TOWARDS SUSTAINABLE MANAGEMENT OF FRESHWATER RESOURCES IN NORTHEASTERN TANZANIA

"Our current actions have long-term effects on the quality of freshwater, the access that people will have to freshwater, and the ecosystem services they provide"

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KEY MESSAGES

- The freshwater resources of northeastern Tanzania, a source of freshwater and food for millions of people, are under increasing threat from habitat degradation, water pollution, flow modification, and invasion by non-native species.
- Climate change is expected to have a far-reaching impact on freshwater resources in the northeastern Tanzania.
- Critically endangered freshwater species such as *Oreochromis variabilis, Amanipodagrion gilliesi, and Oreochromis amphimelas*, remain poorly documented.
- Unless we manage our freshwater resources better, we will not achieve our societies' broader development goals.
- A holistic and integrated management of freshwater resources at all levels is needed to improve the protection of freshwater resources and the ecosystem services they provide for people and wildlife.

BACKGROUND

Northeastern Tanzania region is endowed with a diverse of freshwater resources including lakes, rivers, wetlands, ponds, and man-made reservoirs; which forms an important hotspot of freshwater biodiversity with an outstanding reservoir of freshwater plant and animal species. The northeastern Tanzania freshwater resources support the life of more than 15 million people through fisheries and related activities and serve as a main source of freshwater for different uses. However, the future of freshwater resources in northeastern Tanzania is highly threatened due to the gradual destruction and aggravated pollution of freshwater resources in the region, along with the progressive encroachment of incompatible activities, impelling the need for integrated water resources planning and management. This brief proposes solutions and recommendations to improve the management of freshwater resources in northeastern Tanzania and beyond.

Figure 1: Dried Kikuletwa River at Wahoga Chini gauging station (left); land degradation and soil erosion in Monduli district (second from left); water abstraction for sugar cane irrigation at Kahe (second from right); and proliferation of water hyacinths, reeds, and sedges in Lake Jipe (right).

Drivers of freshwater resource degradation in northeastern Tanzania

• Over-exploitation of water resources for irrigation (particularly in river systems) which consumes more than 70% of available blue water combined with climate change threatens river ecosystem sustainability and ecosystem service delivery.
• Deforestation on the hills and mountains and around the water sources, coupled with inappropriate agricultural practices and livestock grazing that leads to severe soil degradation erosion within the basins, consequently increasing runoff and siltation, and affects the basins' water retention capabilities.
• Overfishing and the use of inappropriate fishing techniques destroy fish spawning habitats, threaten fish stocks, and jeopardies the biodiversity and livelihoods of the surrounding communities.
• Improper liquid and solid waste disposal (especially in major towns) affects the water quality, causes habitat loss and biodiversity loss, and forms the breeding ground for major disease vectors such as mosquitoes.
• Encroachment on freshwater ecosystems by agricultural activities, mining activities, and livestock watering, bathing, and washing destroys freshwater habitats and threatens ecosystem function.

• Nutrient, sediment, and pesticide (residue) pollution from diffuse and point sources jeopardies the water quality and biodiversity, and accelerates the invasion and proliferation of non-native species, particularly in Lake Babati, Lake Jipe, and Lake Victoria.
• Lack of effective rainwater harvesting techniques and poor maintenance of available infrastructures hampers communities' access to water in dry season.
• Lack of a centralised (one-stop center), readily available, and usable freshwater biodiversity information system to support effective management decisions for sustainable conservation of freshwater ecosystems derails management efforts.
• Poor information flow among key sectors and stakeholders hinders proper freshwater resource planning, development and management efficient use and protection of water.

Figure 2: Destruction of the littoral zone by pollution in Lake Jipe (left), encroachment of the littoral zone by livestock in the Ruvu River (middle), and extraction of building materials in the Pangani River (right).

Figure 3: Illegal fishing gears in Nyumba ya Mungu Dam (left), in Lake Manyara Oltukai Village (second from left), in Lake Manyara Esilalei Village (second from right), and immature fish captured by mosquito net in Nyumba ya Mungu Dam (right).

Figure 4: Inappropriate handling and disposal of solid waste pollute the freshwater resources and forms mosquito breeding habitats in the Lake Manyara Basin.

