

Sustainable Catchment Management through Enhanced Environmental Flow Assessment and Implementation for the protection of the Western Indian Ocean from land-based sources and activities in Tanzania (EFLOWS)



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Introduction

- **An environmental flow (EF)** is the water that is **purposely left in**, or **released into**, a freshwater or estuarine ecosystem to maintain it in a condition that will **support its direct and indirect use values** such as supply of good quality water, natural resources (e.g. fish, reeds, wild vegetables and medicines), recreation, aesthetic and cultural values and support of biodiversity.



Environmental Flows Assessment

- Environmental Flow Assessment (EFA) refers to a **science-based process** to **determine the amount of flow** to be allocated in a river reach to meet specific **management objectives**.
- Within the framework of IWRM and the water law, the **primary environmental objective** is to **maintain the vitality of ecosystems** and the **services** they provide.



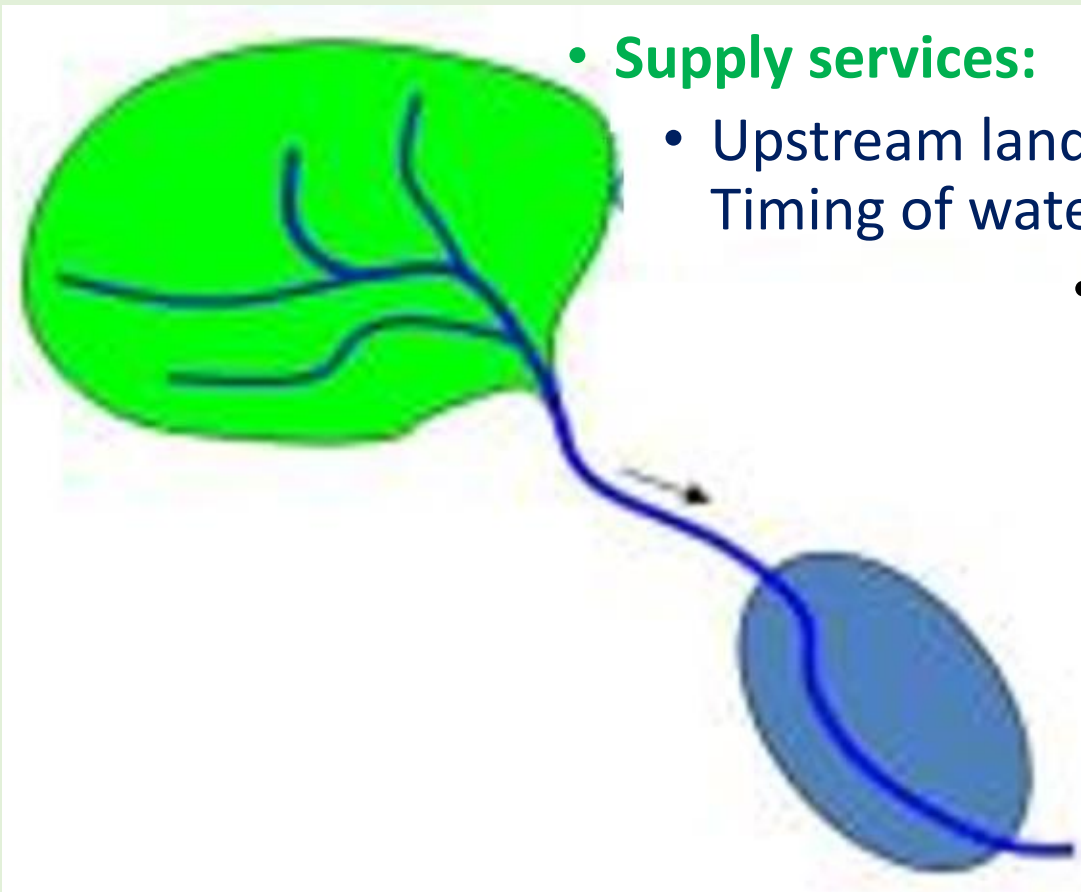
Environmental flows (EFs)

- Effective implementation of EFs should be ensured to meet the SDGs, especially SDG6, “*Ensure availability and sustainable management of water and sanitation for all*”.
 - SDG 6.4 – stipulates sustainable water withdrawals
 - SDG 6.6 – halting the degradation of water related ecosystems
- Consideration of EFs can help **reconcile the different demands for water and reduce the degradation** and loss of wetlands, protect and restore their **ecological integrity** and halt the loss of biodiversity they sustain.



Environmental flows (EFs)

- Understanding EFs can help:
 - Minimize or mitigate the impact of new water resources developments
 - Rehabilitate systems impacted by past developments
 - Allow calculation of the costs of compensating people for such impacts.



- **Supply services:**

- Upstream land uses affect the Quantity, Quality and Timing of water flows

- **Demand for services:**

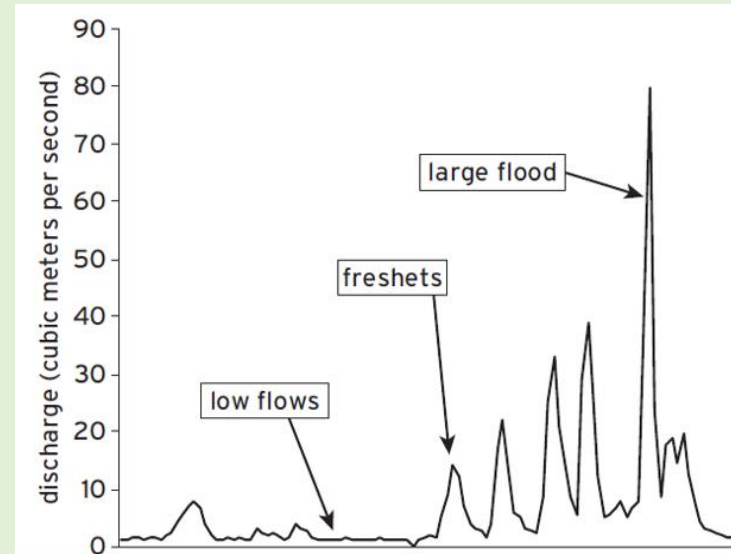
- **Possible downstream beneficiaries**

- Domestic water use
- Irrigated agriculture
- Hydroelectric power
- Fisheries
- Recreation
- Downstream ecosystems

