**SUSTAINABLE OPTIONS FOR WETLAND-BASED LIVELIHOODS: THE CASE OF PANGANI RIVER BASIN, TANZANIA**

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**A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF DOCTOR OF PHILOSOPHY OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.**

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**EXTENDED ABSTRACT**

This study demonstrates how theories of development and international conventions related to wetlands management are translated into national policies and the consequences of their implementation. The study adopted UK's Department for International Development (DFID) livelihood framework in designing sustainable options for wetland-based livelihoods in the Pangani river basin, Tanzania. Comparative and case study research designs adopted in the study considered three livelihood niches (irrigated agriculture, agro-pastoralism and fisheries) and examined 360 households, out of which 120 respondents through stratified random sampling from each livelihood niche were interviewed. The study revealed four major issues that either promote or block sustainability of wetland-based livelihoods. First, is the fragmented management by institutions managing wetlands resources and the challenge on how to link the river basin model to the country's decentralised political structure. Second, variance in governance (differences in government jurisdictions) between stakeholders from water and non-water sectors has intensified water scarcity leading to reduced household revenue and environmental degradation. This is markedly pronounced under irrigated agriculture that contributed to reduced revenue target by 50% to 60% and subsequent migration becoming a common practice (fishers 70%: n=120; agro-pastoralists 90%: n= 120). Third, poor linkage between political and sectoral decentralisation is the major driver of gender inequalities particularly with fishery and agro-pastoral communities. Fourth, education and dependency of family labour ranked as key significant variables (chi-square 248.94: p-value < 0.001) in influencing choices of livelihoods across wetlands. This thesis is an outstanding contribution to knowledge as it demonstrates the fact that, decentralisation system in Tanzania (political and sectoral) as a traditional approach for productive resource governance fails to absorb global models such as the river basin under study. Sustainable options for wetland-based livelihoods in Pangani are recommended including

institutional reforms in linking land and water through co-management from relevant sectors in joint budget planning, revenue collection and cost-benefit sharing. 'Managed resources protected area model' is proposed to core wetlands such as water sources and catchment areas to ensure protection and conservation of resources. Promoting domestic sources of revenue through investments in technology, human capital and capital formation are fundamental in uplifting socio-economic growth and quality of livelihoods as outlined in the national development vision 2025.

## DECLARATION

I, **TERESIA RAFAEL OLEMAKO**, do hereby declare to the Senate of Sokoine University of Agriculture, that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

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The above declaration is confirmed

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career development, they are the source of inspiration in my life.  To all my in laws (father, mother, brothers and sisters). God bless you all!

Finally is due to the almighty God for protecting me and my family throughout my studies. Psalm 30:12, that my heart may sing to you and not be silent. O LORD my God I will give you thanks forever!  Praise be always to the Lord our God Amen!

## DEDICATION

To my parents: My father Mr. Ladslaus Marijani and my mother Mrs. Salome Marijani for their unconditional love, prayers and upbringing from childhood to career development.

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# LIST OF ABBREVIATIONS AND ACRONYMS