Figure 5: Illegal fishing of small fish (locally known as Kayabo) in Lake Manyara (left) and improper handling and processing of the catch cause significant losses in Lake Manyara (middle) and Nyumba ya Mungu Dam (right).

Proposed solutions and recommendations for improving the state of freshwater ecosystems in northeastern Tanzania

Improving Freshwater Management

- Recognition of the multisectoral nature of freshwater resource management and development in the context of socioeconomic development: ensuring coordinated planning and management of freshwater resources that involve all users, planners, managers, and policy and decision-makers at all levels
- Development and operationalisation of Integrated Water Resources Management Plan for each basin.
- Establishment of watershed management teams at the village level to ensure community engagement and sustainable management of freshwater resources.
- Expand and maintain water quality monitoring networks in each basin; ensuring that monitoring networks can take into account new circumstances and needs, such as climate change.
- River basin authorities should conduct environmental flow assessment and quantify the amount of water needed for the environment. Water allocation for different uses should consider the generated data on the available water for each basin.
- Improve water quality and quantity monitoring technology, including real-time in situ monitoring, expanding the number and types of indicators monitored, and improving the reliability of sampling tools and data analysis.
- Conduct multisectoral review of existing water policy towards a more holistic and integrated water resource management
- Mainstream freshwater biodiversity information into policy and decision-making processes to enable the formulation of sound freshwater biodiversity conservation-related action plans, policies, and effective management decisions
- Enhance rainwater collection methods in arid and semi-arid regions to increase community access to freshwater
- Map and demarcate all water sources in the region, particularly, small and temporary water bodies, which are one of the major water sources for the surrounding communities.
- Enhance local groundwater recharge and promote the conjunctive use of ground and surface water to combat the overexploitation of surface water.
- Improve enforcement of the legal prohibition of human activities within 60 metres of a water source as stipulated in the national water policy of 2022, the water resources management act of 2009, and the environmental management act of 2004
- Develop a centralised system for storage and easy access of water quality and quantity data and freshwater biodiversity information in the region
- Ensure proper classification of water sources to facilitate proper regulation on conservation and management of freshwater sources.


Figure 6: Key stakeholders from NM-AIST, the Pangani Basin, the Lake Victoria Basin, the Internal Drainage Basin, Monduli DC, Babati DC, Moshi DC, TAFIRI, TAWIRI, and MWECAU came together to discuss and develop FIMC monitoring protocol, FIMC brochure, policy brief in Babati , December 2022 (left). Key stakeholders from NM-AIST, TAFIRI, TAWIRI, UDSM, MWECAU, COSTECH, the Pangani Basin, and the Lake Victoria Basin attending a capacity enhancement workshop (training) on freshwater biodiversity data mobilisation and publication in Moshi, September 2021 (right).

Enhancing the mainstreaming of freshwater biodiversity information in decision-making processes

• Improve the allocation of internal resources for capacity building in freshwater biodiversity data collection, monitoring, and management at the national level.

• Develop transboundary and integrated monitoring programs for selected freshwater species in the region to ensure comprehensive data collection.

• Enhance coordination and collaboration within and between institutions involved in collecting and holding freshwater biodiversity data to bridge gaps and link decision-makers to data collectors.

• Ensure equitable participation of data providers and users, including local communities, in the adaptive management process for better results and sustainability.

• Foster collaboration among data collectors, providers, and users to produce data and information-derived products in formats that meet policy and decision-makers' needs.

• Quantify the economic values of ecosystem services provided by freshwater biodiversity to highlight their importance.

• Create national networks of freshwater data holders and users to facilitate data sharing and improve data accessibility.

• Digitize and mobilize existing freshwater biodiversity data to increase its usability and impact.

• Develop freshwater biodiversity data sharing platforms and communities to facilitate data sharing and use.

• Enhance citizen science initiatives by involving volunteers in data collection and monitoring to bolster data mobilization efforts.

• Produce high-quality freshwater biodiversity data in a timely manner and in formats that are easily accessible and usable.

• Facilitate interaction between scientists and decision-makers to enhance their mutual understanding of how to improve freshwater biodiversity data flow and use in Tanzania.

• Establish dynamic, active, long-term, cross-sectoral science-policy interfaces that are regularly adapted to meet the needs of data users, policy and decision-makers.

