

Evamab closing workshop

Lake Manyara BR

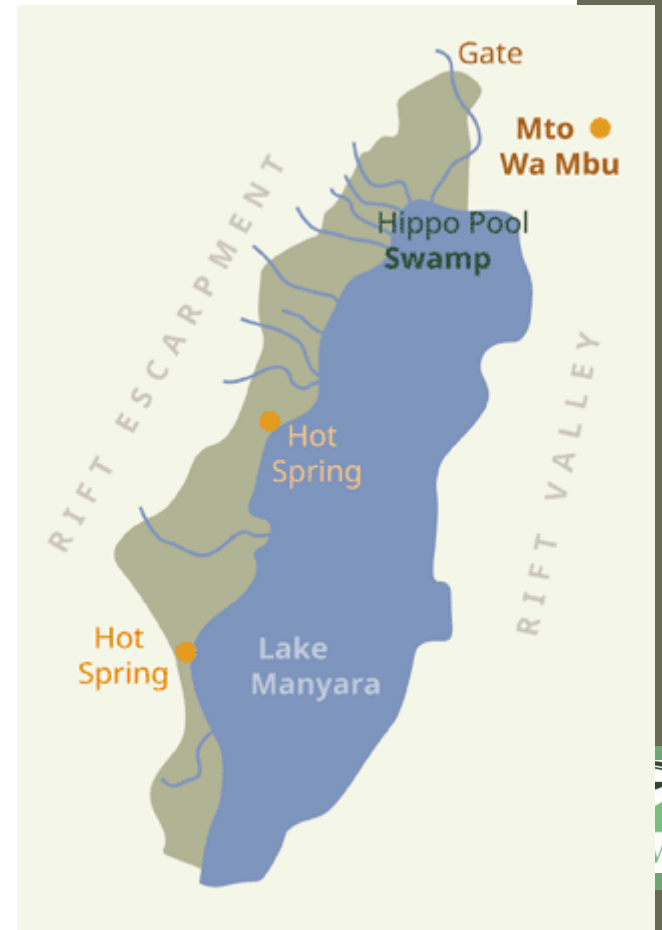
By Luc Janssens de Bisthoven, Anne-Julie Rochette (CEBioS), Jean Hugé, Maarten Vanhove (CEBioS, U Hasselt)

Bahir Dar, Ethiopia
13-17 May 2019

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)

Lake Manyara, Tanzania



Lake Manyara (TZ)



Environmental conflicts

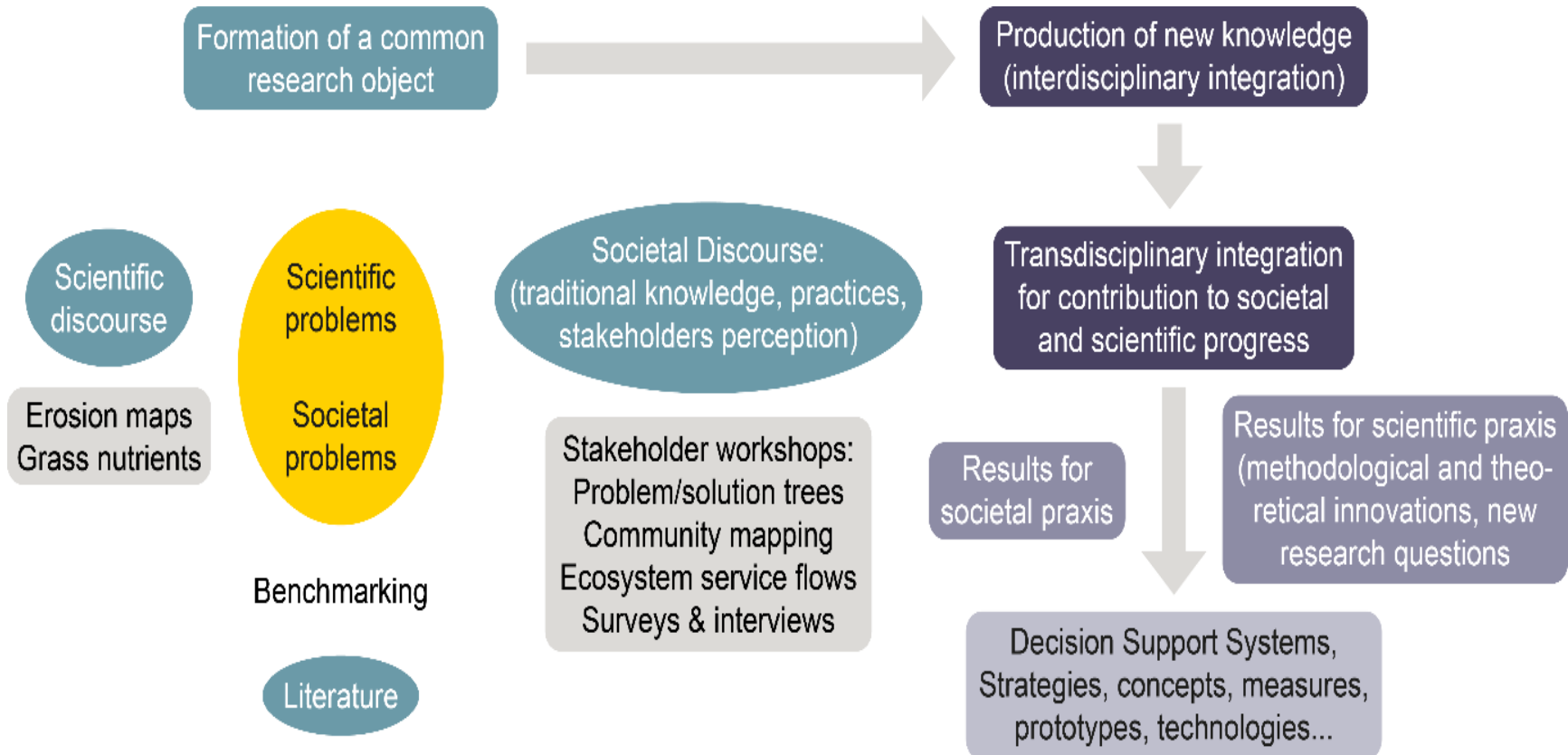
- tourism
- erosion-overgrazing
- climate change
- pastoralism
- irrigation agriculture
- deforestation
- poaching
- human-wildlife conflict ...



