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# Development of an integrated water resources management plan for the Lake Manyara sub-basin, Northern Tanzania

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## Abstract

Water resources management in Lake Manyara sub-basin is an issue of very high significance as the sub-basin hosts a number of national and global assets of great socio-cultural, ecological and economic values. The sub-basin comprise of a Biosphere Reserve with boosting tourism from Lake Manyara National Park with a variety of wildlife population, large livestock population and highly fertile land for agricultural production. The prevailing system of uncoordinated water resources management in the sub-basin cannot sustain the ever increasing water needs of the various expanding sectors, therefore a strategy must be sought to integrate the various sectoral needs against the available water resources in order to attain both economic and ecological sustainability. Through participatory approach with the stakeholders, the study has established key issues, demonstrated considerable experience in water resources management in the sub-basin including existence of water boards, water committees in some districts as well as land resources management practices. However, a number of constraints were noted which inhibit sustainable water resources management including ignorance of water policies, conflicting sectoral policies, lack of coordination between sectors, high in migration rates into the basin, heavy in migration of livestock, conflicts between sectors, poor land use resulting in soil erosion and sedimentation, lack of comprehensive data base on water resources and water needs for : domestic, tourism, livestock, irrigation, wild life and environmental flows. As a way forward it was recommended that a basin wide legally mandated body (involving all levels) be established to oversee water use in the sub-basin. Other strategies include capacity building of stakeholders on water natural resources management policies, water rights and enforcement of laws. This progress report paper highlights the wealth of knowledge that stakeholders possess on water resources management and using that platform develop a participatory Integrated water resources management where roles and responsibilities are ironed out.

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## 1. Introduction

### 1.1. Background

Lake Manyara sub-basin constitutes a Biosphere Reserve and the Mto wa Mbu wetland which is the host of Lake Manyara National Park and consequently a tourist center. The moist environment provides for evergreen and reliable pasture for large numbers of livestock and wild life. Further, the wetland provides fertile areas for cultivation of banana, rice and vegetables therefore is a hectic business center with high in migration (Mwalyosi et al., 1999).

During the dry season, livestock populations move into the wetland from distant villages in search of water. It is during this time when the Mto wa Mbu are serves as holding ground for livestock from the Sukumaland on transit to Arusha town for sale. The resulting situation is that livestock keepers conflict with farmers over pastureland and water. Frequently, village leaders are called upon to resolve conflicts but new conflicts keep on surfacing.

Other factors which increase the stress on water include in migration to the wetland estimated as about 4.5% (Norconsult, 2001) largely from nearby towns e.g. Arusha, Babati and distant areas. During the rain season the pit latrines overflows and due to the shallow water table and result in high pollution in the area. Currently a new tarmac road which is being constructed through the Mto wa Mbu settlement to Ngorongoro Conservation are. This facility will promote tourism in the area but will trigger more influx and stress further the water situation.

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Therefore, with the expanding and competing water needs in the sub-basin a holistic participatory approach on water resources is required to address current and future scenarios on water needs. It is through such approach that socio-economic development can be reached at the same time attain ecological sustainability in the sub-basin.

1.2. The objectives

The general objective of the study is to establish an integrated water resources management plan in the Lake Manyara sub-basin in order to attain both economic and ecological sustainability. The specific objectives of the study are:

- to assess the water resources base in the sub-basin,
- to establish current and future water needs of the stakeholders,
- to develop water balance between supply and demand for present and future, and
- to establish an integrated water resources management system.

1.3. The study area

Lake Manyara sub-basin was selected as the study area because it hosts Mto wa Mbu swamp which is a host of

conflicts in resource use especially water because of high in migration rates to the Mto wa Mbu swamp. Apart from water the swamp has fertile area for agriculture, extensive pasture and water for livestock and Lake Manyara National park with a variety of wild life and hence booming tourism industry. Therefore the area is economically important and of ecological interest because of the diverse biodiversity. The Lake Manyara sub-basin extends approximately 6942 km<sup>2</sup> within the Ngorongoro, Karatu, Mbulu, Babati, and Simanjiro Districts in Manyara Region, and Monduli District in Arusha Region. The boundary of the basin constitute the water divide (watershed) of the area drained by Lake Manyara. The basin extends from 3°05" to 4°05" South and 35°51" to 36°37" East (Fig. 1).