Environmental flows (EFs)

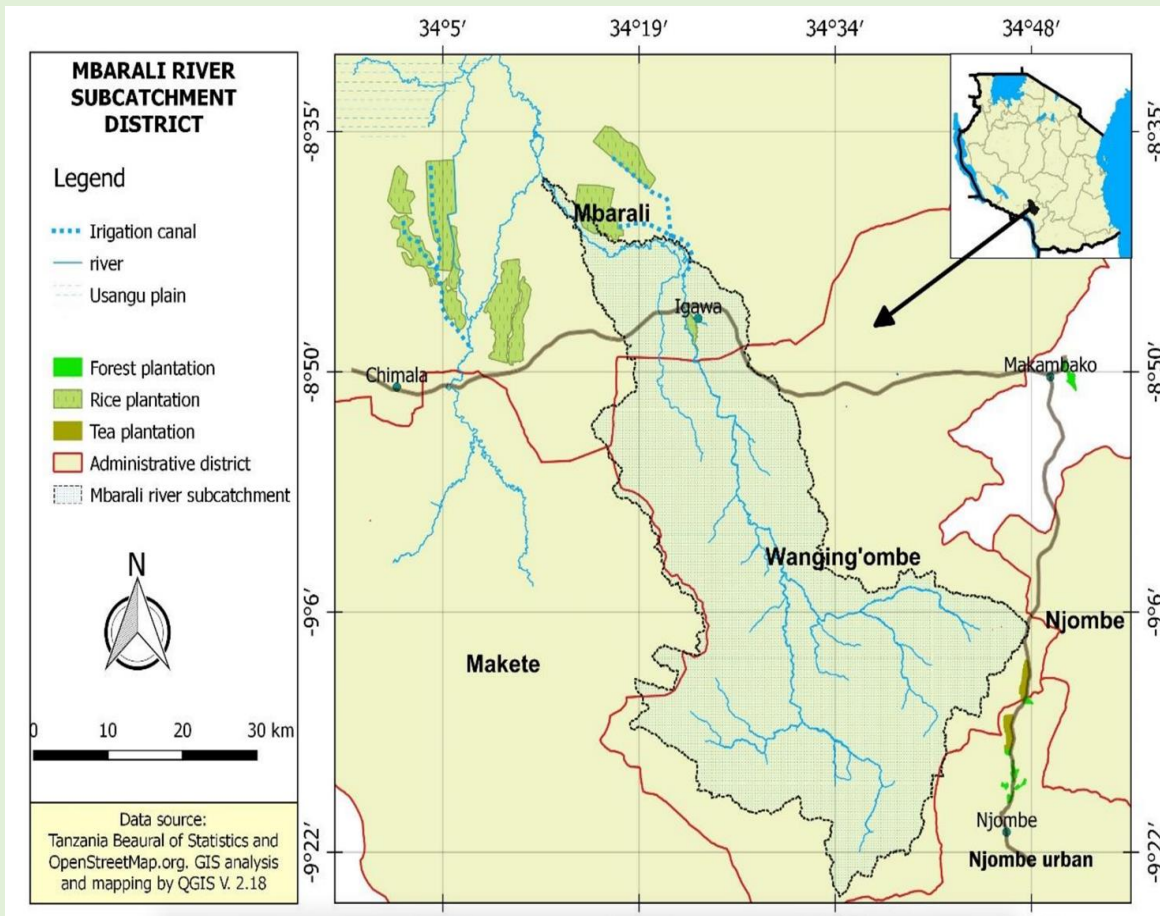
- EFs should consider:
 - Minimum flows
 - Variation in flow regimes
 - Low flows
 - Seasonal highs
 - Flood peaks
 - Extraordinary events

- EFs should be:
 - Legally defensible
 - Scientifically defensible
 - Administratively feasible



- Different **ecosystem functions** are maintained by **different components** of the flow regime.
 - **low flows** maintain the *connectivity of pools* and provide for *longitudinal movement* along the river;
 - **small, more frequent floods** (known as freshets) can *trigger spawning* in some species and may *remove detritus*; and
 - **larger, more infrequent** floods can *water floodplains* and *provide lateral movement of sediment* and *nutrients* to and from the floodplain.

Project Background



- Located in the Rufiji River Basin in the southern highlands of Tanzania.
- Catchment area 1530 sq km,
- Altitude ranging from 1000 to 1800 m asl,
- Average temperature range 25°C and 30°C,
- Mean annual rainfall is about 450 to 650 mm.

Key project partners and their roles:

- NEMC – *co-project implementer*
- Ministry of Water, Rufiji Basin Water Board for hydro-climatic data, monitoring and backstopping
- MNRT, TFS, TAFORI for technical backstopping
- Ministry of Agriculture, Ministry of Natural Resources and Tourism – TFS; LGA etc.) - *Monitoring & backstopping*
- Communities (Villages, Schools, WUA) - *On-ground project implementation*

Project Background

Overall Objective

To reduce impacts/stress from land-based sources and activities and sustainably manage critical coastal-riverine ecosystems through Environmental Flow Assessment and implementation with the support of partnerships at national and regional levels.

Specific Objectives

- i. To enhance capacity for Environmental Flow Assessment and restoration for sustainable water flows.
- ii. To conduct Environmental Flow Assessments in pilot river catchments to guide sustainable management of water flows.
- iii. Implementation of recommended flows for sustainable water resources management.



Key Planned Activities

Activity 1: Capacity of water and natural resources managers to conduct EFA and restorations for sustainable river flows in the catchments enhanced.

- Awareness rising on EFA and DST and their value on/ usefulness for catchment management
- Conduct capacity building to practitioners and regulators on scientific EFA methods and DST for management of flows
- Conduct multi-stakeholder Engagement and participation meetings
- Document, evaluate and disseminate technologies for sustainable management of flows in the selected landscapes

Activity 2: Conducting EFA in pilot rivers and documenting the process (*various reports: site selection, catchment baseline description report, wet and dry season sampling report, experts starter reports, environmental flows assessment report and production of environmental flows workshop report*).