WP B: 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))



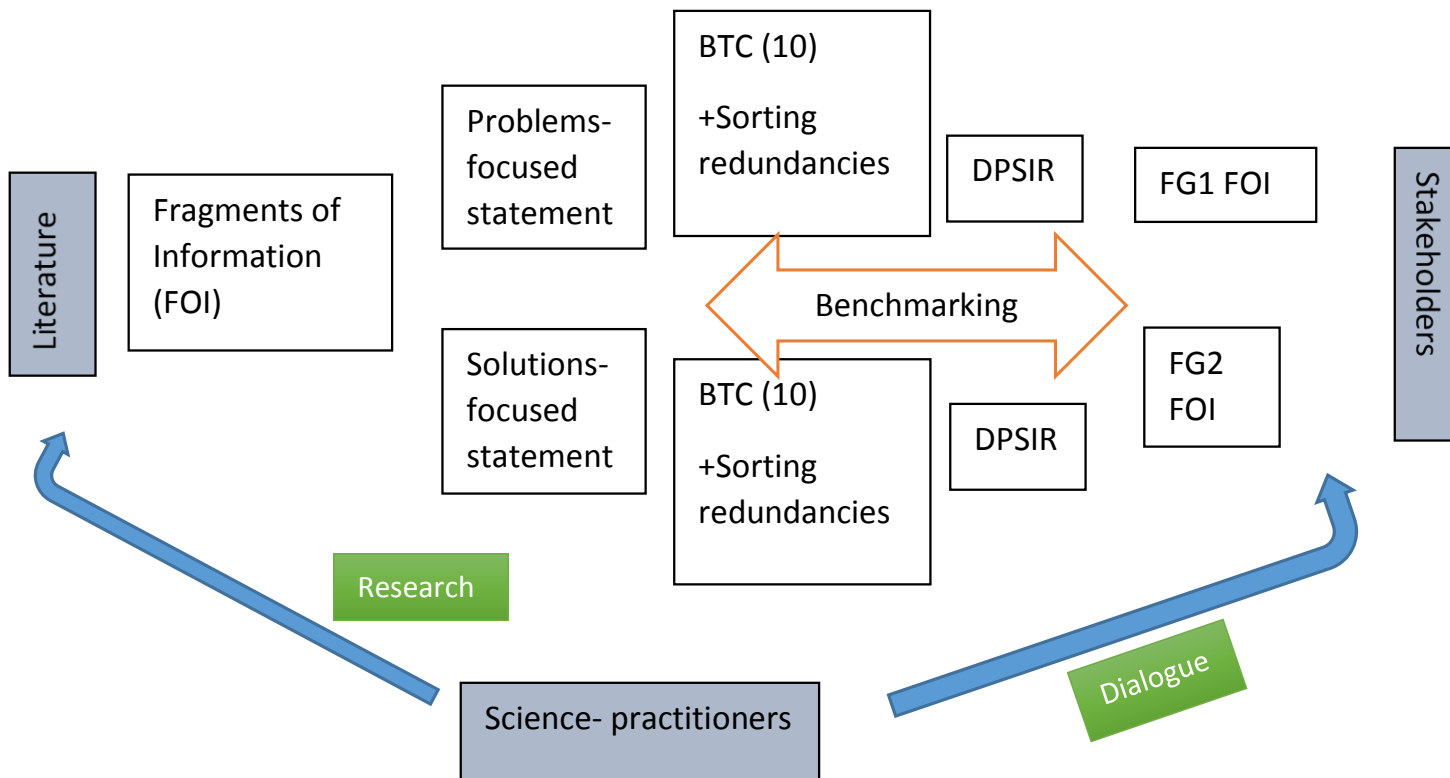


Fig. 3. Interplay between the integrated literature review & the focus groups: information processing in a science-stakeholder dialogue process.