Figure 7. Examples of macroinvertebrates inhabiting freshwater ecosystems in northeastern-Tanzania. From left to right, then top to bottom: *Potamonautes* sp. *(Decapoda), Silvatares* sp. *(Trichoptera), Afrobrianax* sp. *(Coleoptera), Anax* sp. *(Odonata), Gyrinus* sp. *(Coleoptera), Caenis* sp. *(Ephemeroptera), Marsupiobdella* sp. *(Hirudinea), Branchipodopsis* sp. *(Anostraca), Laccotrephes* sp. *(Hemiptera), Streptocephalus* sp. *(Anostraca).*

Improving Land Use Planning and Management

• Ensure the development of a holistic and sustainable land use plan for each basin and its implementation.

• Integration of all sectors in land use planning to ensure sustainable land use management.

• Land use planning and management authorities should factor in climate change when planning future land-use developments.

• Promote nature-based solutionsfor soil and water conservation and landscape restoration, such as the use of semi circular bunds, for sustainable land management

• Incorporation of indigenous knowledge on soil conservation and land management at all levels.

• Ensure proper planning and management of rangelands to avoid overgrazing.

• Proper planning and allocation of areas for waste disposal and recycling to minimise environmental pollution.

• Create and maintain a village land use plan committee for each village for effective land management.

• Reforestation and promotion of good agricultural practices in the region including terrace farming and crop rotation.

• Establish and maintain a water point for livestock watering at the village level to avoid further land degradation.

Figure 8: Key stakeholders from NM-AIST, the Pangani Basin, the Lake Victoria Basin, the Internal Drainage Basin, Monduli DC, Babati DC, Moshi DC, TAFIRI, TAWIRI, and MWECAU came together in Babati for project validation.

Enhancing Fisheries Management

• Generation of accurate data and information on fish populations even in small water bodies
• Harmonization of fishing regulations and by-laws within existing institutions to include all water bodies
• An intersectoral review of fisheries policy is necessary in order to achieve a more holistic and integrated fisheries management; the policy should include small water bodies.
• Conduct a comprehensive fish stock assessment, even in small bodies of water.
• Review of fishing gear to capture current practices
• Review of fishing charges regulations of 2020
• Promote good fish processing practices to reduce post-catch losses
• Promote good fishing practices for the recovery of fish, especially in the major lakes in the region
• Promote dialogue between resource users, scientists, and managers for better management
• Enhance enforcement of existing fishing regulations and control of fishing techniques and gear.
• Encourage alternative means of income generation, including the promotion of aquaculture.
• Encourage the government and development partners to improve the livelihood of the surrounding communities.

Improving Waste Management

• Sensitization of communities on proper waste handling, management, and disposal starting at household level
• Elimination of all anthropogenic mosquito breeding sites including tires, used and abandoned tanks, discarded artefacts
• Adoption and promotion of water recycling, recovery, and reuse
• The government should be encouraged to provide finance to implement needed technologies and infrastructure for proper waste handling, treatment, and disposal.
• Encourage proper wastewater treatment planning in relation to intended water reuse (domestic, agricultural, and industrial) for efficient water quality management.
• Promote cleaner production in industries and agriculture for increased efficiency of water and other materials, preventing and reducing water pollution at the source
• Provide technical and logistical support to communities to help implement technology and infrastructure needed for waste management.
• Promote proper management of solid and liquid waste at all levels (i.e., from the household level).
• Local district councils should do proper planning and make proper land allocations for the disposal of solid and liquid waste.

The way forward

• Enhance communication, education and advocacy
• Raise public awareness of the value of freshwater ecosystems and the services they provide via radio, television, messages, school environmental clubs, and social media platforms.
• Sensitize community to proper waste disposal and handling through village meetings, school environmental clubs, radios, television, messages, and social media.
• Develop freshwater biodiversity data sharing platforms and communities to facilitate biodiversity data sharing and use.
• Raise awareness of the consequences of illegal fishing among fishermen and the fishing community through beach management units, village meetings, radios, television, messages, and social media.
• Sensitize fishing community on the protection of spawning grounds
• Raise public awareness of the benefits of agroforestry in providing a buffer against negative agricultural effects.
• Promote the use of organic fertilisers and their environmental benefits.
• Provide practitioners with training and technical assistance to ensure effective implementation of best practices in water resource management
• Increase land and water management capacity through formal education programmes that train future experts in land and water resource management.

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