

Lake Manyara basin, assessment of a complex socio-ecological system through a multistakeholder approach.

Lake Manyara

By

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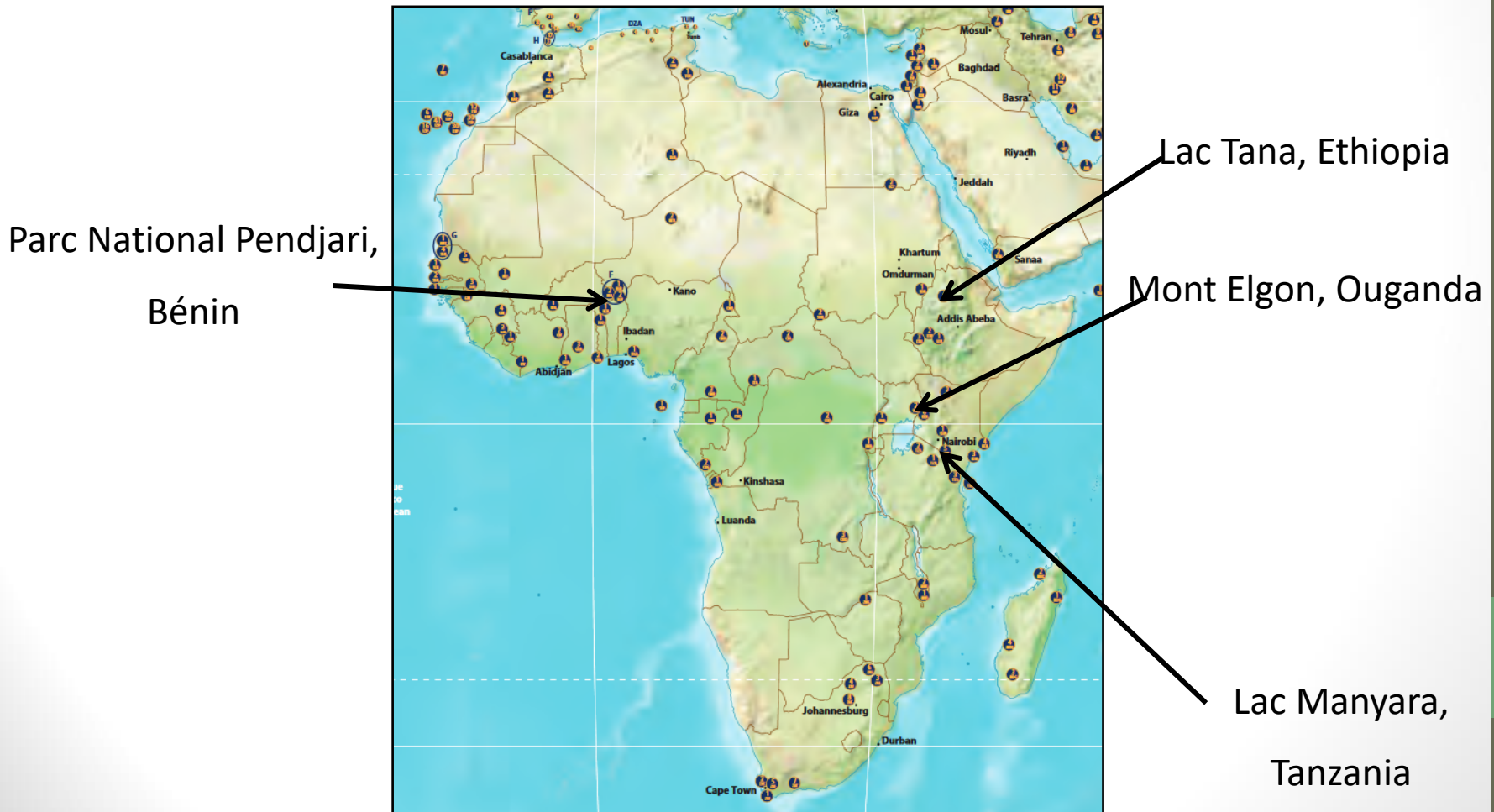
Building stones...