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

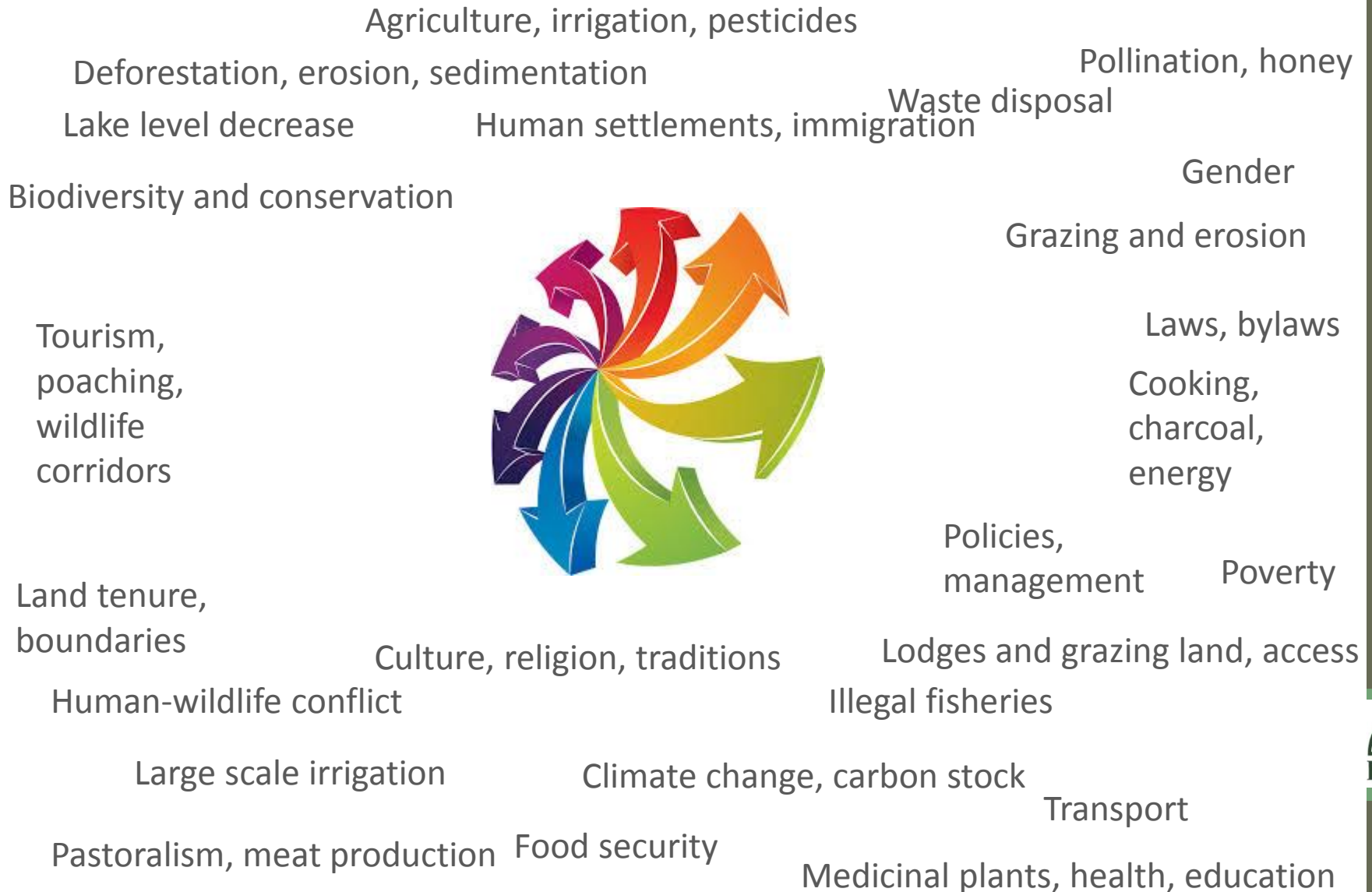


Table 3. Synthesis of the integrated literature review, identifying drivers and pressures of environmental problems, as well as their impacts, threats and conflicts in Lake Manyara. The cluster concerning legal framework, policies and management is treated separately (Table 4). The broad thematic clusters (BTC) are written in capital letters in the table, while the fragments of information (FOI) are written in non-capital letters in the table.

'Problem-focused Statements': drivers, pressure, State and causes of environmental problems, threats and conflicts in Manyara . All 9 clusters are assigned to DPSIR.	'Solutions-focused statement DPSIR)
<p>DEMOGRAPHY- POVERTY-LIVELIHOOD (Drivers)</p> <ol style="list-style-type: none"> 1. Expansion of livestock population; 2. High rates of population growth (both natural growth and in-migration); 3. Human encroachment in the park, Human settlement expansion and infrastructure development; 4. Increasing migration; 5. The high incidence of poverty and marginalisation; 6. Villagisation; 7. Misguided development initiatives; 8. Alienation of large grazing areas from Maasai control; 9. Poor financial ability for the communities to buy tree seedlings; 	<p>DEMOGRAPHY- POVERTY-</p> <ol style="list-style-type: none"> 1. Tree planting; 2. Intercropping a 3. Promoting bee- 4. Bushmeat cons a small degree l be most succes relative to alter 5. Attention need: community-bas current land us 6. A strategy invol conservation, is
<p>KNOWLEDGE-INFORMATION-EDUCATION-AWARENESS (Drivers)</p> <ol style="list-style-type: none"> 10. Poor education; 11. Ignorance of various regulations on natural resources management e.g. water policy, water rights, inadequate education concerning erosion; 12. Lack of knowledge on contours construction; 13. Lack of environmental conservation knowledge in the villages, e.g. Endabash and Karatu divisions; 14. Lack of coordination and of information between experts, leaders and communities; 15. Lack of knowledge on zero grazing to communities; 	<p>KNOWLEDGE-INFORMATIC</p> <ol style="list-style-type: none"> 7. Capacity buildir 8. Revive appropr conservation; 9. Training Of Trai 10. Increased envir 11. Follow-up what been implemer 12. Bring awarenes conservation st
<p>CONFLICTS-DEGRADATION-LAND USE (State-Pressure-Impacts)</p> <ol style="list-style-type: none"> 16. Conflicts between sectors; among different water/land users, including farmers, pastoralists and conservationists; 17. Scarcity of good agricultural land, poverty, land arbitration and land ownership problems; 18. Limited initiatives towards environment conservation programmes and lack of effective government support for development; 19. Environmental destruction: illegal logging, lack of fuel wood 20. Mining in the park; 21. Uncontrolled fire; 22. Poaching of wildlife; 23. Increased human-wildlife conflict, and blocking of wildlife migratory corridors; 24. Crop cultivation in and around wetlands and livestock grazing by pastoralists compete with conservation interest particularly during the dry season when water is scarce; 25. Serious conflicting in water use between large-scale farmers and small-scale farmers in the Kiru valley. Agricultural development particularly in Kiru valley abstract much water for irrigation affecting wetland conservation; 26. Conflicting interests (political vs. conservation agendas); 	<ol style="list-style-type: none"> 13. Soil erosion: pri and Mbulu mbt 14. Appropriate de practices in the create a self-int maintain relativ adapted to loca system; 15. Successful man between the gc community aro 16. There should be communities, s conservation ar
<p>POLLUTION (Pressure, Impacts)</p> <ol style="list-style-type: none"> 27. During the rainy season the pit latrines overflow and this, in combination with the shallow water table, results in high pollution in the area; 28. Increased irrigation farming; 29. Growing use of synthetic agrochemicals (fertilizers/pesticides); excessive use of pesticides and haphazard disposal of pesticide remnants and containers caused environmental pollution; 30. In the mining industry (7 existing mining licences), water is trapped and used in the leaching/washing of minerals resulting in water pollution that ultimately finds its way to Lake Manyara affecting lake biodiversity; 	<p>CONFLICTS-DEGRADATION</p> <ol style="list-style-type: none"> 17. Preserving the l into the Lake; 18. Proper land use the stakeholder 19. No direct actor conducted follc Department;
<p>PLANNING-COMMUNITY (State, Impact)</p> <ol style="list-style-type: none"> 31. Lack of participatory planning in sustainable utilization of water resources; 32. Cultural devastation; 33. Inadequate provision of social services includes water supplies, health and educational facilities, although the latter are in the process of improvement; 34. Tendency of the actors promoting conservation in Tanzania to misrepresent or ignore the realities on the ground that defy official policy promises; 	<p>POLLUTION</p> <ol style="list-style-type: none"> 20. Regular monito relation to seas 21. Easy access to e health and limit agrochemicals. agriculture, agr
<p>LIVESTOCK (pressure)</p>	<p>PLANNING-COMMUNITY</p> <ol style="list-style-type: none"> 22. A number of vil ploughs in the s 23. Community for

