

Water Resources Management Issues and conflict resolutions at a catchment Level. A Case Study of Pangani River Basin, Tanzania

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Abstract

The Pangani River Basin is situated in the north-eastern part of Tanzania. The basin is endowed with different water use activities including agriculture on the upstream and hydropower plants that are situated at the downstream of the river. The increase in activities (deforestation for agricultural land, overgrazing) and changes in the land use have resulted in less available water in the river for the stakeholders especially those who reside downstream. Due to the diminishing water availability, conflicts have risen between the different water users. This paper documents the social and economic conflicts among the water users and discusses some engineering and institutional solutions including the dialogue method as one of the possible approaches to resolve the conflicts between the different water users.

Introduction

Conflict is an inevitable part of life. Generally, dry land areas such as those found in the Pangani Basin are faced with decreasing supplies of water that result into 'simple scarcity' conflicts. As water supplies decrease, communities are forced to move to seek new resources, resulting in tensions with other communities, which may be termed 'group-identity conflicts'. Water scarcity and the related social stresses (migration of the community, coping mechanisms such as increased spending on water from vendors, etc) can disrupt key social institutions. Indigenous councils of elders may no longer be able to meet, for instance, or the loss of the most mobile members of society (stereotypically young men) may mean that traditional natural resource management regulations and other social regulations can no

longer be enforced. This leads to social instability, breakdown of mutual support mechanisms, and possible civil strife.

Research findings in Pangani River Basin as reported by different workers (Ngana, ed 2001, 2002) show close agreement although diverse methods have been adopted to reach those conclusions. In spite of the fact that the subject in question is water conflict, this paper is a summary of inputs from different previous works and disciplines that range from socio-economic to engineering. It can therefore be argued that, when dealing with complex problems like that of water resources optimizations one should opt for a multi-disciplinary approach, whereby all dimensions of nature are exclusively considered in advance.

Some events and case studies of water conflicts are discussed to give insights to the current critical conditions of water resources utilization in the Pangani River Basin. This paper not only discusses some engineering solutions to the problem of water crisis in the region, but also recommends the initiation of deliberate campaigns to bring about understanding of the socio-cultural and socio-political within the context of local communities, as well as suggests trainings or at least awareness of theories of conflict resolution, as essential tools for the successful planning and implementation of water projects at the catchment level.

Description of the Study Area

The Pangani Basin is situated in the north-eastern part of Tanzania and is drained in the south-east direction by a river with the same name into the Indian Ocean at a place called Pangani. The location is shown in Figure 1. There is a man made reservoir at Nyumba ya Mungu (NyM), which is fed by the tributaries of Kikuletwa and Ruvu. The latter originates from Lake Jipe. Downstream of the reservoir, the river is joined by another river, the Mkomazi, which flows from the South Pare Mountains and the Soni River, which drains the Usambaras Mountains. The basin has a total area of 42,200km², 2,320km² of which are located on the Kenyan side.

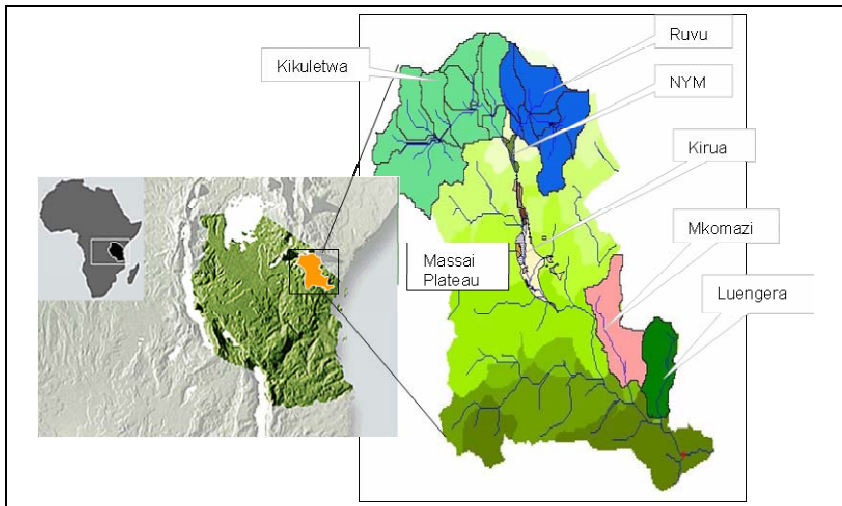


Figure 1: Location map of Pangani River Basin

Conflict in Water Uses

Different people have different goals and interests while using the same resource. When people in the course of using a resource reach a point of incompatibility or non-reconciliation, the situation is described as a dispute or conflict. The existence of a competition or a change in the use of the resource may provide a sufficient spark to trigger a conflict.