- Previous project: VLIR-UOS North South South (2015-2016)
 - “Balancing water for biodiversity and socio-economic use in a changing climate: towards a Decision Support System for sustainable land and water use in Lake Manyara”
Promotors: KULeuven (BE, Prof. Luc Brendonck) and Nelson Mandela Institute for Sciences and Technology (TZ, Dr. Hans Komakech)
- Current project: EVAMAB, funded by Belgian Science policy (BELSPO) in support of UNESCO-Man & Biosphere (Paris): Economic valuation of ecosystem services in Man and Biosphere reserves: testing effective rapid assessment methods in selected African MABs

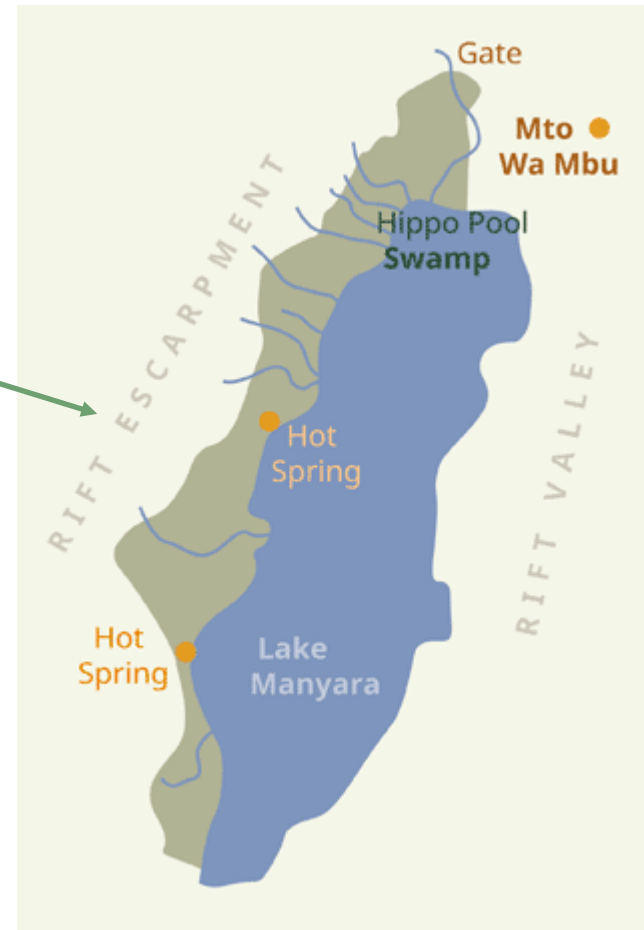


EVAMAB

4 Biosphere Reserves(Core and transition zones):



Lake Manyara, Tanzania



Lake Manyara NP (TZ)