- Conducting literature review and baseline survey to establish the past and current conditions of the selected river catchments and river flows
- Carrying out catchment/landscape and site selection for conducting environment flows using established criteria
- Conducting field sampling campaigns during both the **dry and wet seasons** to collect the necessary social, water quality, river health, ecological, hydrologic, hydraulic, climatic and geomorphologic data
- Conducting the necessary modeling and scenario analysis to identify trends in river flow, sediment yield, water quality and ecological parameters under the change in land use and climatic conditions for the study catchment, and prepare **expert reports** with suggested environmental flow recommendations and water allocation criteria
- Conduct a **flow recommendation workshop** and setting river management objectives including restoration activities with all stakeholders



Key Planned Activities

Activity 3: Evaluating and application of Incentive-based decision support tools/technologies to promote restoration activities and the implementation of the recommended environmental flows.

- Identifying and evaluating incentive-based decision support tools
- Promoting and implementing restoration activities/technologies recommended for EF management
- Installing of monitoring equipment to measure flow and water quality parameter and other indicator parameters



Key Achievements

Objectives	Achievements	Percentage progress
<p>Capacity building of water and natural resources managers on Environmental Flows Assessment (EFA)</p>	<p>The project implementation started in March 2021 following the receipt of the first disbursement of funds in late February 2021</p> <p>Various means of communication have been used to create awareness on EFlows and need for sustainable catchment management and restorations.</p> <ul style="list-style-type: none"> ▪ Project Inception workshop conducted in July 2021 ▪ Created a project Blog https://eflows-tz.blogspot.com/. ▪ Produced an EFlows documentary https://www.sua.ac.tz/news/documentary-eflows-research-project-progress ▪ Conducted several multi-stakeholder engagement meetings (WUA-MBUMTILA, BALALI and MPANDO, LGA, RBWB, TFS, TAFORI, HLIs) ▪ Presented the project results and engaged policy and decision makers during the Maji (Water) Scientific Conference (4th - 5th April, 2022), (<i>Topic: Exploring Nature based Solutions for Improved Environmental Flows in the Mbarali River Catchment, Tanzania</i>) ▪ Presented and engaged policy and decision makers, private sector during the 5th National Multi-sectoral Forum on Water Resources Management and Development, held at the BoT on 18th June 2022. 	<p>Approx. 95</p>



Key Achievements



Some of the stakeholders whom were consulted



MAJI SCIENTIFIC CONFERENCE



NMSF ON WRM&D



Key Achievements

Objectives	Achievements	Percentage progress
<p>Conducting EFA in pilot rivers and documenting the process (various reports, site selection, catchment, baseline description report, wet and dry season sampling report, experts starter reports, Environmental flows report and production of an environmental flows workshop report)</p>	<p>Building Block Methodology (BBM)</p> <p>Specific activities and achievement:</p> <ul style="list-style-type: none"> i. Recruited Experts (<i>hydrologist, hydraulic engineer, fish and invertebrates expert, geomorphologist, socio-economist, water quality expert and ecologist (vegetation and riparian)</i>) ii. Completed EFA Site selection iii. Completed dry season (low flow) sampling (11th -23rd November 2021) and wet season 20th -25th May 2022 sampling iv. Land use and land cover analysis and ground truthing. v. Flow measurement using ADCP and currentmeter vi. River cross-section survey at sampling sites vii. Fish and invertebrates sampling viii. Water quality sampling ix. River geomorphological assessment, sediments and substrate sampling and characterization. x. Riparian vegetation sampling xi. Socioeconomic surveys xii. River buffer characterization xiii. Water abstraction point mapping and hot spot erosion mapping 	<p>Approx. 85</p> <p>Experts starter reports to be ready by 31st July 2022</p> <p>Flow recommendation workshop to be conducted a week of 08th August 2022</p>



Key Achievements



Key Achievements

Objectives	Achievements	Percentage progress
<p>Evaluating and application of incentive-based decision support tools/ technologies to promote restoration activities and the implementation of the recommended environmental flows</p>	<ul style="list-style-type: none"> • Conducted multi-stakeholder consultations and field visits, co-water sources mapping & characterization and co-identification of restoration options. ➤ Nature based solution (NbS) profiling and prioritization - <i>enhanced sustainable management and use of natural features and processes to tackle socio-environmental challenges.</i> <p>Multiple direct benefits:</p> <ul style="list-style-type: none"> ❖ food, jobs, carbon sequestration (natural trees), ❖ Sustainable development <ul style="list-style-type: none"> ○ Tree nursery establishment Use of local knowledge and contemporary vegetation ecology to identify water friendly natural trees (35,000 seedlings) ✓ <i>Ficus sur</i> (Mdzombe), ✓ <i>Syzigium guinense</i> (Mvengi), ✓ <i>Asenia abyssinica</i> (Mdobole), ✓ <i>Salix subserrata</i> (Msusuliani), ✓ <i>Rauvolfia caffra</i> (Mvelevele) ○ Supportive income and livelihoods <i>Beekeeping, home gardens plus other IGAs</i> ○ Law enforcement Awareness, demarcation and zoning (<i>go and no go zones</i>), 	<p>Approx. 65</p>