The major features of the basin include the Gregory Rift Valley with only the eastern escarpment being conspicuous, in some areas rising to over 200 m. The Ngorongoro massive (3650 m) forms the northwestern boundary, while the Mbulu plateau (2135 m) forms the western boundary. In the south, the conspicuous boundary feature is the Kwahara mountain (2415 m). In the east the Lolkisale hill, while in the north and northeast are the volcanic peaks of Lossimunguri, Burko and Monduli ranging between 2130 and 2660 m. In the central part of the basin is the lake Manyara (920 m.a.s.l) Based on climatic and hydrological variations,

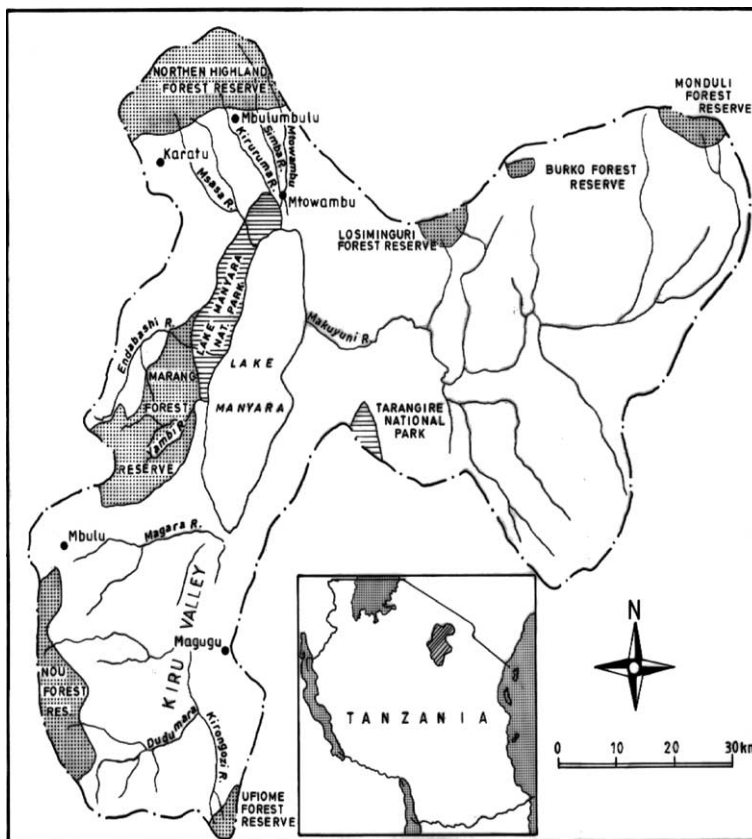


Fig. 1. Lake Manyara sub-basin.

the basin can be classified into three zones forming concentric rings around the highlands. About 50% of the basin is flat land, 20% is hilly and mountainous, and 30% is rolling to moderately dissected hills.

Lake Manyara Basin is categorized as a semi-arid area which forms part of the Maasai Steppe formerly used for transhumance livestock pastoralism and wildlife conservation as the most sustainable land use practices. In recent years, however, the basin has been opened up for subsistence and mechanized farming, settlements, and increased tourist activities. Migrants from all over the country are attracted into the basin by its relatively fertile farmlands and irrigation potentials. The abundant of wildlife and biodiversity in the basin is promoting tourism development activities including hotels, tented camps, trading centers, and vegetable production. In addition, there is abundant herds of livestock in the basin. During the dry season, the basin further supports a large population of livestock from other areas. All these activities are dependent on water resources that are available in the basin.