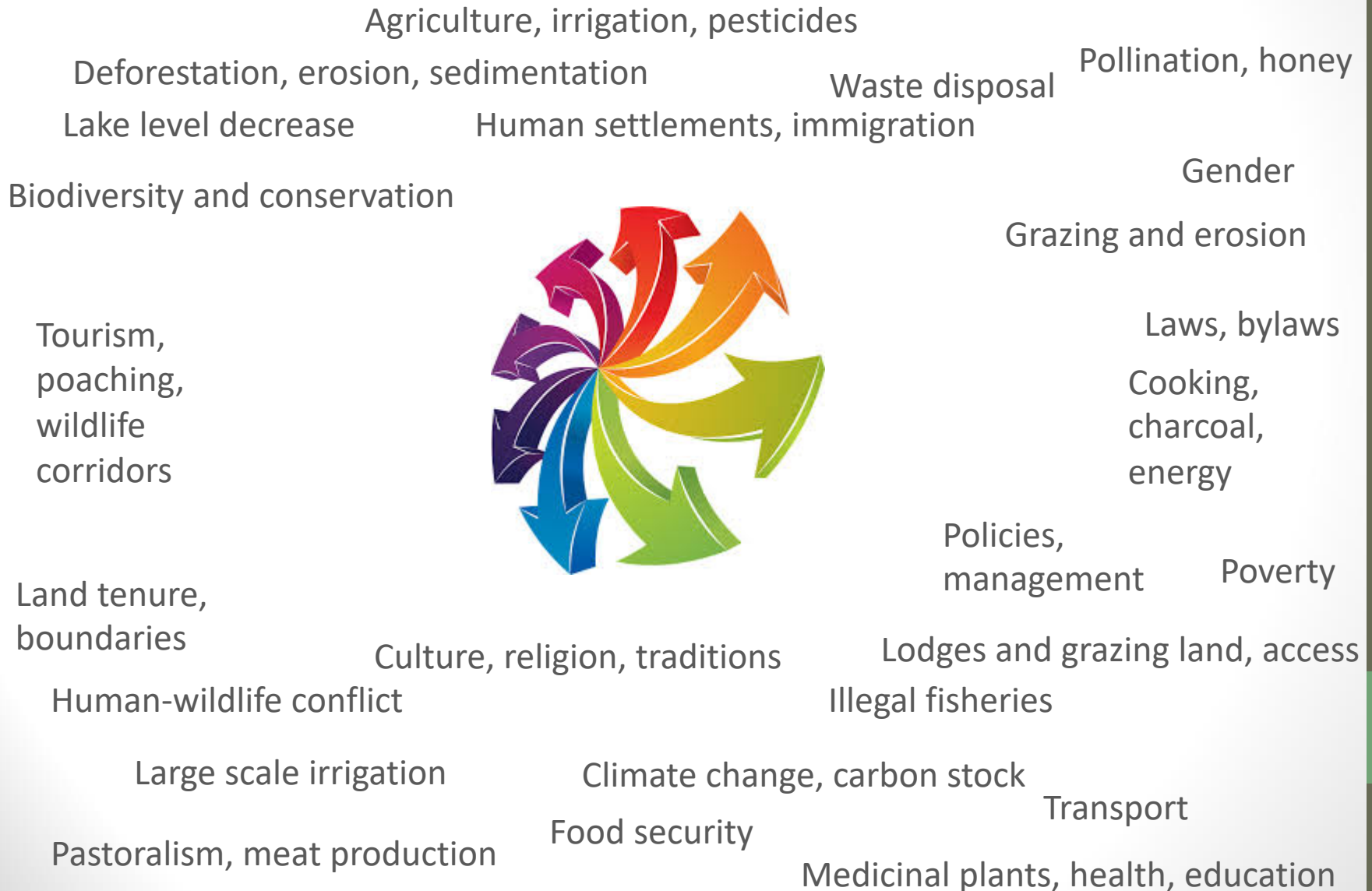


Environmental conflicts

- tourism
- erosion-overgrazing
- climate change
- pastoralism
- irrigation agriculture
- deforestation
- poaching
- human-wildlife conflict ...



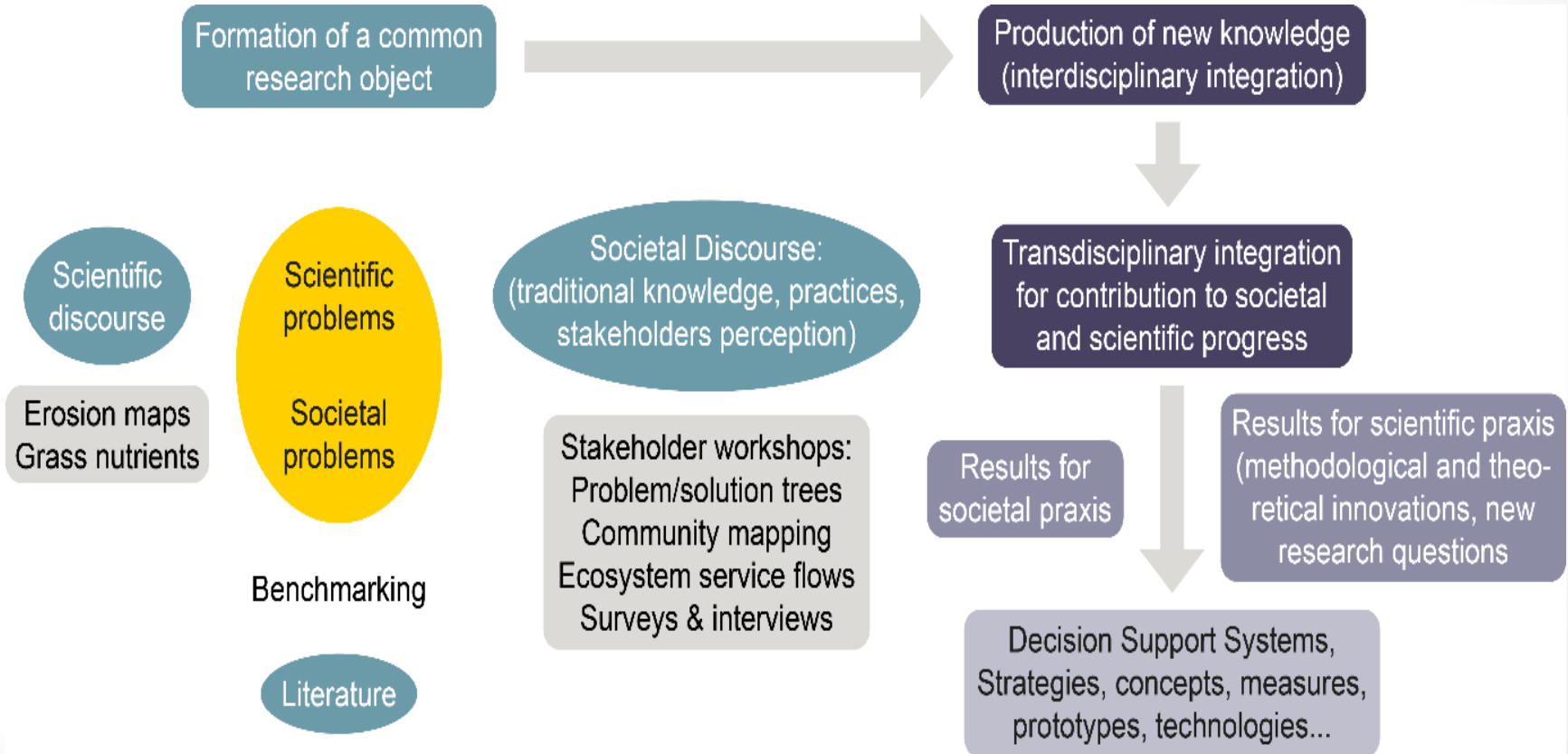
Tanzania, Lake Manyara Subbasin: Environmental issues, assets, benefits, ecosystem services, criteria, etc...