Key Achievements

Status of the catchment

Diverse Anthropogenic activities



Cattle drinking water within the river at Mayota Village



Sand mining within Mbarali river at Mayota village



Water abstractions at Mwakaganga area- Ubaruku



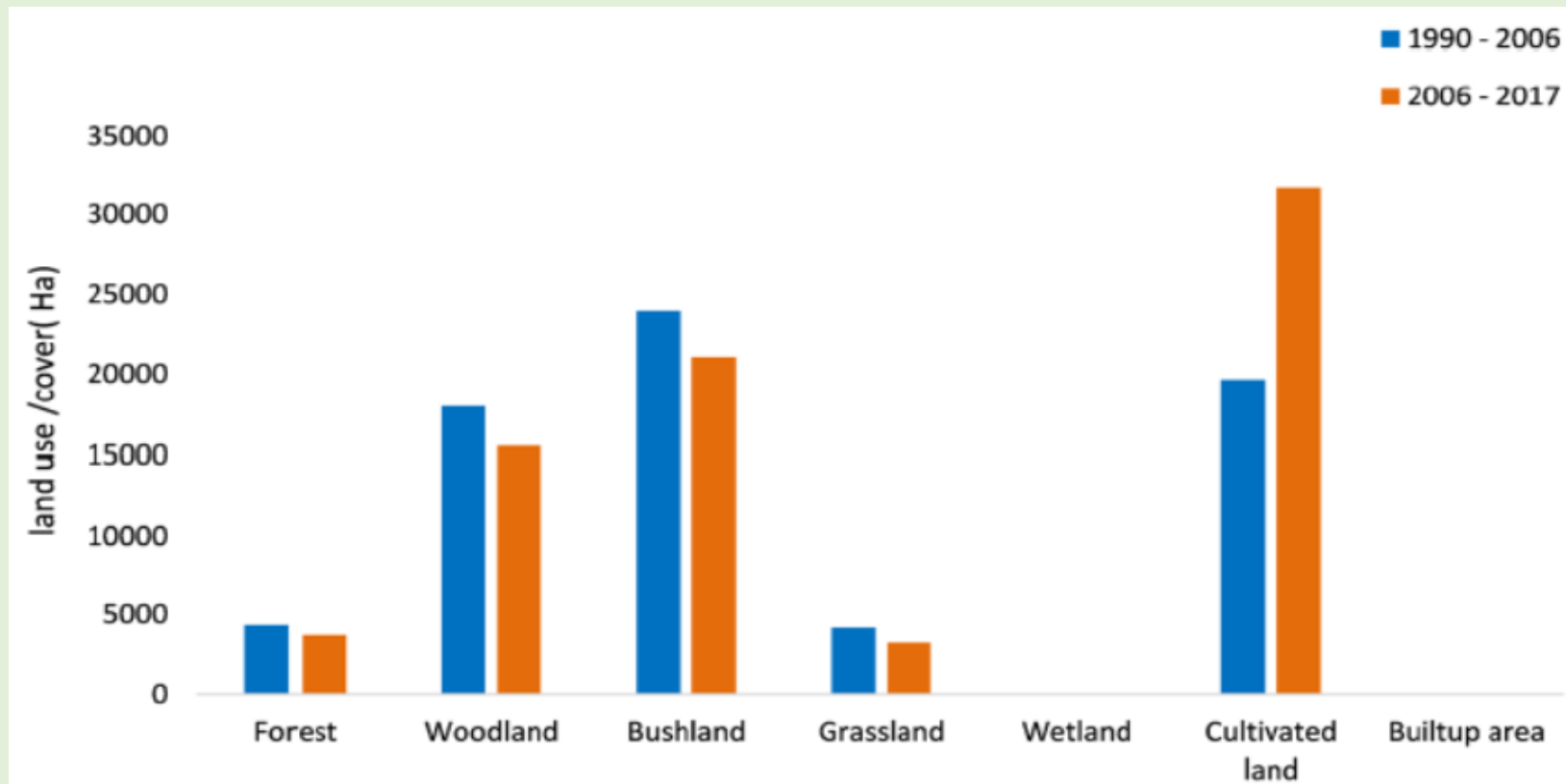
Brick laying along Mbarali river at Mwakaganga area- Ubaruku

Ongoing anthropogenic activities in different stretches of the Mbarali river as observed during field visit in November 2021

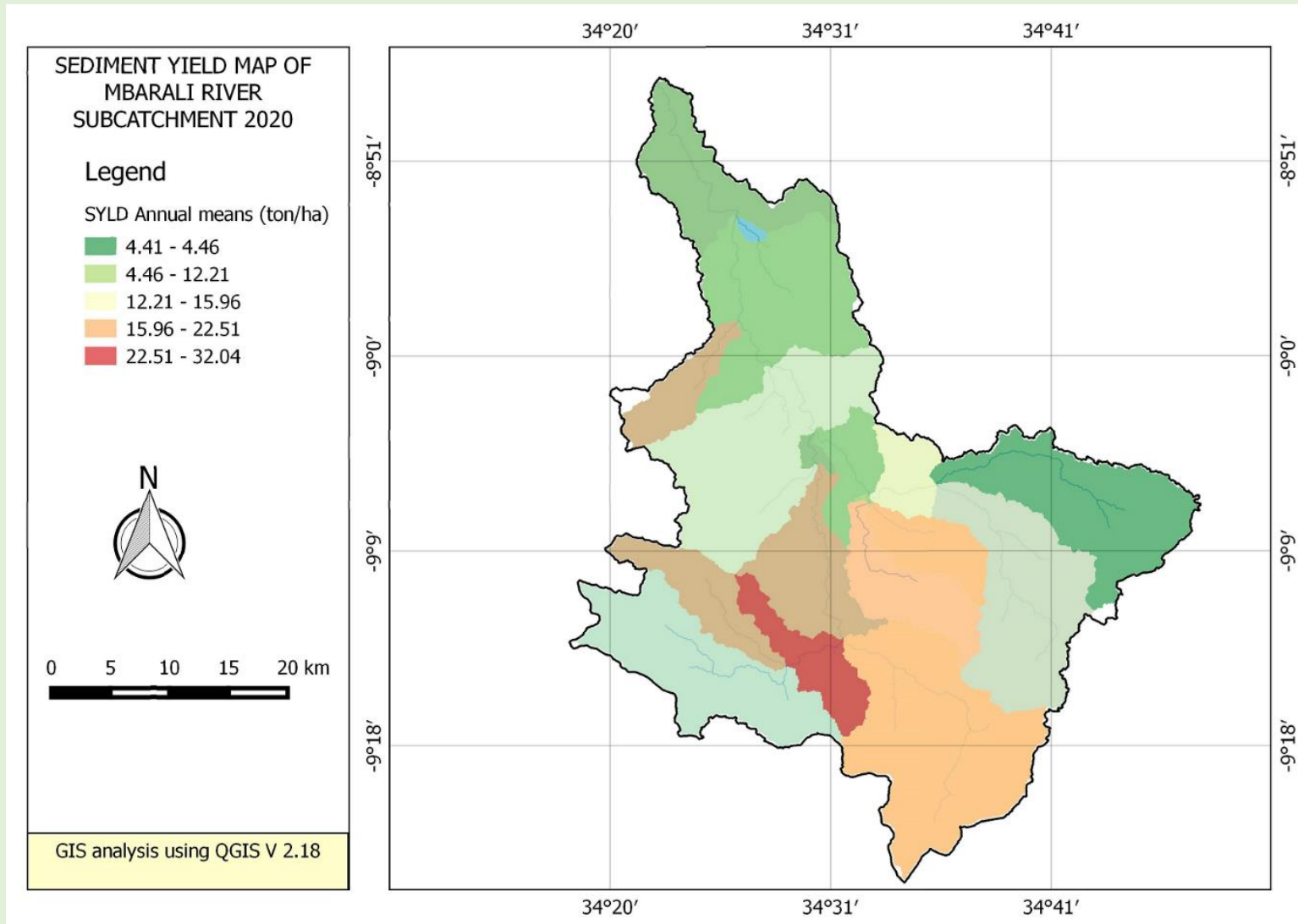
Status of the catchment

Land cover and Land use change

- *Drastic decreased in forest, woodlands and wetlands with the increased in cultivated land and settlement*



