Enhancing community resilience to climate variability through ecosystem services from forests and trees in Indonesia

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Existing concepts

- Multiple benefits of forest and trees: shelter, safety nets and natural buffers protecting people and their livelihoods from climate variability.

- Linkages between ecosystems and people’s resilience increasingly acknowledged in frameworks on human vulnerabilities.

  e.g. Disaster (UNISDR/HES) and Climate Change (IPCC)
Knowledge gaps

- Complex effects of ecosystems on human vulnerabilities in social-ecological systems (Folke 2006, Birkmann 2006).

- How these effects depend on ecosystems’ conditions (Estrella, Renaud & Sudmeier-Rieux 2013, Noordwijk et al. 2014) and be shaped through management (Laukkonen et al. 2008, Harvey et al. 2013, Doswald et al., 2014).

- How interactions between ecosystem and society can be better described at lower level in rural areas (IPCC 2014, Hinkel et al. 2014, Diaz 2011).
Research question: How do social-ecological interactions shape human vulnerability?

Mediating factors:
1. Institutional arrangements
2. Knowledge & Skills
3. Land cover management
4. Land-use practices
5. Technology
6. Finance and markets

Governance systems
Changes in Ecosystems
- Cultural Services
- Regulating Services
- Provisioning Services

Social-economical context

Changes in human vulnerability:
- Exposure
- Sensitivity
- Adaptive capacity
Study sites: 4 villages in Indonesia

Legend:
- Forest
- Plantation
- Non Forest

West Kalimantan

Central Java
Study sites: landscapes

West Kalimantan site

Central Java site
Study sites: gradient of anthropization

Forested area/family
[ha forested areas/household]

- V1: 140 ha
- V2: 14 ha
- V3: 1.5 ha
- V4: 1 ha

Plantations
[% village territory]

- V1: 4%
- V2: 32%
- V3: 35%
- V4: 62%

Increased anthropization
Research methods

**Methods**

- **Secondary data from satellites**
  - Landsat (GIS)
  - TRMM satellite (Climate)

- **4 meetings** with communities and key informants

- **26 Focus Group Discussions**
  - Historical Timeline
  - Participatory Mapping
  - Seasonal Calendar
  - Sensitivity Matrix & Problem tree
  - Venn/Sociograms

- **256 Household survey**

**Objectives**

- Study sites land-use maps with changes and precipitation series

- First contact and overview

- Understand village history, landscape, livelihoods and practices, vulnerabilities

- Understanding impact of climate variability and responses
Institutional arrangements (land tenure, access, rights)
- rights to access and harvest in communal forests + restrictions to outsiders => safety nets
- rights to harvest some products and cultivate in state-owned plantations => diversification, safety nets

Finance and markets (taxes, markets, certificates)
- limited access to markets and job opportunities, low prices => more dependency on forest products, lower role in adaptation
- many off-farm job opportunities, high wood market prices => lower role of forests in livelihoods and adaptation

Trees products for livelihoods
less anthropized
more anthropized
Institutional arrangements (land use regulations, planning)

- local rules for protecting forests in strategic areas => water regulation for agriculture
- limited use of fertilizers and irrigation technology => more dependency on regulating services

Land use practices (techniques)

- identification of areas at risk/low productivity to plant trees rather than crops => lower agricultural vulnerability, diversification
- Increased selected trees areas near cropland => more soil water infiltration and better yields

Trees for soil fertility & moisture in agricultural land

less anthropized

more anthropized
Institutional arrangements (land use planning)

- forests as land reserve for emergency or future uses => safe places for assets/people relocation

Land cover management (vegetative + structural measures)

- tree planting along riverbanks as protection => reduced losses due to soil erosion
- trees as buffer/alternative due to wild life intrusion in crop land => decreased damages
- tree cover maintained or increased in dry lands + terracing, dams => reduced erosion & landslides
Importance of mediating factors

What are important factors for the resilience of people and their environment?

- regulations and social norms for balancing use and protection of remaining forests.
- management interventions for restoring vegetation and planning the use of scarce land.

less anthropized

more anthropized
Key messages

- **Benefits from forest ecosystems for human vulnerabilities are regulated by multiple mediating factors:**
  - Policy arrangements (institutions, knowledge),
  - Environment management (land cover, land-use practices)
  - Financial & technical opportunities (markets, technologies)

- **To fully exploit the potential of forests & trees to reduce human vulnerabilities:**
  - diversify solutions depending on environmental conditions and development pathways
  - promote mediating factors that have enabling influences
  - control mediating factors that constrain response strategies
Thank you!
Literature