Lake Manyara BR

DPSIR framework	Approaches to collect data in the present study		
	Workshops	Own research (Grass/soil cover/TANAPA data)	Interviews
Drivers (social; economic; political; social–economic)	Community mapping exercise	Socio-economic profile of the farmers and pastoralists in the area and attitudes toward conservation (Trias) Perception about wildlife and the ecosystem (Trias)	Main environmental challenges identified (drivers, e.g. climate change, overpopulation)
Pressures (economic–environmental)	Possible reasons for the drying up of the lake (Problem tree) Results of the focus group exercise for each of the priority ES (pressures and processes affecting stocks, supply and demand)	Human-wildlife conflict (Trias)	Main environmental challenges identified (pressures e.g. illegal fishing, overgrazing)
State (environmental)	Community mapping exercise, field visit, community mapping	Prevalence of wildlife (Trias) The physical and biological environment, soil quality + land cover	Priority ES identified
Impacts (environmental–social)	Priority ES (scoring) Consequences of the drying up (problem tree)	Income from production (Trias) (environmental impact): erosion	Possible future (Priority ES identified)
Response (political–social; political–economic; political–environmental)	DSS (reference to SWOT), solution tree, field visit	Participatory land use planning Interventional services received (Trias)	Ways of improvement

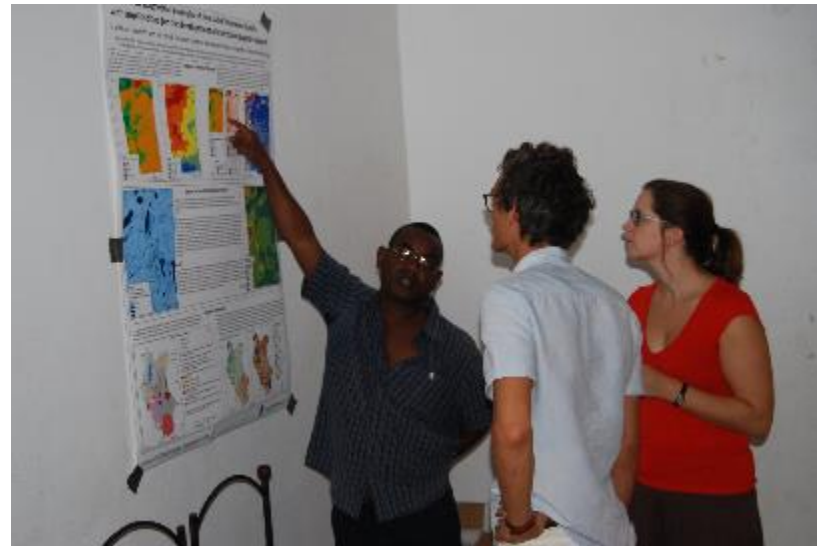
Co-production of social-ecological knowledge in the Manyara catchment area: data collection and integration (adapted from Jahn et al. (2012))