ADB             African Development Bank

BMUs            Beach Management Units

CPRs            Common Pool Resources

CSOs            Civil Society Organisations

DANIDA          Danish International Development Agency

D-by-D          Decentralisation by Devolution

DFID            Department for International Development

EIA             Environmental Impact Assessment

EU              European Union

EWURA           Energy and Water Utilities Regulatory Authority

FAO             Food and Agriculture Organisation

FINNIDA         Finnish International Development Agency

GAD             Gender and Development approach

GDI             Gender-related Development Index

GDP             Gross Domestic Product

GEF             Global Environment Facility

GTZ             German Technical Cooperation

GWP             Global Water Partnership

IFS             International Foundation for Science

IPTL            Independent Power Tanzania Limited

IUCN            International Union for Conservation of Nature

IWRM            Integrated Water Resources Management

JAST            Joint Assistance Strategy for Tanzania

JICA            Japan International Cooperation Agency

| | |
|---|---|
| Km$^2$ | Kilometre square |
| Km | Kilometres |
| Kwh | Kilowatt Hour |
| l/s | Litres per second |
| LGAs | Local Government Authorities |
| LMIS | Lower Moshi Irrigation Scheme |
| LOMIA | Lower Moshi Irrigators Association |
| M$^3$/s | Cubic metres per second |
| MAR | Mean Annual Rainfall |
| MDAs | Ministries Departments and Agencies |
| MEA | Millennium Ecosystem Assessment |
| MIS | Mawalla Irrigation Scheme |
| MKUKUTA | "Mpango wa Kukuza Uchumi na Kuondoa Umaskini Taifa", National Strategy for the Growth and Reduction of Poverty |
| MLR | Multinomial Logistic Regression |
| MW | Megawatt |
| NOK | Norwegian Kroner |
| NORAD | Norwegian Agency for Development Cooperation |
| NUFU | Norwegian Program for Development, Research and Higher Education |
| NYM | Nyumba ya Mungu dam |
| O and OD | Opportunities and Obstacles to Development |
| ONGAMA | Oria, Ngasinyi and Mawalla |
| PBWO | Pangani Basin Water Office |
| PMO-RALG | Prime Ministers' Office Regional Administration and Local Government |

| | |
|---|---|
| PRA | Participatory Rural Appraisal |
| REPOA | Research on Poverty Alleviation |
| SACCOs | Savings and Credit Co-operative Society |
| SAREC | Department for Research Cooperation |
| SIDA | Swedish International Development Agency |
| SLA | Sustainable Livelihoods Approach |
| SPILL | Strategic Plan for Implementation Land Laws |
| SPSS | Statistical Package for Social Science |
| TANESCO | Tanzania Electric Supply Company |
| UK | United Kingdom |
| UNDP | United Nations Development Program |
| URT | United Republic of Tanzania |
| US$ | United States Dollar |
| VICOBA | Village Community Banks |
| WRI | World Resources Institute |
| WUAs | Water Users Association |
| WWF | World Wide Fund for nature |

**CHAPTER ONE**


**1.0 INTRODUCTION**

**1.1     Wetlands and Sustainable Livelihoods**

Wetlands[1] constitute an important natural resource base that significantly contributes to people's livelihoods through direct and indirect ecosystem services from water, soil, plants and animals. The Millennium Ecosystem Assessment (2005) distinguishes four main categories of ecosystem services derived from wetlands, including provisioning, regulating, cultural and supporting services. Provisioning services are the most direct and visible services that human populations derive from wetlands and can be used for human consumption, including supplies of water, land, fish, plants, game, fuel energy and construction materials. Regulating services are processes related to water sediment and climate, and wetlands play a major role in groundwater recharge and discharge, water purification to eliminate pollutants and contribute to nutrients and can form a buffer against floods. Cultural services include spiritual, inspirational, recreational and educational services that provide people with opportunities to experience and learn about nature through social and educational visits. While supporting services include soil formation (accumulation of sediment and organic matter) and nutrient cycling.


These processes are crucial for proper functioning of wetlands and the wider ecosphere and are also vital for people living far from wetlands. Water and land are key features of wetlands and are the central focus of this study because they serve an important provisioning function for individuals' livelihoods by generating cash income and food

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[1] Wetlands as defined by the Ramsar Convention as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt including areas of marine water, the depth of which at low tide does not exceed 6 metres. This broad definition includes inland wetlands (such as marshes, lakes, rivers, peatlands, forests, karst, and caves), coastal and near-shore marine wetlands (such as mangroves, estuaries, and coral reefs), and man-made wetlands (such as rice fields (paddies), dams, reservoirs, and fish ponds) (MEA, 2005). http://www.maweb.org/documents/document.358.aspx.pdf.

security. However, while fresh water wetlands have the potential to provide substantial support to livelihoods, scramble for land by large scale estates investments is threatening the sustainable livelihoods options for the local people. As put forward by the GRAIN report (2012), 'behind every land grab is a water grab', and mega-irrigation schemes in Africa not only threaten the livelihoods of millions of farmers but also deny access to and control of fresh water resources across the entire African region. Large scale estates are generally located within river basins in the fertile and fragile wetlands where water can be easily abstracted. The report further noted, 'behind the current scramble for land in Africa is a global struggle for a commodity increasingly seen as more precious than gold or oil – water'. Additionally as highlighted by Batha (2012), the scramble on the part of foreign investors for cheap African land for irrigated farms threatens to leave millions of people without water. Supported by Southgate and Hulme (2000), Dixon and Wood (2003), Munishi and Kilungu (2009) and Munishi *et al*. (2011) that , continued conflicts over fresh water wetlands resources due to scarcity among stakeholders has increased the levels of poverty and vulnerability for marginalised groups mostly significant in many parts of East Africa.