## 2. Components of water resources management in the Lake Manyara sub-basin

In order to analyze the water resources of the Lake Manyara sub-basin it is important to indicate the relevant components in the water balance. It can simply be said that water budget equation in the basin is as follows:

Potential water resources in the sub-basin

$$\geq \sum \{ \text{Water needs for Environmental flows} \\ + \text{Domestic use} + \text{Irrigation} \\ + \text{Tourism (Hotels \& Camps)} + \text{Livestock} + \}$$

In the above equation, the major concern is how to ensure that the various water needs do not exhaust the environmental needs required to maintain ecological balance in the sub-basin. The above relationship is diagrammatically simplified more in Fig. 2.

It has been report above that the choice of the study area was based on the intense conflicts between the various users. The causes of the water pressure is largely due to the in-migrating population into the Mto wa Mbu swamp/wetland for livelihood support (Mwalyosi, 1994). The irrigation efficiency in the area is estimated to be below 60% and is the major water consumer and yet so extravagantly done particularly due to lack of water demand management procedures and low technologies. The intensity of the problem is mostly felt during the dry season.

The expanding tourism sector with various new hotels and campsites also pose pressure on the available water resources. It has been noted that the newly constructed road from Makuyuni town to Ngorongoro Conservation Area (NCA) gate would exacerbate further the stress on the water situation in the sub-basin as it would act as an attraction for more migrants and investors in the tourism sector.

Livestock population apart from increasing from time to time, it is also enhanced, especially during the dry season due to in-migrating pastoralists with their herds.

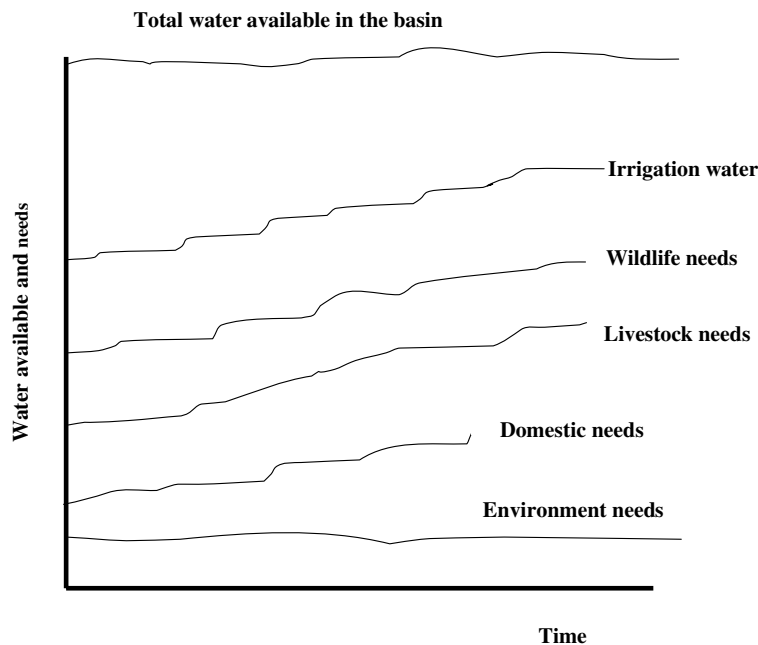


Fig. 2. Relationship between potential available water and various uses.

It has been reported that almost double the existing livestock population flocks into the Mto wa mbu swamp areas from neighboring districts during the dry season. This situation is partly caused by availability of pasture and water in the sub-basin. It is during this period that serious conflicts arise between irrigators and livestock keepers that lead to confrontation and calls for conflict resolution measures. Therefore, the existing challenge is to ensure a balance between the available water resources and present and future water needs as demonstrated by the needs of the various stakeholders and water users.

### 3. Study methodology

The first exercise was to collect baseline information through review of relevant materials and documents on the subject matter. This exercise was followed by a reconnaissance survey which was undertaken to inform the key stakeholders in the sub-basin about the project and agree on a convenient date for the initial stakeholders' workshop. The reconnaissance visit also enabled the identification of more stakeholders who were crucial to be involved in the study. Subsequently, a stakeholders' workshop was convened with the following objectives:

- to introduce the objectives and approach of project to the basin stakeholders,
- to tease out key issues in water resources management in the sub-basin,
- to solicit appropriate approaches in the research problem,
- to document various intervention experiences (success stories and constraints) in water resources management,
- to map out the Way Forward.