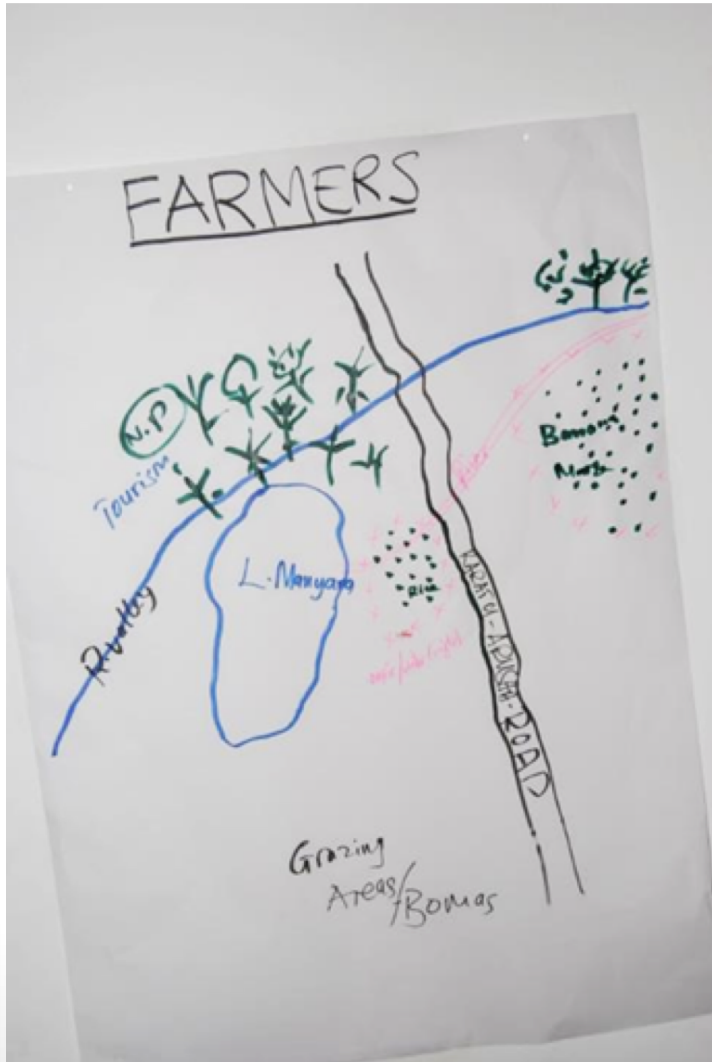
Lake Manyara BR

December 2015: 1st workshop

- Stakeholder engagement, looking together for solutions
- Workshop organised through local civil society organisations e.g. Water authorities, Tanapa, NM-AIST, Trias, representatives from farmers, pastoralists
- Structuring exercises
- Participative
- Iterative
- Stakeholders interest-influence matrix



Community mapping



Different perceptions?