Key Achievements



- High rates of sedimentation

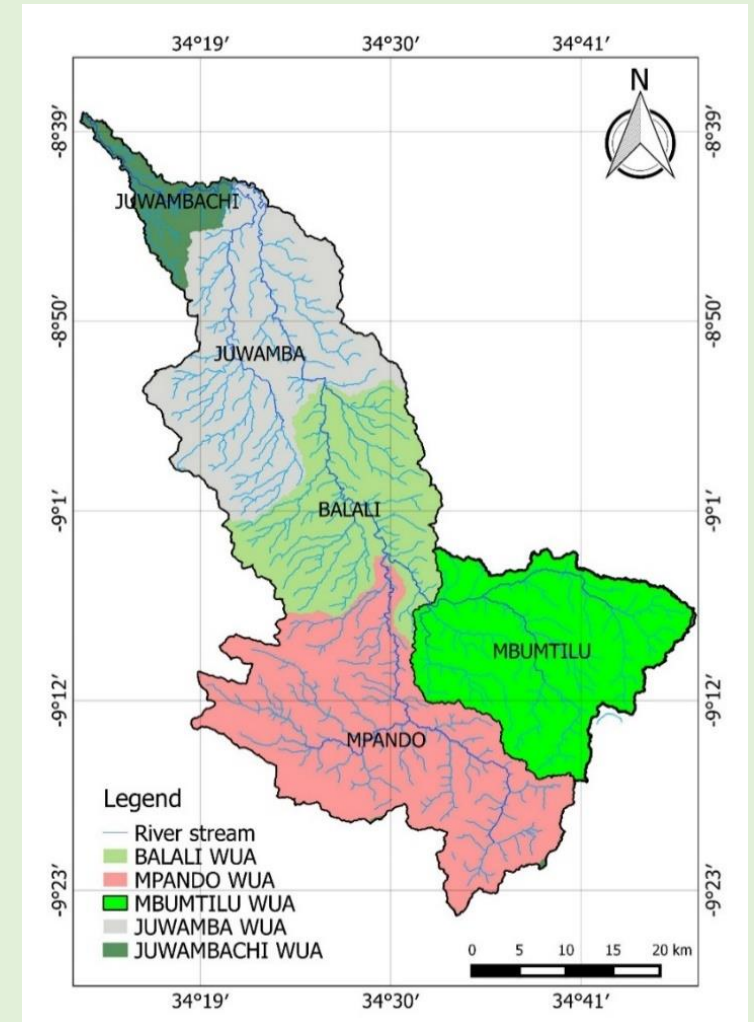


Key Achievements

Current status of water sources

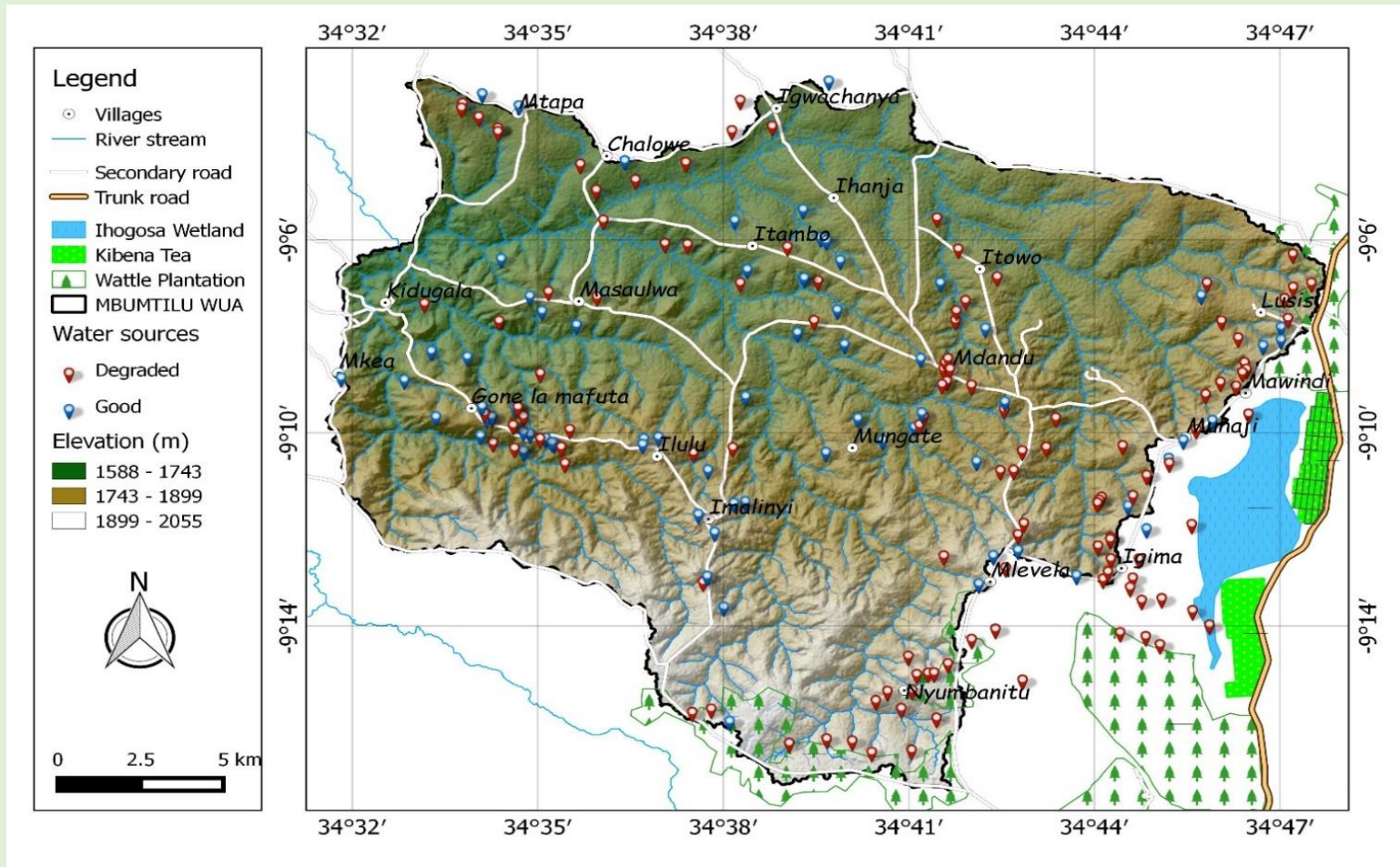
Water Users Associations

- Mbarali River subcatchment has total of five (5) WUA's,
 - two (2) WUA in Mbarali district namely JUWAMBA and JUWAMBACHI and
 - three (3) WUA in Wanging'ombe District namely MBUMTILU, MPANDO and BALALI.