Tanzania's lack of a donor policy limits the state bureaucracy's ability to accept or reject the bilateral and multilateral development aid that is commonly associated with neo-liberal policies which have the potential to either promote or limit the sustainability of the livelihood trajectories of marginalised groups. The policy gap is evident, as the system of water permits in Tanzania is not connected to land rights resulting from investments in lands that directly use wetland water resources. This has resulted in variations across governance levels in the country's decentralised political structure (central, regions, districts, wards and villages/sub-villages) with respect to the regulation of land and water

use investments in wetlands and subsequently to greater insecurity in village land tenure and water scarcity.

According to URT (2007), wetlands cover 10% of Tanzania's total land area (945 000 km$^2$), of which the four designated Ramsar sites[2] account for 5.5%. The study investigated sustainable options concerning wetland-based livelihoods in the artificial wetlands of Tanzania's Pangani river basin between upstream, midstream and downstream users. According to URT (2007) artificial wetlands are defined as "constructed wetlands area or terrestrial area purposely impounded with temporary or permanent water with the aim of collecting or storing water to supply goods and services such as electricity, fishery, water and sports". The most common artificial wetlands found in Tanzania are paddy/rice irrigation fields and hydro-electric dams/reservoirs for both power production and fishery uses. According to Ostrom *et al.* (1994), artificial wetlands have been always considered as common pool resources (CPRs). CPR is a type of good consisting of a natural or artificial resource system such as an irrigation system or fishing grounds, whose size or characteristics makes it costly, but not impossible, to exclude potential beneficiaries from obtaining benefits from its use (*ibid*).

Several authors including Gordon (1954), Hardin (1968), Ostrom *et al.* (1994) and Gardner *et al.* (2000) contend that individuals who depend on CPRs face a social dilemma that leads to the degradation and destruction of these resources. The dilemma encountered is due to the absence of government regulation to set limits to access the resources. Moreover, Arnold *et al.* (2012) acknowledge the political dynamics related to CPRs and demonstrate that dialogue is crucial in addressing problematic power relations among

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[2] A Ramsar site is a wetland area acknowledged to be internationally important by the Ramsar Convention on wetlands – Iran, 1971 (URT 2007). Ramsar is a convention on wetlands, an intergovernmental treaty that provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

stakeholders in adaptive decision making. Additionally, Silvius *et al.* (2000) and Agrawal (2007) note that poverty analysts have failed to consider scholarly findings on CPRs that could contribute to shaping the institutions and property rights concerning CPRs, as most poor households are highly dependent on these resources for their daily livelihoods.

Irrigated agriculture accounts for the largest share of water abstraction in the Pangani river basin, at 80% of the total (Ngana, 2001; PBWO/IUCN, 2007), where paddy/rice is the primary wetland crop. Coffee, sugar, flowers, and fruits are also grown in the basin, much of which are produced for export. These crops are cultivated using irrigation on large plantations or estates in the northern part of the basin. Many other crops, including maize, beans, bananas and vegetables, are grown for local markets. According to PBWO/IUCN (2007), Gross Domestic Product (GDP) per capita in the four regions comprising the Pangani river basin (Arusha, Kilimanjaro, Manyara and Tanga) ranges from Tshs 384 000 to 445 000. Average monthly household incomes in the downstream areas of the basin from fishing activities range from Tshs 15 000 to 560 000. Over 90% of the inhabitants of approximately 12 villages adjacent the Nyumba ya Mungu (NYM) dam depend on fisheries for income and food (URT 2007). The average monthly income from irrigated agriculture in upstream and midstream locations is estimated at Tshs 600 000 per household, while livestock account for from Tshs 300 000 to 700 000 per household (PBWO/IUCN, 2007).

Further noted by Mutayoba (2003) and Turpie *et al.* (2005), water resources in the Pangani river basin are over-subscribed and there are frequent conflicts among stakeholders. This is illustrated by the authors on the amount of land allocated to foreign investors holding large scale estates of over 202 530 hectares (sugar estates account for 6 200, coffee estates 95 000, tea estates 6 330, and sisal plantations 95 000), while small

scale farmers account for a total of approximately 50 000 hectares with low irrigation potential. The ratio of large to small scale farming is 4:1.

