

- Even though EbA can complement other adaptations (infrastructure or technology)
- Advantages of Ecosystem-based Adaptation
  - Often builds on existing local strategies
  - Flexibility
    - Ecological adaptability to climate changes (unlike technofix)
  - Co-benefits
  - Lower costs
    - Biodiversity
    - Mitigation

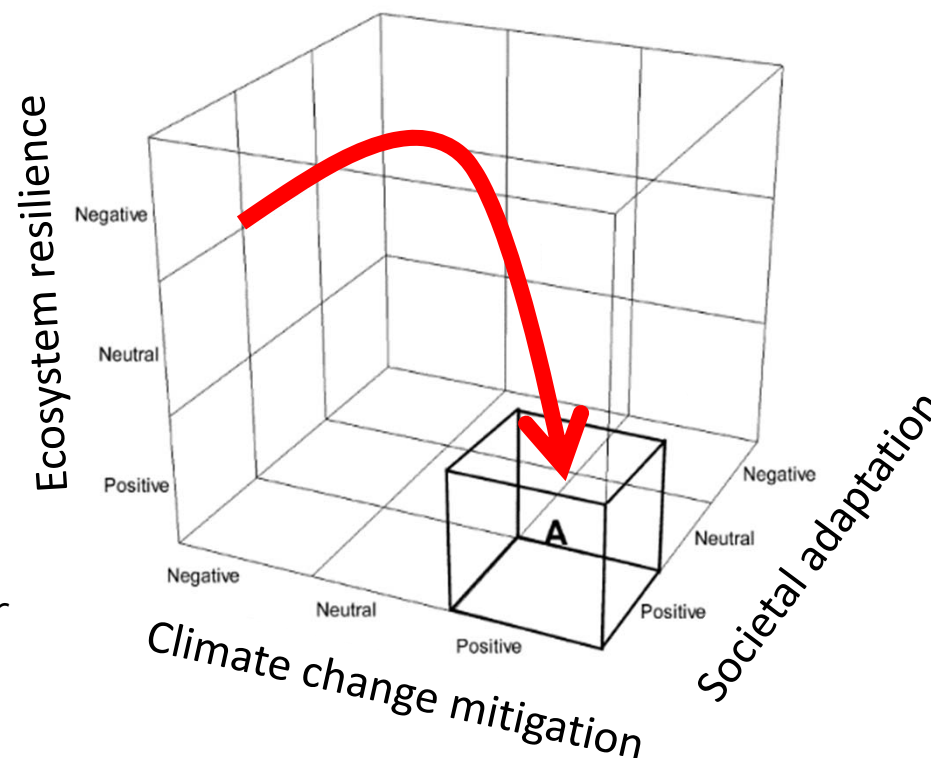


# Ecosystem-based Adaptation and Mitigation



# Managing ecosystems for both adaptation and mitigation benefits

- A lot of common drivers:
  - Rights and tenure, institutional strengthening, incentives, etc.
- Always win-win?
  - No: A lot a trade-offs!
  - Example:
    - Reforesting for carbon sequestration with species that consume a lot of water => more vulnerability of downstream population to water scarcity



(adapted from Butler et al., 2014)

Need to understand, accept and manage these trade-offs.  
Need to learn from previous experience with transformative adaptation and from current climate change initiatives.