WP B: Lake Manyara BR

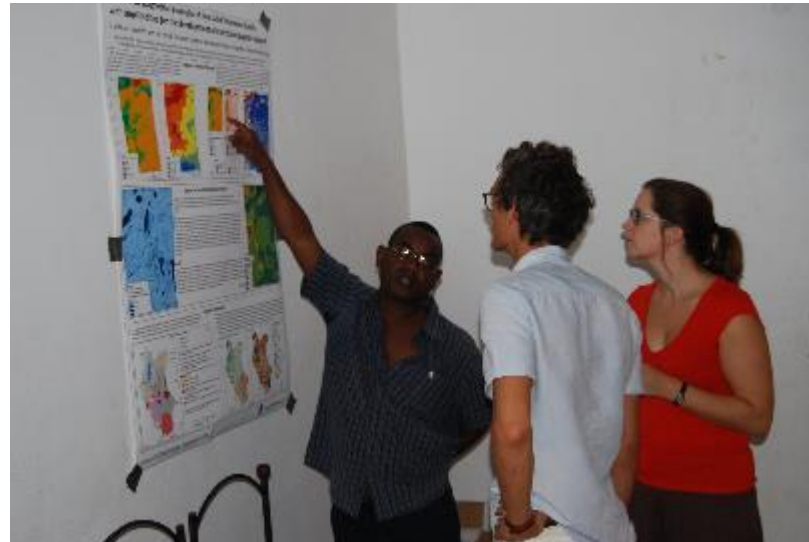
December 2015: 1st workshop

Stakeholder engagement, looking together for solutions

Structuring exercises

Participative

Iterative



Stakeholder analysis

- Workshop organised through local civil society organisations
- e.g. Water authorities, Tanapa, NM-AIST, Trias, representatives from farmers, pastoralists
- Interest-influence matrix