The stakeholders who attended the workshop came from the four districts that cover the sub-basin, namely: Monduli, Karatu, Mbulu and Babati Districts. The invited stakeholders included:

- District Planning Officers (DPLOs),
- District Water Engineers (DWEs),
- District Natural Resources Officers (DNROs),
- District Agricultural and Livestock Development Officers (DALDOs),
- Ward Executive Officers (WEOs),
- Village Chairmen, and Village Executive Officers (VEOs),
- Representatives of livestock keepers and farmers,
- Representatives of institutions involved in natural resources management in the sub-basin (i.e. Lake Manyara National Park, Tarangire National Park, and Tanzania Wildlife Research Institute (TAWIRI),
- Representatives of hotels and campsites.

## 4. Presentation and discussion of results

### 4.1. Successes

It was observed that the local communities have made concerted efforts in natural resources management in the basin (Ngana, 2002). It was reported that a number of villages have good farming practices including use oxen-driven ploughs in the steep sloping areas instead of tractors, community forestry in some villages, and reserved wildlife corridors. For example, there is conservation of natural forests like the Marang, Nou and Hasama forests, which are important catchment forests for the Lake Manyara sub-basin. There is also control of soil erosion by planting trees, establishing proper contour bunds, practicing good livestock rearing systems including zero grazing.

A good example was demonstrated in Karatu District whereby a Water Board of Trustees has instituted to manage economically a water scheme for the Karatu town. The management structure of the Board is shown in Fig. 3.

Karatu District has initiated a number of other water management programs to cater for water needs of the villages. According to the new water policy, the private sector and community involvement are highly recommended for the management of water schemes (URT, 2002). These modes of involvement include, Trusteeship, Water User Associations, Water Company etc. Some villages in Karatu district agreed to adopt the Trusteeship mode which was later approved by the Villagers (Business Care Services, 2002). It is noted in Fig. 3 above that the Water Manager coordinates various domestic point committees in the village. Apart from coordinating the later committees he/she gets advises from the village committee on the management of the water in the entire village. The overall management of the water in the village is presided by the Board of Trustees.

The above scheme demonstrates that non governmental institutions are now coming in the management of water resources including private sectors, NGOs, companies, Water User Associations (WUAs) etc. This is a healthy situation for many more players are coming in the sector and services delivery will be further improved.

### 4.2. Constraints

Despite the above successes a number of constraints were observed. These include; ignorance of various regulations on natural resources management e.g. water policy, water rights. Conflicting national policies e.g. the agricultural policy, natural resource policy mineral and water policy. Furthermore, farming and grazing around water sources is quite pronounced, weak enforcement of

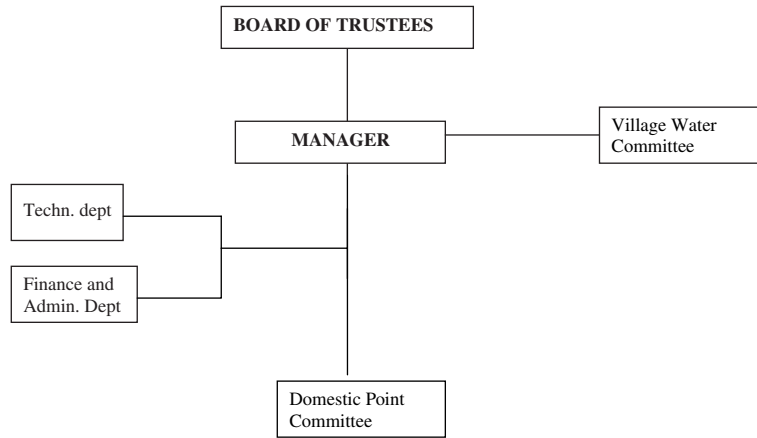


Fig. 3. Karatu Town Trustee water supply management scheme.

conservation laws and uncoordinated sectoral and institutional aspects for sustainable utilization of water resources. Other aspects include, lack of participatory planning in sustainable utilization of water resources, rapid population increase, poverty, political interests versus professional recommendation, influx of large herds of livestock during dry season.