- Focused on water sources in MBUMTILU WUA – covering larger area in Mbarali river subcatchment (20 villages)
- Has Three permanent tributaries draining to Mbarali River namely Mbukwa river, Mtitafu river and Lumbidzi river.



Key Achievements

Current status of water sources



Spatial distribution of water sources and their status across MBUMTILU WUA



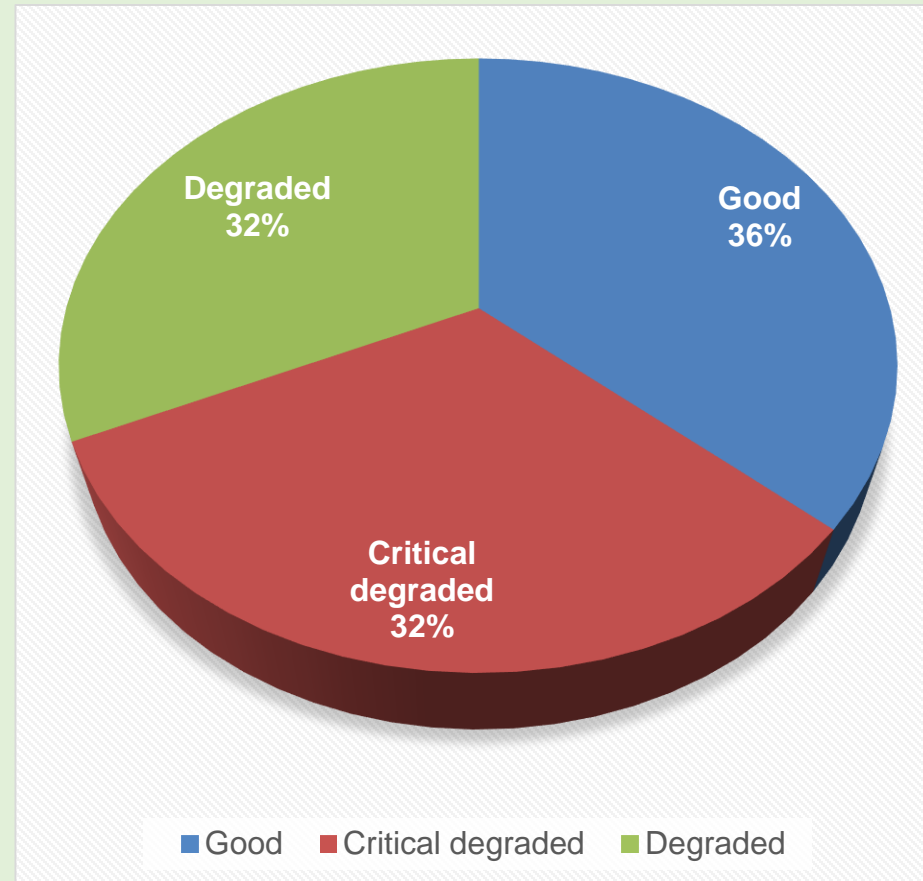
Key Achievements

- 181 water sources draining to Mbarali river were identified and mapped.