Stakeholder analysis

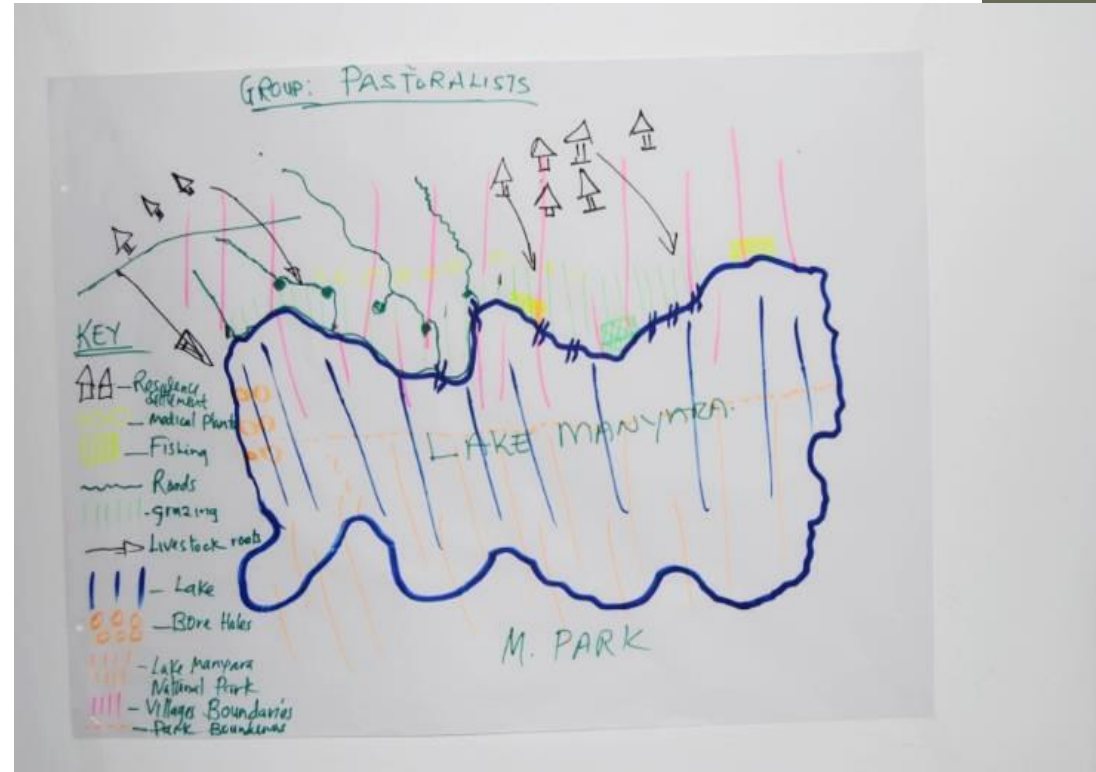
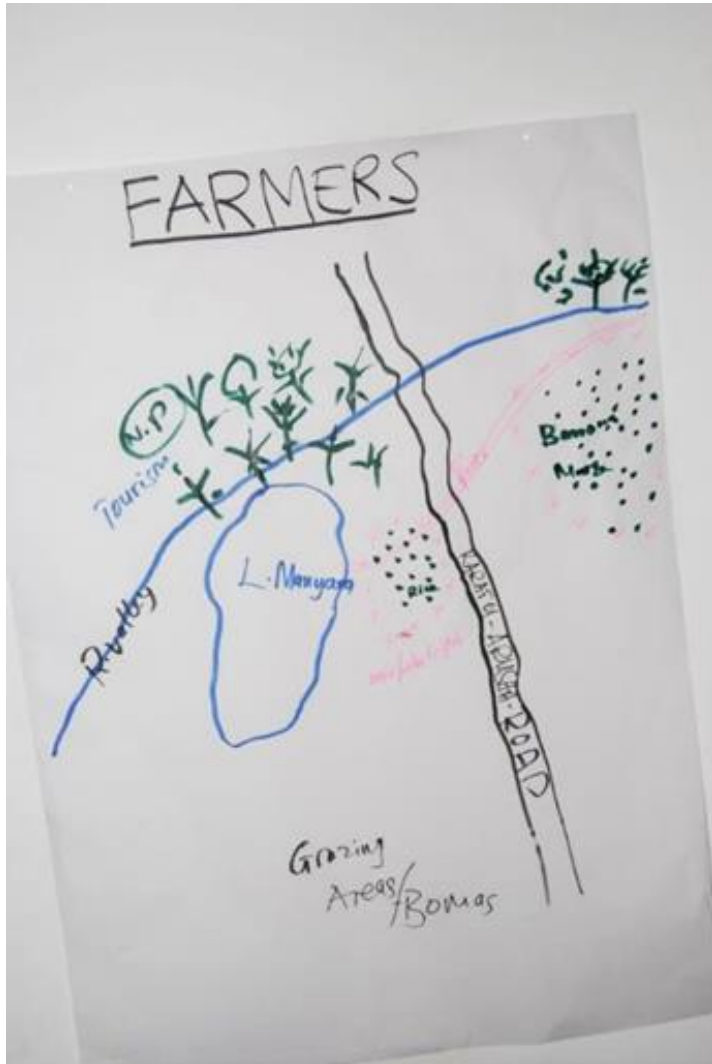
Nr.	STAKEHOLDER	Interest, activitied Area of focus
1	Ujamaa-CRT	Land use, pastoralists
2	Trias	Sustanaibale natural resources, small scale farmers
3	Mviwata	Small holder farmers
4	Monduli district	Administration planning land aspects & natural resources
5	Tanapa	National conservation : conservation of L. M and associated biodiversity, improving livelihoods surrounding communities in support of conservation
6	University Zimbabwe	Aquatic systems
7	University Western Cape	Hydrology, socio-economic aspects
8	Royal Belgian Institute Natural Sciences	Improving communication science-policy interface, translating aquatic science to socio-economic relevance, link with Belgian embassy and vice president's office
9	Nelson Mandela Institute African Sc & Tech	Academia for society, translating to management water resources & biodiversity for benefits of communities
10	Internal drainage basin water board	Water management and allocation , abstraction from bore holes, furrows (irrigation)
11	Catholic University Leuven	<ul style="list-style-type: none"> •Link between erosion and land use & linking to ecosystem services on the land and in the water •Link between water use and ecosystem quality, biodiversity
12	Plymouth University	Link between erosion and land use & linking to ecosystem services on the land and in the water
13	African wildlife foundation I-NGO	Restoration, rehabilitation outside national park , in catchment, assisting communities in good practices (forestry, bee keeping, anti-erosion), in partnership, parallel with Tanapa
	GOVERNANCE	
14	Karatu (Ar), Mbulu (Ma), Monduli (Ar), Babati (Ma) districts, Kondoa (Do), Simanjiro (Ma), Arusha (Ar) district	<p>Forestry, land & natural resources, mining + other departments such as community development, water , health, connection with ministry, several districts make a region,</p> <p>next levels: division, ward, village, subvillage</p> <p>councils = executive organ</p>