Situations which may trigger conflicts on water as a resource may include:

- Competition for the resource when there's a scarcity.
- Differences in organizational station and influence.
- Unmet expectations.
- Unmet interests or needs.
- Unequal power or authority.
- Jurisdictional ambiguities.
- Incompatible objectives or methods.
- Communication breakdown.
- Interdependence of people and tasks.

The Pangani River Basin conflicts may have been caused by any or a combination of the above situations. The studies carried out in this basin identified the following conflict categories:

- Small scale versus large scale irrigators.
- Upstream- downstream irrigators.
- Domestic water use versus other uses (agriculture, livestock, industrial and municipal).
- Industrial versus environmental water use. (Environmental protection and Ecosystem management).
- Agricultural versus industrial use (power generation)
- International organizations (donors) that support different projects in the basin.

Lake Jipe Water Crisis

Lake Jipe lies 37.7° E and 3.58° S astride the Kenya-Tanzania border, to the east of the Northern Pare Mountains of Tanzania in Kilimanjaro administrative region and Taita – Taveta Districts in Kenya. The lake has a maximum length of 12km and a depth less than 3m; the total area is approximately area 28km² (Timothy ., 2001). The lake is in the greater Pangani basin, which drains the eastern side of Tanzania and borders Tsavo West National Park of Kenya in the south while Mt. Kilimanjaro dominates the horizon some distance to the north-west.

River Lumi that drains Mt. Kilimanjaro in the Tanzanian side is the main river serving the lake. The other main inflow is via River Muvulani from the Pare Mountains. There are several temporary streams, mainly from the Pare Mountains, which also drain into Lake Jipe. The lake has one outflow, the River Ruvu, located in Tanzania. This river drains in to the Nyumba ya Mungu Reservoir to the East.

The water of Lake Jipe, which is surrounded by an arid environment, is the remaining vital resource to the riparian communities and their livestock. The lake provides crucial watering and feeding resources of the wild game of Tsavo West National Park (e.g. elephants, buffaloes, zebra, giraffes, and Oryx). The lake has a variety of avifauna including many palaeartic migrant waders and inter-African migrant water birds.

The trans-boundary Lake Jipe has undergone major changes in Land cover over the last 15 years (Gadain, 2005). Multi-temporal LANDSAT Thematic Map satellite imagery of 1st January 1987 and 4th March 2001 were analyzed using IDRISI Kilimanjaro digital image processing software to map out the dynamics of the lake changes. The results showed that the surrounding forests and water body have decreased by 45% and 32% respectively (Figure 2).

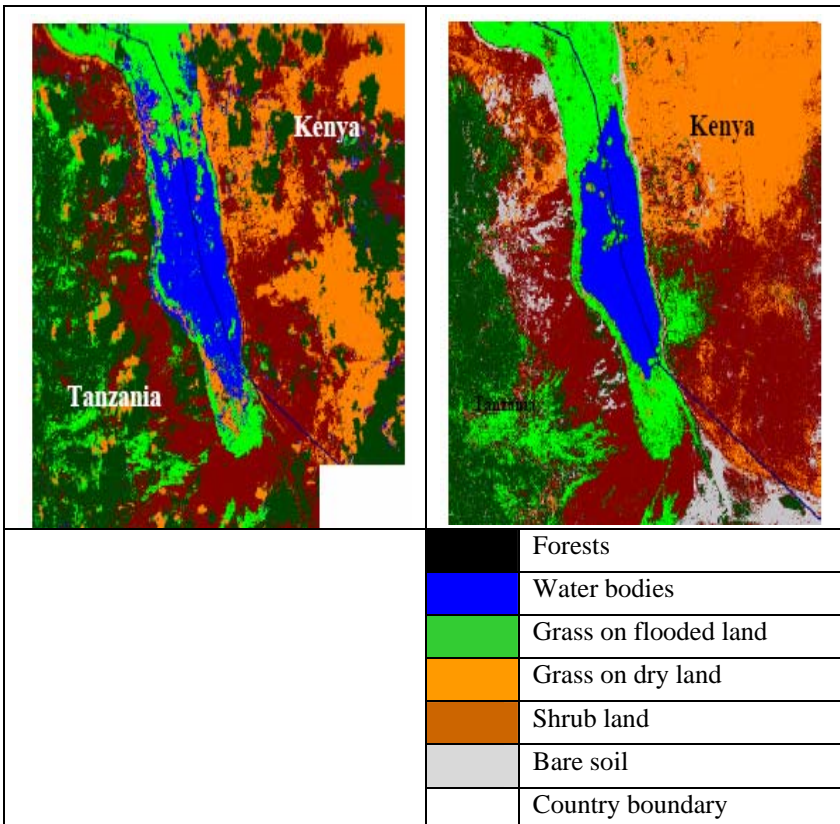


Figure 2: Temporal and spatial variations of land use and land cover around Lake Jipe – left 1987; right 2001 (Gadain, 2005).