4.3. General consensus

In order to address adequately the above multitude of problems it was recommended unanimously that a basin wide institution be formed and mandated to address the above constraints. It was noted that at the village level suitable institutions in respective areas can be estab-

lished e.g. water user association (WUA), company on water provisioning, Trust etc. These could be coordinated under award and eventually to a district framework. This would apply to those wards of that particular district falling under the basin boundary (see Fig. 4 below). Similar arrangement can be made for the other districts (Monduli, Mbulu and Babati).

5. Discussions and recommendations

During the survey, it was observed that, there were local initiatives on water management at different scales in each district. It was observed that at Mto wa Mbu lowlands for example there are furrow irrigation

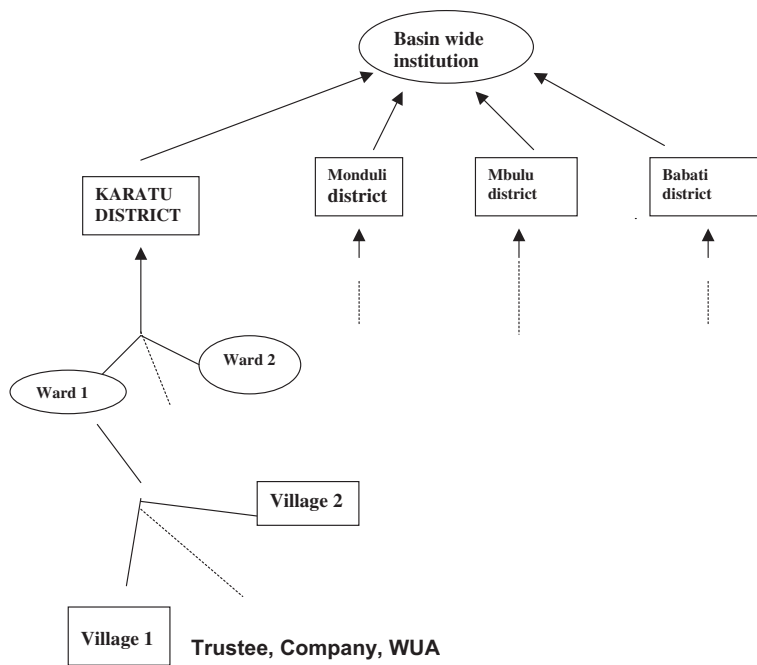


Fig. 4. Institutional framework for integrated water resources management in the Lake Manyara sub-basin.

committee managing allocation of water to various users under approved schedules.

In Losirwa village (which is a livestock keeping) a committee was formed to be responsible for allocating water for livestock in agreed schedules. Furthermore, Losirwa and Mto wa Mbu (irrigators village) together have formed a joint committee to handle conflict resolution strategies between irrigators and livestock keepers. The committee is operational and a breakthrough is noted in the conflict management between the sectors.

It was reported that in both districts several villages are engaged in various conservation techniques both in farming and forest conservations. Villages are reported to have good farming practices using oxen driven ploughs instead of tractors in sloping areas, community forests in some villages, reserved wildlife corridors. Conservation of natural forests is in place for natural forests in Marang, Nou and Hasama forests. There is control of soil erosion by planting trees, establishing proper contour bunds, good livestock rearing like zero grazing.

It can be deduced from above that the knowledge on integrated water resources management in the basin is taking place slowly. It can be understood that these efforts are unfortunately done sectorally and district wise. What is required is a basin wide effort taking the basin as a planning unit and plan holistically.

It is also worth observing that local communities have jointly agreed to establish a basin wide body to improve on coordination and overseeing issues basin wide. This is a good entry point in embarking on integrated water resources management in the basin. Also it is worth noting that the stakeholders themselves articulated the core problems in the basin and their cause and recommended remedial measures which could address the problems.

The new Water policy has provided an enabling environment for which many more players are invited in investing and participating in water resources management. Therefore, the good practices already in place in certain villages in the four districts can be emulated elsewhere in the basin and respective authorities in the districts strive hard to sustain them.

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