15	regional commissioners Manyara and Arusha, Dodoma (level above the district) 1 commissioner per region	Centralise the districts
16	Hunting companies	Hunting for trophies, future plan to be more committed to conservation, outside national park. 95% of issues is outside.
17	Tour operators	Tourists within and outside the NP.
18	Mto Wa Mbu, wards (3)	Population: 200-300.000/ 3 M in basin tbc, no waste collection system/ natural springs at foot of escarpment, tap, container/ pipe responsible: water engineer district of Munduli/ water user associations operating/ water + meter (district)
19	Water research association group	Water user's association
20	pastoralists	Land use, land rights, land protection (datonga, sukuma, masaa)
21	Farmers	Mto Wa mbu: Small holder (no large companies): rice, banana, maize, beans, vegetables, fruits, sugar cane
22	Farmers, plantations (not represented here)	Large scale: rice, sugar cane, maize, beans
23	Informal groups Fisher (seasonal and professional) immigrants from all over the country, even Malawi	Seasonal in Lake Manyara: 5 species, lost two species: oreochromis nilotica manyarensis, tilapia reddish, catfish Clarias gariepinus: season: conflict fisheries closed due to the law, allowed to fish during the wrong time. Breeding season period: long rain season, more water filling, July-September (dry season) lots of fish, water quality down, fish kills/ Temporary system: link law-fisher-season of plenty of fish dynamics / two years ago some data in the office of tanapa/ is lots of money in few days Fish migrate into the rivers in the NP/ Fishing = poaching in the NP. 2/3 is protected Lakes babati and Burungi: peak seasons, overflow brings fish to L. Manyara
24	Middle men (lorries!)	Trade in fish
25	NGO World Vision	Supporting community, land use plans in villages, environmental programmes (trees, bees...) worked together with pastoralist, broader than african wildlife (more wildlife focused)
26	Catholic relief service--ces	Karatu, Endabash area
27	Mto Wa Mbu cultural tourism programme	Walking around villages (manyara and tarangire ecosystems, homesteads, dancing, cooking....) appreciated
28	Other NGOs see justine	Long list
29	Lodge, private sector, TATU, national environment council	Water use
30	Ngorongoro conservation Area Authority NCA	Springs, forest water catchment, multiple land use (go inside the crater for salt licking)

Exercise: transfer stakeholders from previous table

<p>A/ High interest/low influence 6, 7, 8, 9, 11, 12</p> <p>Note: some districts can be located different, 16, 17, 19, 20, 21, 23, 24 (not based here), 28, 29 (not organised)</p>	<p>B/ High interest/high influence 5, 2, 3 (yes: small holder farmers invited to parliament for the katiba), 1 (networking, lobbying, alliances are heard), 4 (65% of income go to the villages in the corridor), 10 (some reservation), 15, 18 (primary beneficiaries), 22, 29 (neg. influence, conflict with communities), 30</p>
<p>C/ Low interest/low influence Keep them informed</p> <p>7, because large interests, 26, 25, 28</p>	<p>D/Low Interest/ high influence Lots of efforts to convince District Mbulu,</p>

Community mapping



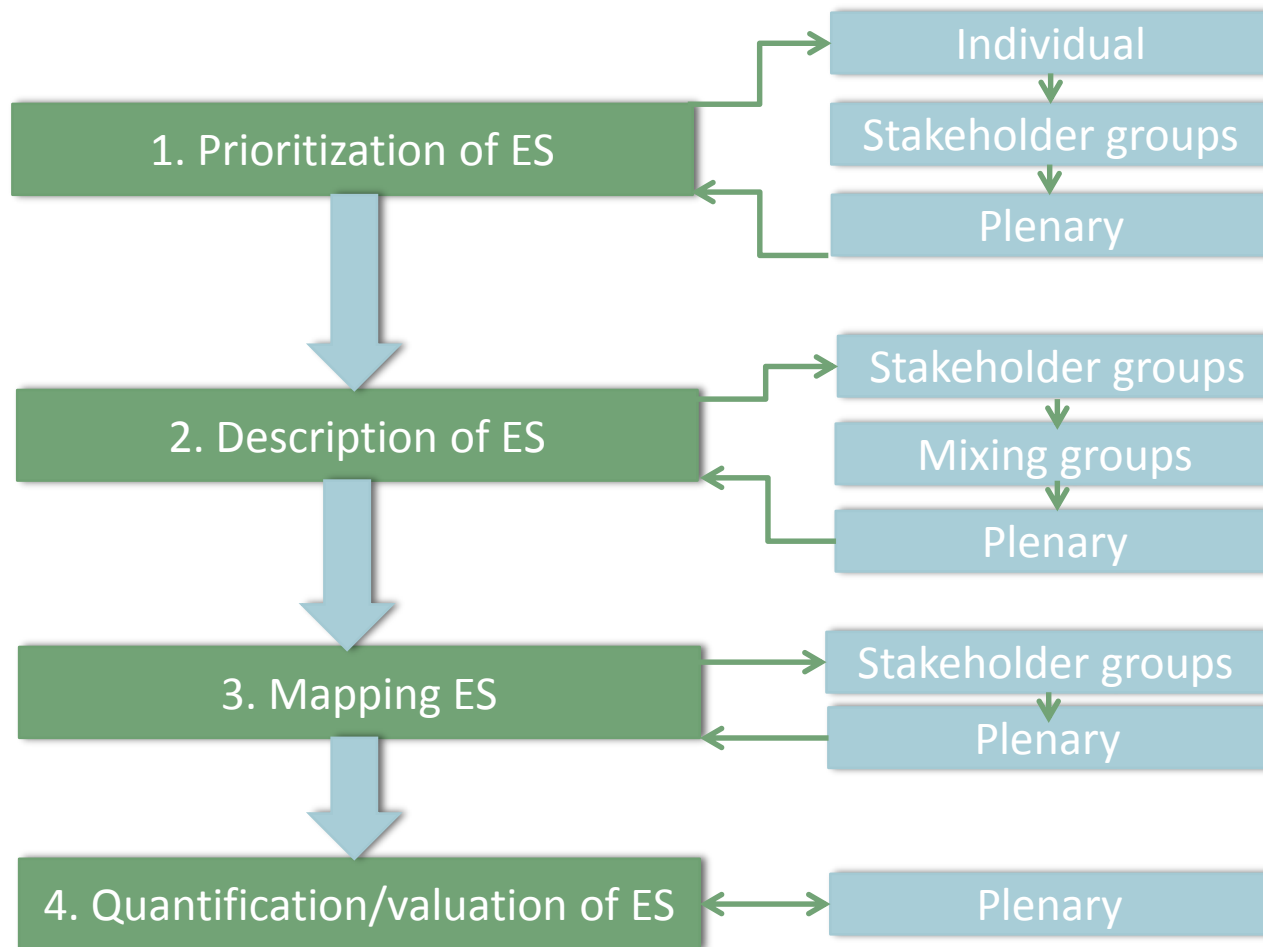
Different perceptions?