The present study adopted the UK's Department for International Development (DFID) sustainable livelihood framework that focuses on the elimination of poverty in poorer countries. The Sustainable Livelihoods Approach (SLA) as put forward by numerous studies was introduced by the DFID in the 1990s and is based on several underlying principles including being people-centred and multi-level with a focus on responsiveness and participation, dynamics, partnerships and sustainability (Chambers and Conway, 1992; Ashley and Carney, 1999; DFID, 2000; Ellis and Mdoe, 2003; Kadigi, 2006; Scoones, 2009).

The study focused on the principle of sustainability in designing sustainable options for wetland-based livelihoods in the Pangani river basin and according to the SLA, the key aspects of sustainability are the institutional, environmental and socio-economic dimensions. The significant strength of the SLA framework is the strong, interactive relationships among research, policy and practice (DFID, 2000; Solesbury, 2003; Allison and Horemans, 2006). The major research question addressed by this study is: to what extent have people in the Pangani river basin been able to convert wetland resources and thereby improve their livelihoods sustainably? The study found out that lack of sustainable livelihoods in the wetlands of Pangani is the result of poor linkage between the river basin model and decentralised political structure. The SLA framework was applied to analyse the roles wetlands can play as CPRs in strengthening the link between river basin model and political structure to inform policy debates and reforms on better land and water use investments in Pangani.

**1.2    The River Basin Model and the Decentralised Political Structure in the Pangani**

The river basin model practised in Pangani is basically rooted on Integrated Water Resource Management (IWRM[3]) and is perceived as being separate from the country's decentralised political structure due to the presence of multiple actors from Donor funding agencies in policy and decision making processes regarding water and land resources. Lein and Tagseth (2009) presented three approaches to water governance in Pangani, 'state centred', 'market based', and 'community based', and highlighted the problem of arriving at a single focus for development due to the use of the different development ideologies advocated by different professions. As Biswas (2008) contends, IWRM has not been 'a universal solution' in terms of its results or application and is highly unlikely to deliver promising results in the future. Moreover, Lein (2004) questioned the practical applicability of a river basin model given the relevant political and administrative boundaries. Lein (2004) quoted Barham's (2001) conclusion that the adoption of this model will definitively lead to conflicts with democratic rights. Additionally, Kemper *et al.* (2007) commented on the difficulties in the integration and decentralisation of river basin management into the administrative system of a given country and highlighted the impact of time on achieving significant results. The authors noted that nearly a century was required before the benefits of integration were demonstrated in the Murray-Darling basin in Australia.

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[3] Integrated Water Resource Management – IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP, 2000).

### 1.2.1 River Basin Model

According to Molle (2009), the river basin[4] model is a political and ideological construct that constitutes the legitimate application of a technical rationality designed to address the problems of water storage and allocation, flood control or risk management. However as pointed by Molle, these fundamental issues have yet to be resolved, and a system of governance that unites hydrological boundaries and social development remains elusive. The river basin model is a global model that was exported to several countries and, as reported by Hoag (2006), focused on industrial development, agricultural growth and hydro-electric power generation but ignored social development. Donor agencies influenced how funding and expertise were provided and decided the types of technology employed and the projects to be undertaken. The construction of large dams was central to the river basin model to promote the intensification of agricultural production, electricity generation and flood control.

As noted by various authors, Kirmani and Le Moigne (1997), Moore and Sklar (1998), Miler and Hirsch (2003) the internationalisation of the concept of river basin management to numerous countries, including Tanzania, was largely supported by the World Bank, which has also been involved in establishing and implementing national policy agendas. Tanzania adopted the river basin model in the 1950s through development agencies such as Food and Agriculture Organisation (FAO), and the United Nations declared it an essential aspect of economic development (Hoag, 2006). As highlighted in the URT (2002) and URT (2009), the river basin concept was introduced as a modern management system for allocating water resources based on hydrological boundaries. The management

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[4] A river basin is the land that water flows across or under on its way to a river. Just as a bathtub catches all of the water that falls within its sides, a river basin sends all of the water falling within it to a central river and out to an estuary or to the ocean. http://www.ncstormwater.org/pages/workbook_riverbasin.html

of water resources in Tanzania has been entirely based on nine river basins that do not conform to the administrative boundaries of regions and district authorities since 1992. The Rufiji river basin, covering an area of 177 420 km$^2$, is the largest and was the first river basin in Tanzania to be established under the Stiegler's Gorge dam construction project financed by the Norwegian Agency for Development Cooperation (NORAD) in the 1970s (Hoag, 2006). Other river basins in the country include the Pangani, Wami/Ruvu, Lake Nyasa, Lake Rukwa, Lake Tanganyika, Lake Victoria, Ruvuma and Southern Coast basins, the internal drainage basins of Lake Eyasi, and the Manyara and Bubu depressions.