- December 2016 : 2nd stakeholders' workshop

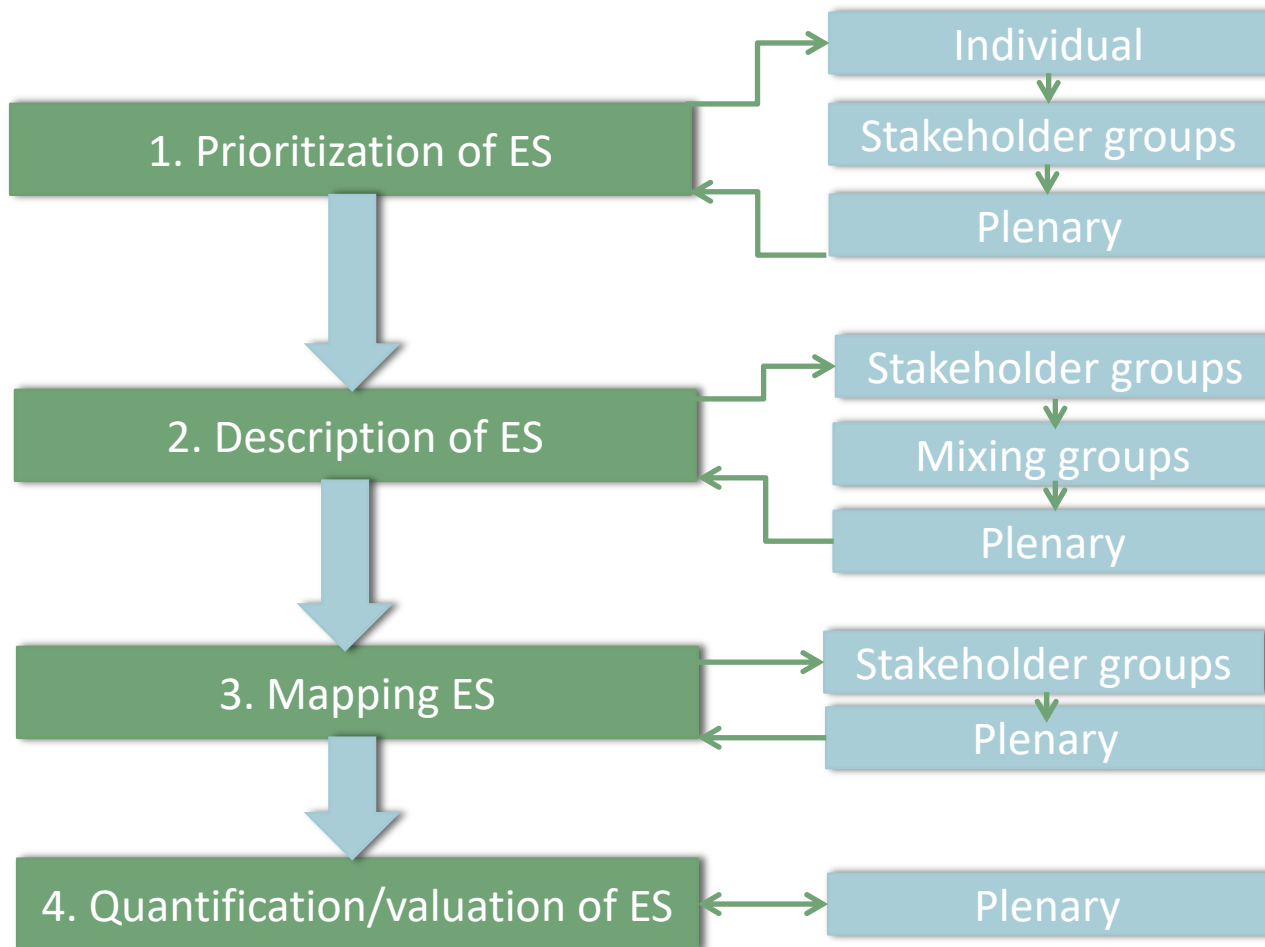


- Water basin authority
- Scientists Tanzania and abroad
- Representatives from farmers and pastoralists
- NGOs



Structure

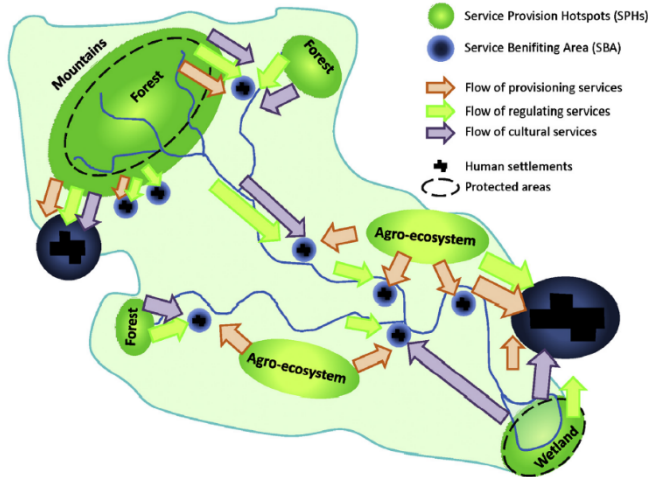
Part I: Identification of Ecosystem Services



Summary of ecosystem services trends and prioritization perceived by the focus group participants (n=18).