- December 2016 : 2nd stakeholders' workshop



Structure

Part I: Identification of Ecosystem Services



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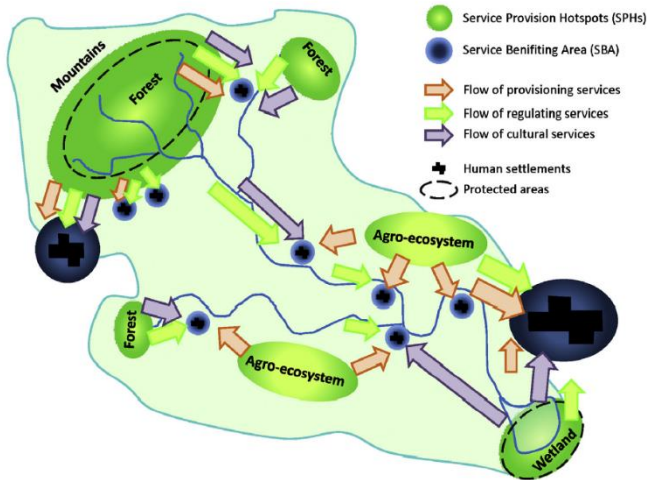
Ecosystem service	Example/definition	Rank (5-1)	Trend ↗→↘
Food provided by agriculture	Products derived from biodiversity for consumption as food		
Food provided by cattle			
Food provided by fishing			
Food provided by hunting			
Beekeeping			
Water provision	Good-quality water from surface or below-ground flows for human, agricultural or industrial use, as well as desalted water		
Raw material of biological origin	Materials such as wood and vegetable fibers to produce goods for consumption		
Biomass for energy	Materials such as wood and vegetable to produce energy		
Medication and therapeutic compounds	Healing compounds contained in traditional medicines or used by pharmaceutical manufacturers to produce medications		
Climate regulation	Vegetation capacity to absorb CO2, mesoclimatic regulation and regulation of temperature by forests and water bodies		20
Air purification	Retention of air pollutants by vegetation		
Water depuration	Extraction of contaminants from water by vegetation, invertebrates and soils		
Water regulation	Regulation of water fluxes by aquifers		
Erosion control	Control of erosion by vegetation to prevent landslides or reservoir siltation		
Soil fertility	Natural fertility of soils, nutrient richness		
Disaster mitigation	Diminution of the effects of perturbations such as fire or floods by ecosystems		
Biological control	Control of pest and diseases affecting agriculture, cattle or humans		
Pollination	Insect cooperation with plants to facilitate reproduction		
Habitat for species	Maintenance of habitat for species to facilitate species conservation		
Scientific knowledge	Scientific knowledge gathered from the study of ecosystems		
Traditional knowledge	Practices and customs transmitted through generations and used for managing agriculture, cattle, and other relationships with the environment		
Wildlife tourism	Travel to natural areas for safaris, to practice hiking, birdwatching, relaxation		
Environmental education	Instruction in ecological processes, raising of awareness about biodiversity and ecosystem services in visitor centres or educational activities		
Aesthetic values	Appreciation of landscape beauty		
Spiritual value	Practice of traditional processions or conception of nature as something sacred		
Existence value and species conservation	Satisfaction of knowing that certain species and ecosystems exist		



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

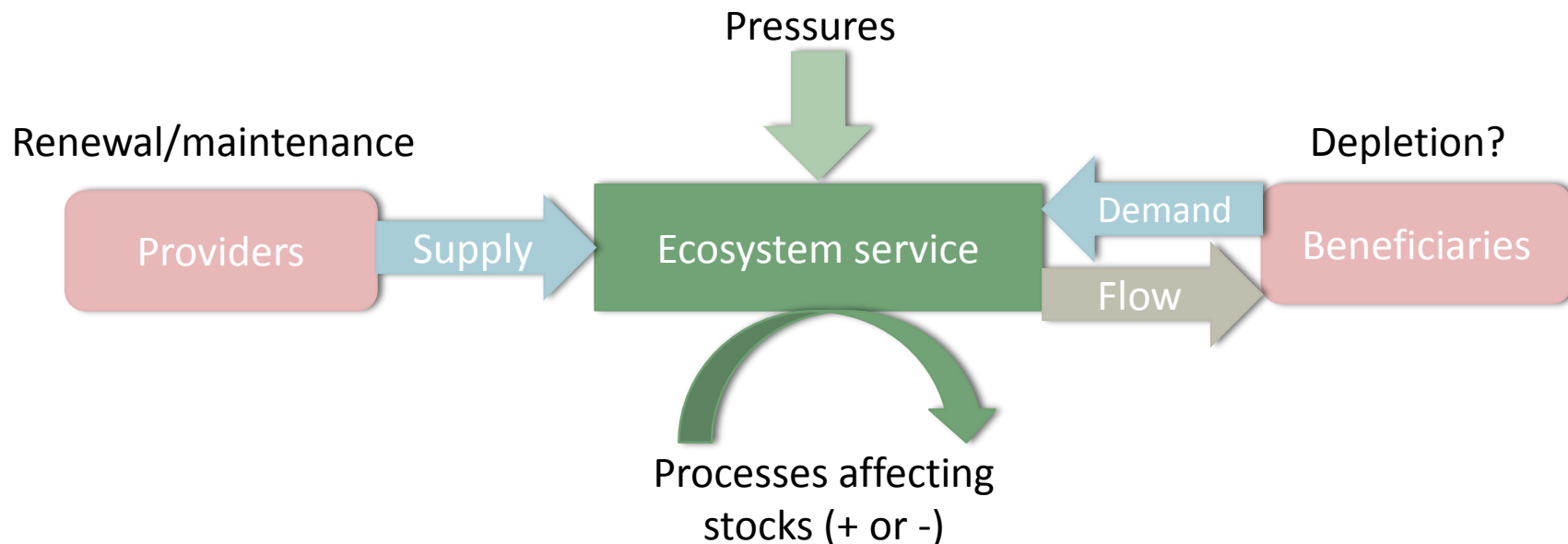
Ecosystem service	Mean score	Trend	Times selected as priority ES
Water provision	5.6	↘	10
Food provided by agriculture	5.1	↗	8
Erosion control	4.8	→	3
Food provided by cattle	4.6	↗	3
Environmental education	4.5	↗	2
Soil fertility	4.5	↘	3
Climate regulation	4.5	↗	4
Scientific knowledge	4.4	↗	3
Aesthetic 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