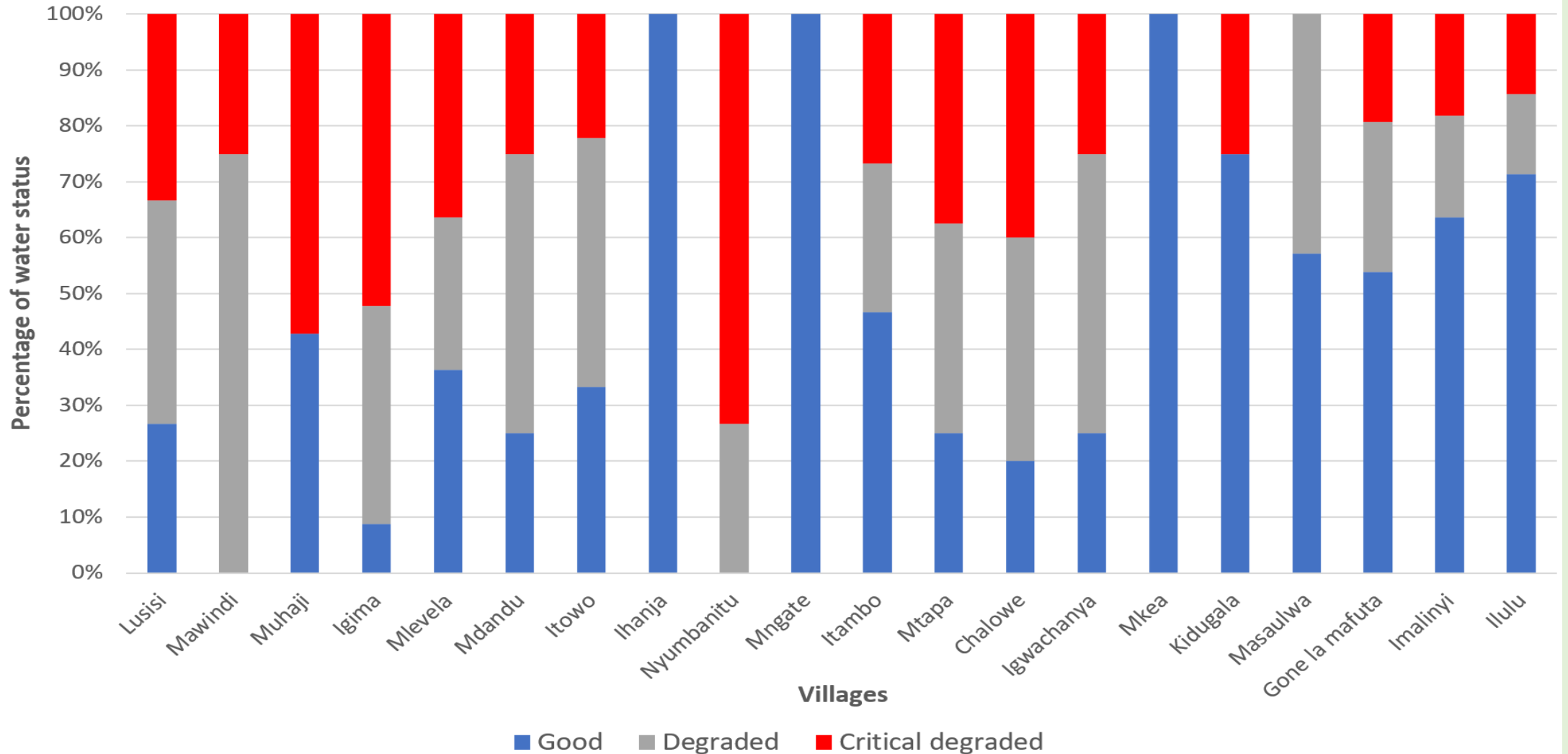


Status/Condition

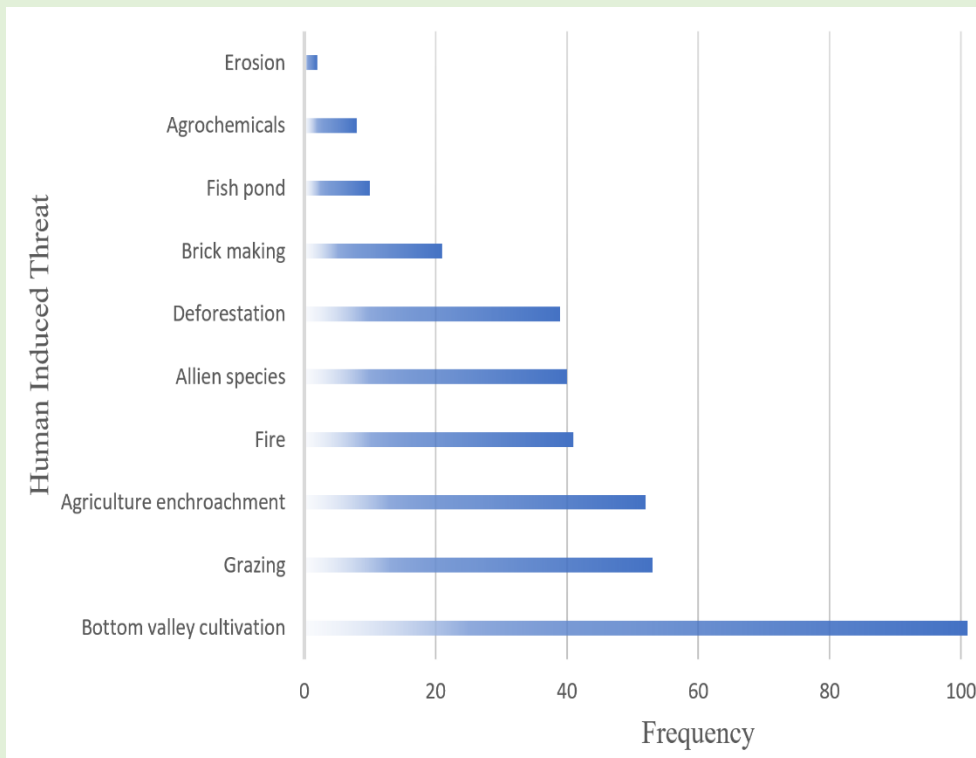
- 36% in good condition,
- 32% - degraded
- 32% - critically degraded from human induced activities



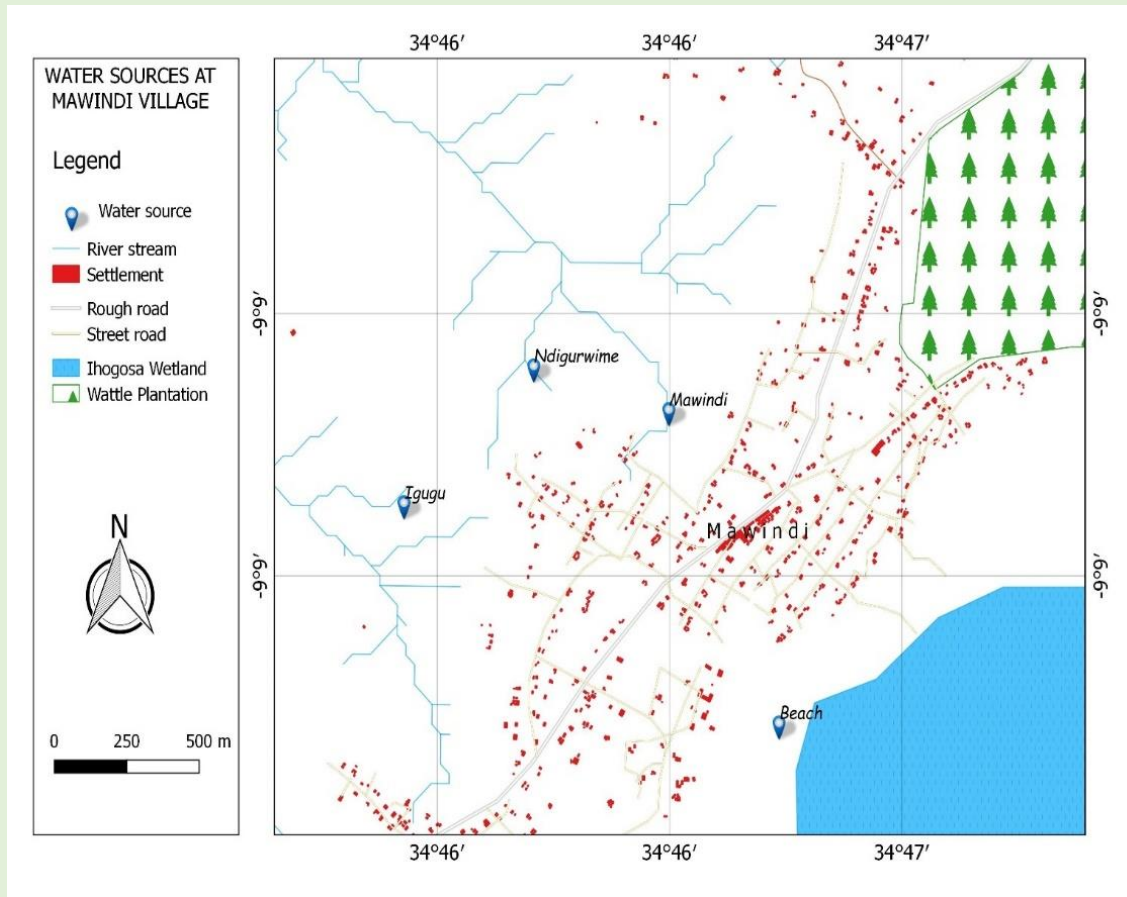
Water source status across MBUMTILU WUA villages