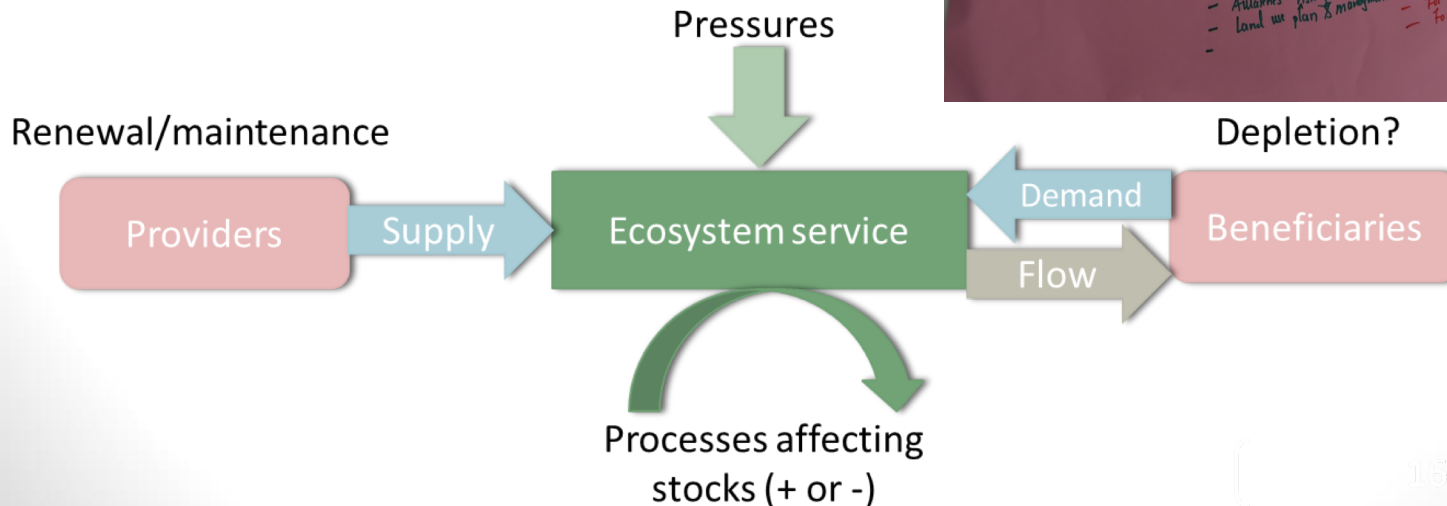
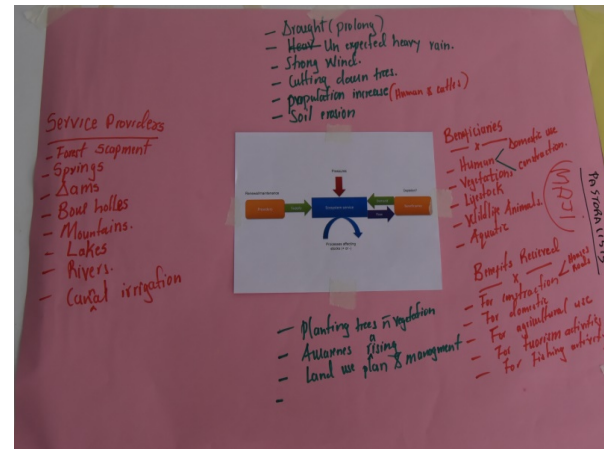
Ecosystem service	Mean score	Trend	Times selected as priority ES
Water provision	5.6	↘	10
Food provided by agriculture	5.1	↗	8
Erosion control	4.8	→	3
Food provided by cattle	4.6	↗	3
Environmental education	4.5	↗	2
Soil fertility	4.5	↘	3
Climate regulation	4.5	↗	4
Scientific knowledge	4.4	↗	3
Aesthetic values	4.3	→	2
Biological control	4.2	↘	3
Traditional knowledge	4.1	↘	2
Disaster mitigation	4.1	↘	1
Water regulation	4.0	↘→	1
Medication and therapeutic compounds	4.0	→	1
Existence value and species conservation	3.9	→	1
Air purification	3.8	→	0
Raw material of biological origin	3.7	→	2
Habitat for species	3.6	→	1
Wildlife tourism	3.6	↗	2
Water depuration	3.3	→	1
Pollination	3.3	↘→	0
Biomass for energy	3.0	↘	1
Beekeeping	2.9	↗	1
Spiritual value	2.9	↘	0
Food provided by fishing	1.7	↘	0
Food provided by hunting	1.5	↘	0

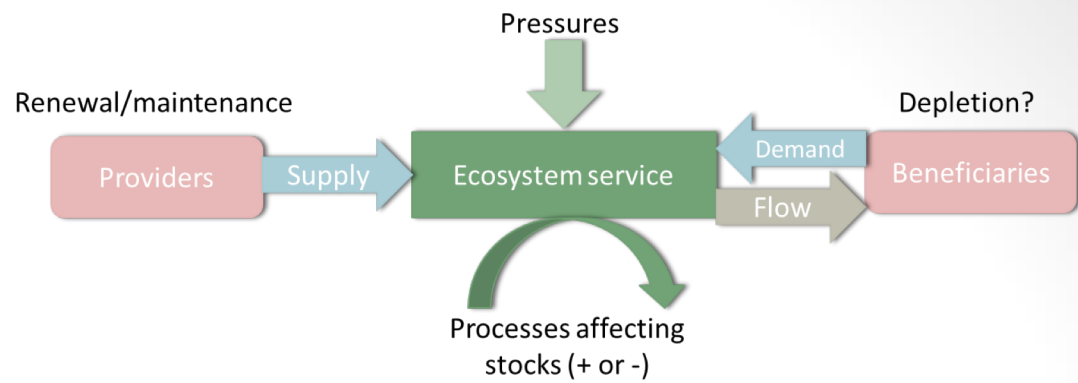
Representation and mapping of the dynamics of the services



Priority Ecosystem Services identified:

- Water
- Food from agriculture
- Erosion control
- Climate change regulation





Ecosystem service addressed	Pressures	Processes affecting the stocks (+ or -) (Response and drivers/pressures)
Climate change and erosion control (by Authorities and scientists)	<ul style="list-style-type: none"> • Global change • Overgrazing • Deforestation • Poor agricultural practices • Natural processes e.g. landslides • Urbanization and population growth 	<ul style="list-style-type: none"> • Good agricultural practices (crop rotation, terracing, nutrient appl.) • Livestock stocking density • Land use plan • Grazing calendar • Sustainable forestry
Food from agriculture (by farmers)	<ul style="list-style-type: none"> • Transportation • Conflicts between farmers and pastoralists • Capital • Education and technology • Pests and disease • Fertility • Market and Price 	<ul style="list-style-type: none"> • Drought • Flood • Wildlife • Geographical position-remoteness • Politics (multiparty conflict)
Water (by pastoralists)	<ul style="list-style-type: none"> • Drought • Unexpected heavy rains • Strong winds • Cutting down trees • Population increase (human and cattle) • Soil erosion 	<ul style="list-style-type: none"> • Planting trees • Awareness raising • Land use plans and management

Interviews results according to the DPSIR framework (n=13).

