Soil erosion in East Africa: an interdisciplinary approach to realising land management change

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Soil erosion, land degradation, the FWE nexus and SDG in East Africa
Soil erosion in East Africa: an inte-
realising pastoral land manag 

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Environmental forensics in the Lake Manyara catchment

- Endorheic system
- System of high social-ecological diversity and importance
- Increasing pressures
- Threatened ecosystem service provision

Social-ecological type system for East-African rift
Sediment fingerprinting and mixing model

- Most of sediment in LM comes from two tributaries.
Land cover reconstruction and erosion modelling
Sedimentary evidence of landscape change and increased erosion

- Different geochemical properties linked to topsoil and subsoil (weathering profile)
- Some geochemical properties enhanced by lake drying (e.g. Mg)
- Multivariate analysis combines all geochemical signals to identify overall recent trends

**Key question:** what time period does this 1 m core represent?
- Linking Excess 210-Pb profile with drought record
General increase in sediment input with alternating periods of top- and subsoil [gully] input.

- Soil resources are disappearing
- Natural history corresponds with oral narratives of environmental change
  ➢ **Unsustainable change**
Loss of vegetation cover [drought, grazing, deforestation] exposes and weakens soil.
Reduced infiltration leads to OLF and sheet erosion

Photo: Carey Marks/University of Plymouth
OLF converges with natural topography and along trackways...
Incision and gully network development increases connectivity system at a tipping point?

Photo: Carey Marks/University of Plymouth
Increased flood peaks and siltation of downstream ecosystems threaten infrastructure, biodiversity and water quality

Enhanced runoff and erosion is a catchment-wide problem
But... ‘overgrazing’ and ‘land cover change’ are symptoms of wider environmental and social dynamics and transitions

- Natural high vulnerability to soil erosion.
  - Changing environmental conditions
- Complex history of disruptions
  - Indigenous social-ecological systems
  - Colonial period
  - Post-independence
- Current drivers of increased erosion
  - Poverty
  - Population increase
  - Governance and political rep.
  - Land rights and –access

Changing interactions between the social, economic and natural domains

Diagram (a): Externally regulated persistence vs. Co-adaptation: high productivity vs. Collapse vs. Co-adaptation: low productivity

Diagram (b): Economic production vs. Natural resources

- Externally regulated persistence
- Co-adaptation: high productivity
- Collapse
- Co-adaptation: low productivity
- Economic production
- Natural resources
Communities locked in unsustainable trajectories.

Population growth
Changing rainfall patterns
Sedentarisation / migration
Governance change
Shifts in land ownership

How can they escape?
Realising change: barriers and opportunities

- Cultural importance of cattle & cattle as ‘savings account’
- Lack of skills and opportunities to diversify livelihood
- Who takes responsibility for protecting common land?
- Harmony in community versus environmental protection
- Education and external input is more accessible and valued
- Degradation is fast and leads to recognition that environment may force change
- Cohesive communities
- Possibility for win-win situations
• Co-designing management plans through a shared community vision for the future
• Innovative tools for learning and to support behaviour change
Meeting the community's challenge: impact ambitions 2018-2019

- Demonstrating land management techniques
- Building links with local sustainable examples
- Nesting co-designed community solutions in governance structures (byelaws)

Demonstration restoration plots to catalyse behaviour change
Knowledge exchange to elucidate community-led solutions
Co-design of village-specific byelaws
The interdisciplinary Jali Ardhi [Care for the Land] Project

https://www.plymouth.ac.uk/news/interdisciplinary-approach-the-only-way-to-address-devastating-effects-of-soil-erosion
https://vimeo.com/282603338

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