Threats to water sources



Mapped threats at water sources and proposed interventions



SN	Name of source	Status	Observable threats	Intervention
1	Mawindi	Degraded	BVC & BM	PT
2	Ndingurwime	Critical degraded	GRZ & BM	PT, SBM & BK
3	Beach	Degraded	GRZ & BVC	SA & BK
4	Igugu	Degraded	BM	PT & BK

Observable Threats: BVC = Bottom Valley Cultivation; GRZ = Grazing; BM = Bricks making;

Proposed Intervention:

PT = Planting trees; BK = Bee Keeping; SA = Stop Agriculture; SBM = Stop Bricks Making;

Water sources at Mawindi village



Ongoing activities

Nursery establishment and beekeeping (RBWB, WUA, TFS, LGAs)



USIMAMIZI ENDELEU WA MADAKIO YA MAJI KUPITIA TATHIMINI YA
KUMARISHA MTIRIRIKO WA MAJI KWA MAZINGIRA NA UTEKELEZAJI WAKE
KATIKA KULINDA UKANDA WA MAGHARIBI MWA BAHARI YA HINDI
KUTOKANA NA ATHARI ZA SHUGHULI ZA KIBINADAMU, TANZANIA.

KITALU CHA MITI RAFIKI NA MAJI AINA YA MIVENGI KWA
AJILI YA KUPADWA KATIKA VYANZO VYA MAJI VYA DAKIO
DOGO LA MTO MBARALI

JUMUIYA YA WATUMIA MAJI YA MBUMTILU – MDANDU

UMEFADHILIWA NA MRADI WA EFLWS

Ongoing activities

- Beehives fabrication
- Water sources demarcation
- Home garden establishment

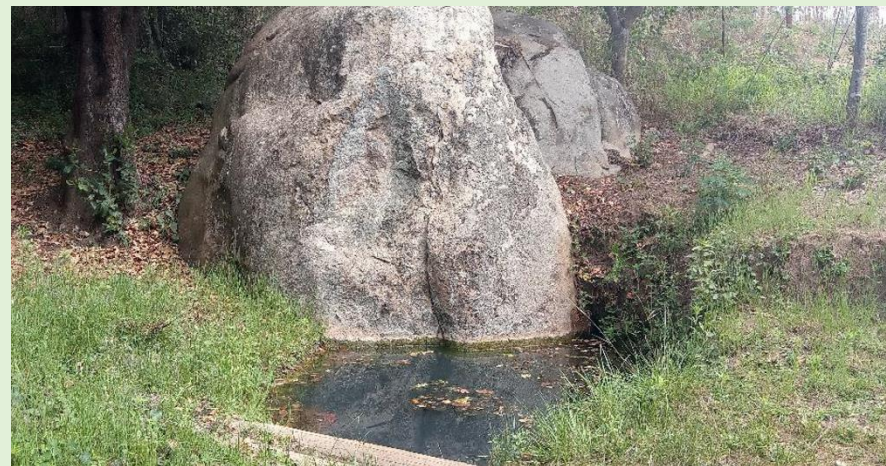


What resilience looks like for water sources?



- high cover & diversity
- high recruitment
- strong recovery

- established zones
- good water quality
- good hydrology



Key Challenges and Recommendations

Challenges

- **Delayed Project Start:** Received funds late February 2021, which was about 5-months delay since the 2nd countersigning of the revised agreement in October 2020. COVID-19 lockdown!
- **Insufficient funds:** Activities planned at a later stage were brought forward to enhance the project delivery. **More fund** is required to support the restoration activities at the degraded water sources and formation of an Apex body for Mbarali River catchment to oversee the operations in the catchment.
- **Poverty:** limited alternative livelihoods and incomes among communities inhibiting immediate implementation of the interventions.
- **Managing local expectations:** some see it as an opportunity for the self gains.



Recommendations

- Expedite the disbursement of additional support for enhanced project implementation.
- Adaptive management is key to successful implementation
- Local knowledge and contemporary vegetation ecology is vital to NbS
- Implement nature based solutions for enhanced Eflows and incomes
- WUAs' empowerment is critical for the sustainability of restoration actions through NbS
- Monitor progress (even beyond project) to reveal the project impact and implementation lessons.



Sustainability

- There is strong, **high-level government commitment** for the conservation and restoration efforts in the Mbarali River sub-catchment for enhanced flows to Julius Nyerere HEP.
- Rufiji Basin Water Board and the WUAs have demonstrated a strong commitment to support the implementation of recommended flows and the buy-in from the Water User Associations has been significant.
- The **District Councils are supporting income generating activities** that have conservation components implemented by women and youth. They are **required to set a side at least 10%** of their annual income to support these activities.

Acknowledgements

- UNEP, Nairobi Convention and GEF for their support
- VPO-DoE for the coordination
- NEMC –project implementing partner
- Ministry of Water, Rufiji Basin Water Board for hydro-climatic data, monitoring and backstopping
- MNRT, TFS, TAFORI for technical backstopping
- LGAs, WUAs for on ground project implementation





*Thank
you!*