# Further reading

- Pramova E., Locatelli B., Djoudi H., Somorin O., 2012. **Forests and trees for social adaptation to climate variability and change**. WIREs Climate Change 3:581–596.  
<http://onlinelibrary.wiley.com/doi/10.1002/wcc.195/pdf>
- Pramova E., Locatelli B., Brockhaus M., Fohlmeister S., 2012. **Ecosystem services in the National Adaptation Programmes of Action**. Climate Policy 12(4): 393-409.  
<http://www.tandfonline.com/doi/pdf/10.1080/14693062.2011.647848>
- Guariguata M.R., Locatelli B., Haupt F., 2012. **Adapting tropical production forests to global climate change: risk perceptions and actions**. International Forestry Review 14(1), 27-38.  
[http://www.cifor.org/publications/pdf\\_files/articles/AGuariguata1201.pdf](http://www.cifor.org/publications/pdf_files/articles/AGuariguata1201.pdf)
- Locatelli B., Evans V., Wardell A., Andrade A., Vignola R., 2011. **Forests and Climate Change in Latin America: Linking Adaptation and Mitigation**. Forests 2(1): 431-450.  
<http://www.mdpi.com/1999-4907/2/1/431/pdf>
- Locatelli B., Imbach B., Wunder S., 2014. **Synergies and trade-offs between ecosystem services in Costa Rica**. Environmental Conservation 41(1): 27-36.  
[http://www.journals.cambridge.org/article\\_S0376892913000234](http://www.journals.cambridge.org/article_S0376892913000234)
- Locatelli B., 2011. **Synergies between adaptation and mitigation in a nutshell**. COBAM Brief, CIFOR, Bogor, Indonesia, 4p.  
[http://www.cifor.org/publications/pdf\\_files/cobambrief/3619-cobambrief.pdf](http://www.cifor.org/publications/pdf_files/cobambrief/3619-cobambrief.pdf)
- Locatelli, B., Kanninen, M., Brockhaus, M., Colfer, C.J.P., Murdiyarso, D. and Santoso, H. 2008. **Facing an uncertain future: How forests and people can adapt to climate change**. Forest Perspectives no. 5. CIFOR, Bogor, Indonesia, 97 p.  
[http://www.cifor.org/publications/pdf\\_files/Books/BLocatelli0801.pdf](http://www.cifor.org/publications/pdf_files/Books/BLocatelli0801.pdf)
- Brockhaus M., Djoudi H., Locatelli B., 2013. **Envisioning the future and learning from the past: Adapting to a changing environment in northern Mali**. Environmental Science & Policy 25: 95-106.  
<http://www.sciencedirect.com/science/article/pii/S1462901112001414>
- Djoudi H., Brockhaus M., Locatelli B., 2013. **Once there was a lake: Vulnerability to environmental changes in northern Mali**. Regional Environmental Change 13(3): 493-508.  
<http://www.springerlink.com/content/k14663215381l821/>
- Wertz-Kanounnikoff S., Locatelli B., Wunder S., Brockhaus M., 2011. **Ecosystem-based adaptation to climate change: What scope for payments for environmental services?** Climate and Development 3(2): 143-158.

---

# Pour en savoir plus

- Pramova E., Locatelli B., Djoudi H., Somorin O., 2012. **Le rôle des forêts et des arbres dans l'adaptation sociale à la variabilité et au changement climatiques**. Brief. Center for International Forestry Research (CIFOR) Bogor, Indonesia  
[http://www.cifor.org/publications/pdf\\_files/infobrief/4023-infobrief.pdf](http://www.cifor.org/publications/pdf_files/infobrief/4023-infobrief.pdf)
  - Locatelli B., 2011. **Les synergies entre adaptation et atténuation en quelques mots**. COBAM Brief, CIFOR, Bogor, Indonesia, 4p.  
<http://goo.gl/lcvTZ>
  - Locatelli, B., Kanninen, M., Brockhaus, M., Colfer, C.J.P., Murdiyarso, D. and Santoso, H. 2009. **Face à un avenir incertain : comment les forêts et les populations peuvent s'adapter au changement climatique**  
[http://www.cifor.cgiar.org/publications/pdf\\_files/Books/BLocatelli0901F.pdf](http://www.cifor.cgiar.org/publications/pdf_files/Books/BLocatelli0901F.pdf)
-

---

# Para saber más

- Pramova E., Locatelli B., Djoudi H., Somorin O., 2012. **Bosques y árboles para la adaptación social al cambio y la variabilidad del clima**. Brief. Center for International Forestry Research (CIFOR) Bogor, Indonesia.  
[http://www.cifor.org/publications/pdf\\_files/infobrief/4024-infobrief.pdf](http://www.cifor.org/publications/pdf_files/infobrief/4024-infobrief.pdf)
  - Locatelli, B., Evans, V., Wardell, A., Andrade, A., Vignola, R., 2011. **Bosques y cambio climático en América Latina: Vincular adaptación y mitigación**, In: Gobernanza forestal y REDD+: Desafíos para las políticas y mercados en América Latina. Petkova E., Larson A., Pacheco P. (eds.). CIFOR, Bogor, pp. 79-95.  
[http://www.cifor.org/publications/pdf\\_files/Books/BPetkova1101.pdf](http://www.cifor.org/publications/pdf_files/Books/BPetkova1101.pdf)
  - Locatelli, B., Kanninen, M., Brockhaus, M., Colfer, C.J.P., Murdiyarso, D. and Santoso, H. 2009. **Ante un futuro incierto: Cómo se pueden adaptar los bosques y las comunidades al cambio climático**.  
[http://www.cifor.cgiar.org/publications/pdf\\_files/Books/BLocatelli0901.pdf](http://www.cifor.cgiar.org/publications/pdf_files/Books/BLocatelli0901.pdf)
-