The grass on flooded areas, grass on dry areas and scrublands have all increased by 19%, 15% and 26% respectively while the forests decreased by 45% from their original areas since 1987. Bare soils area

has increased over 100 times. These alarming environmental and hydrological changes need sound multi-sectoral management plans and strategies so as to prevent Lake Jipe from extinction.



Figure 3: Sediment deposits and floating bloom of weeds in Lake Jipe (*Mtalo 2005*)



Figure 4: Abandoned canoes at the muddy shoreline of Lake Jipe (*Mtalo 2005*)

The water level has gone down to such an extent that even fishing is no longer possible. Figure 4 shows a number of fishing canoes that are abandoned on the shoreline. Other sources reported evidence of varnishing lake waters. Poor farming practice in the Pare Mountains are said to accelerate erosion in the catchment that leads to an alarming rate of sediment deposition in Lake Jipe.

Conflict Resolution Measures

Various measures are known to have been used to resolve some of the conflicts. The indigenous, people on the Kilimanjaro and Pare Mountain slopes have had traditional water allocation (sharing) and conservation methods that worked efficiently. They also managed to resolve any conflicts that might have arisen in the course of water sharing practices through the institutions.

The system was abandoned by the government in favour of a centralized system controlled through government institutions. The latter has not been able to resolve (as for now) the conflicts within the water users' community.

Facts and Figures

The total irrigated area along the Pangani River Basin is estimated to be around 40,000ha using 400 – 480 million m³ of water annually.

The hydropower plants on this river are situated at the downstream end (Pangani Falls 60MW and Hale 21MW) and irrigated agriculture is upstream of the power plants. For the hydropower operators, any abstraction for irrigation is counted as loss in power production.

Conflicts are also reported between large and small scale irrigators. There are more than 2000 small scale traditional furrows that date as far back as the 17th century. They are used by the indigenous people as a source of water for drinking and irrigation.

Large commercial farms for sugar cane and rice at lower Moshi are competing for the same water.

Of late horticulture has gained ground due to the lucrative flower prices they are fetching in Europe; they are ready to divert as much water as available for the purpose.

The fall of coffee prices on the world market has encouraged diversification into food crops by the indigenous coffee farmers.

These crops are grown through irrigation and they require more water than the coffee they are replacing.

Possible Measures

Equitable management of water resources is needed, e.g. rehabilitation of the old irrigation furrows to make them more efficient. Currently the furrows' efficiencies range between 15-20%. Overall efficiency could be raised to 40–50% by lining, thus reducing water losses.

According to records 1028 water rights were issued by the Pangani Water Office with an abstraction capacity of 30.7m³/s by 2000. Reconnaissance on the ground has established 2094 abstractions without water rights. 40m³/s are abstracted and most of them for irrigation works upstream of the hydropower plants. This has been caused by population pressure and land scarcity on the slopes of Kilimanjaro, Usambara and Pare Mountains. People have migrated to semi-arid low lying areas where one can only survive through irrigated agriculture.

Dialogue has been considered as one method, which can be used to reduce the upstream and downstream conflicts. Initiatives by NGOs such as PAMOJA (an NGO registered in Moshi) have brought the conflicting parties together and have been able to bear some fruits. The upstream water users were sent to the down stream areas to see the effect of their abstractions on the downstream users. Agreements on equitable use and sharing of the water were reached.

Engineering and Institutional Framework Solutions

Promote and co-ordinate non-farm activities, providing the necessary skills, and policy reorientation (in the case of cross-border trade (Kenya/Tanzania) and control over other activities, such as the charcoal business is absolutely necessary.

Factors contributing to water decrease in some areas in streams in the rural Moshi District are a result of ineffective enforcement of conservation laws, climate change, population growth, social-economic and political changes, and the lack of an effective institutional framework. These contribute greatly to a decrease in water resources in the area. In order to attain ecological sustainability

and social equity, good management tools and an effective institutional framework in an enabling environment are crucial.

The immigration to the Pangani Basin tends to increase population pressure and water conflicts.

The efforts to improve water management using traditional or local knowledge should be taken into consideration. Communication with the primary water managers is important.

To contain the situation, population growth control and provision of alternative activities that could draw off people from absolute dependency on cultivating the land are necessary.

The promotion of the use of groundwater for irrigation, adopting more water-efficient cropping patterns and the construction of micro dams at the end of conveyance canals for storage of water during the rainy season are some of the ways of reducing the strain in the competition for water between irrigation and hydropower generation in the Pangani River Basin.

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