Drivers

- **Population increase (9)**
- Lack of (environmental) education (3)
- Poverty (1)
- Laws and government promoting agriculture (2)
- Bad governance (6)
- **Tourism management**
 - Unclear and uneven redistribution of benefits from tourism (WMAs, lodges, NPs) (5)
 - **Approach to wildlife and tourism excludes population and cattle (7)**
 - Bad management of WMAs (1)
 - Communities have a bad opinion of protected areas, wildlife and tourism (5)
- Climate change (5)

Pressures

- **Increased use of natural resources**
 - Use of firewood or trees for daily life (5)
 - Agriculture
 - **Agricultural expansion (11)**
 - Unsustainable agricultural practices (9)
 - Illegal fishing (4)
 - Poaching (1)
 - Pastoralism
 - Overgrazing (5)
 - Increase in livestock density (3)
 - Grazing inside protected areas (NPs, WMAs) (4)
- **Increase of human settlements, closer to protected areas (7)**

State and environmental impacts

- Increased erosion (6)
 - Floods (5)
 - Soil fertility decreases (5)
 - **The Lake becomes shallow and full of mud (8)**
 - Water quality and quantity decrease (4)
 - Flamingos and other migratory birds at risk
- **Loss of connectivity and decrease in wildlife migrations (9)**
 - Inbreeding risks and endangered wildlife (2)
- Bare soils and reduction in grazing areas (7)
- Habitat loss (1)

Social impacts

- The nomadic way of life of Masaai and their cattle is made difficult (2)
- Land for cattle is taken from pastoralists
 - Masaai have fewer chance to face drought / reciprocity system at risk (3)
 - Livestock mortality (1)
- **Land use conflicts between cattle/farming/protected areas (7)**
- Human-wildlife conflicts (5)
- Decreased agricultural productivity (3)
- Tourism is at risk if wildlife decreases (1)

Responses (drivers)

- **Environmental education/awareness (5)**
- Develop/extend protected areas (3)
- Governance**
 - Community leaders are key for managing resources (2)
 - Coordination between responsible ministries for better management and governance (2)
 - Communities should be involved in the management of resources (3)
- Tourism and protected areas**
 - Benefits from tourism should be used to develop communities/they should receive tangible benefits from wildlife and tourism (3)
 - Communities should be more involved in tourism activities (3)

Responses (pressures)

- **Secure land for pasture and wildlife (4)**
- CCROs (4)
- Land use planning and by-laws (3)
- **Improve agricultural practices (5)**
 - Improve grazing methods (2)
 - Wildlife and cattle should coexist on a same land (3)
 - Promote alternative activities (3)
- Trees**
 - Develop brick fabrics and train communities (1)
 - Carbon offset programmes to protect forests (3)
 - Promote biogas (2)
 - Planting trees (2)

Responses (state/impacts)

- Water**
 - Water systems for livestock and wildlife (3)
 - Water sources protection (1)
- Erosion**
 - **Infrastructures, vegetation planting, soil management and well-managed forests to stop floods and erosion (5)**
- Human-wildlife conflicts**
 - Building bomas and living walls to protect cattle (2)
 - Compensation (3)
 - Toolkit against attacks (1)

Conclusions (1)

- **Many** stakeholders with interests in **freshwater** (entering the lake), but **few** stakeholders interested in the **saline** lake water itself (ecological condition).
- Large consensus on the importance of **tourism** and the **vulnerability** of the ecosystem and its biodiversity
- Some parties with an important financial stake in the basin were not present, being (1) the **tourism** industry and (2) the **intensive agriculture**. (1) supportive to integrated management. (2) will negotiate on water rights.

Conclusions (2)

- Increasing **human-wildlife conflicts** and influences (1) people's attitudes towards conservation and (2) wildlife migration patterns.
- **Importance of bylaws on land use and a more visible and fair redistribution of tourism benefits.**
- **Conflicting interests** between the Water Act, the Irrigation Act and the Wildlife Act etc.
- **Encourage all parties to mobilize adequate national and international policies and resources to develop a **Decision Support System** with a guiding vision and a few clear objectives, leading to an **operational integrated management** of this **important MAB site**, owned by all stakeholders, to defuse present environmental and socio-economic tensions.**



Thank you!