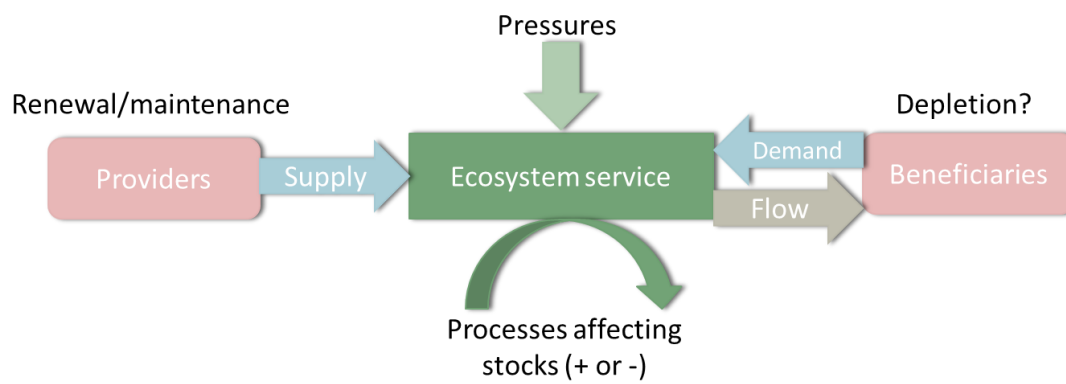
Representation and mapping of the dynamics of the services



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"> • Transportation • Conflicts between farmers and pastoralists • Capital • Education and technology • Pests and disease • Fertility • Market and Price 	<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)

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)

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)

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)

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)

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)

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)

Conclusions (1)

- The social-ecological system of Manyara is characterized by **many** stakeholders with interests in **freshwater** (entering the lake), but **few** stakeholders interested in the **saline** lake water itself (ecological condition).
- Consensus on the importance of **tourism** and the **vulnerability** of the ecosystem and its biodiversity is largely present.
- Our study benefited from the input of small-holder farmers, pastoralists, scientists, authorities and NGOs. However, some parties with an important financial stake in the basin were not present, being (1) the **tourism** industry and (2) the **intensive agriculture**. (1) is expected to be supportive to integrated management. (2) is expected to negotiate on water rights.

Conclusions (2)

- Other threats : new land use reduces the space for pastoralists and wildlife corridors and so increases **human-wildlife conflicts** and influences (1) people's attitudes towards conservation and (2) wildlife migration patterns.
- Our focus groups, the interviews, the literature survey and the input by the Belgian NGO Trias emphasised **the importance of bylaws on land use and a more visible and fair redistribution of tourism benefits.**
- On the governance side, one should look at **conflicting interests** between the Water Act, the Irrigation Act and the Wildlife Act
- **We hope that the present study will give a new impetus to 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.**

Conclusions (3)

- The need to develop national MRV systems for MAB reserves, and the need of national and local political involvement and resources to do so.

Snow ball effects of the Evamab project (Manyara)

North South South : Development
of decision support system for
Lake Manyara integrated
management (2015-2016) Funds:
VLIR-UOS



EVAMAB: valuation and perception
of ecosystem services in 4 Afrimab
sites, including Lake Manyara (2017-
2019). Funds: BELSPO

UK NERC project on land use
and stakeholders (2017-).
Funds: DFID



IFS BENIN, UGANDA, ETHIOPIA

Leopold III BENIN

LIMU15 JOINT : installing
SDG15 in universities
connected to MAB sites,
including L. Manyara
(submitted). Funds: VLIR-
UOS, (2018-2020)

Integration in Higher Education
curriculum at UHasselt (mini-workshop with
students on the Manyara case.

To be submitted soon (2019)

Social-ecological assessment of Lake Manyara, Tanzania: a mixed methods approach

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Steensels, A.^b, Malan-Meerkotter, M.^f, Henok, S.^f, Nhiwatiwa, T.^g,
Casier, B.^h, Kiwango, Y.A.ⁱ, Kaitila, R.ⁱ, Hugé, J.^{c, j, k}, Komakech,
H.^d, Brendonck, L.^b



Thank you!