As noted by the World Bank (2004), water scarcity became a national issue in Tanzania in the early 1990s, and administration of water resources on the basis of river basins was meant to address the issue. Previously, water resources had been managed on the basis of the administrative boundaries of the country's decentralised political structure. According to the World Bank, water scarcity became an issue due to the expansion of large commercial estates resulting from neo-liberal policies, which necessitates increased water use. The global model was adopted to the Pangani river basin with support from major international Donor agencies such as the World Bank, Japan International Cooperation Agency (JICA), Norwegian Agency for Development Cooperation (NORAD) and International Union for Conservation of Nature (IUCN). The donor agencies focused on artificial wetlands such as the construction of dams/reservoirs in the Nyumba ya Mungu, Hale and Pangani and the development of irrigation and associated infrastructure projects for paddy/rice cultivation. The establishment of the Pangani Basin Water Office (PBWO) was also considered as important priority to monitor water quality and quantity and administer water permits system for water users. The funded projects identified the Pangani basin among those facing the most severe water scarcity issues and acute conflicts

related to multi-sector water allocation among agriculture, the environment and hydro-electric power production. These authors note that over 90% of the surface water flow in Pangani is used for irrigation and hydro-electric power generation, and the main conflicts in the basin are between upstream and downstream users (Mujwahuzi, 2001; Mbonile, 2005; Turpie *et al.*, 2005; PBWO/IUCN, 2007).

### 1.2.2 Decentralised Political Structure

Political structure refers to institutions or groups and their relationships and patterns of interactions with respect to policies, regulations, laws and norms within the political system. Pateman (1971) defined political structure as the structure of power and authority that represents an 'external constraint' on individual influences, attitudes and behaviours that in the process shape the political or civic culture. A political system has been defined as 'particular authoritative roles and law norms and allocation of rights and duties historically determined through conflict and balancing of powers' (ibid). Political elites have the right to command and fulfil the roles and responsibilities within the system (Easton, 1965).

While many different political structures have existed throughout history, three major forms exist in modern nation-states and this includes totalitarianism, authoritarianism and democracy. Totalitarianism is a political structure that exercises complete control over its citizens' lives and does not tolerate opposition (Pateman, 1971). Authoritarianism is a political structure that is less controlling than totalitarianism but still denies its citizens the right to participate in government roles and responsibilities and all authority rests in a single individual called a 'dictator' (*ibid*). Democracy is a political structure where governance is exercised either directly by the people or through elected officials who represent them. This is a structure where all members of society have an equal share of

formal political power. Democracy originates from a Greek term, 'Demokratia', meaning rule of the people (Demo meaning 'people' and Kratia meaning 'rule'). The norms of political efficacy insist that the citizens of a democracy should be politically active and leaders should be responsive to citizens' demands (*ibid*). However, as argued by (Easton and Dennis, 1967; Pateman, 1971) that, the internalisation of norms of political efficacy should begin at an early age and is fundamental for shaping adult behaviours and diffusing support for changes in the political structure throughout the political system.

The political structure of Tanzania is based on democratic administration principles, among which the decentralisation by devolution principle (D-by-D) is central in promoting welfare and public participation in the development process. The Tanzanian political structure has five levels of governance: the central government, regional authorities, district authorities, wards and villages/sub-villages. A bottom-up approach to development planning is employed, commonly referred to as opportunities and obstacles to development (O and OD), running from the village/sub-village level to the central government. The justification for the bottom-up approach is to ensure that all citizens are equal before the law and have access to the legislative process, thereby creating a situation that makes an inclusive society possible. Jutting *et al.* (2005) define decentralisation as the 'transfer of power and resources from high tiers to lower tiers of government', and Bennet (1990) defines it as the 'transfer of authority, responsibility, power and resources downward among different levels of government'. For the purposes of this study, decentralisation is thus defined as the devolution of authority from the central to regional and local governments (districts, wards, villages/sub-villages), with all of the administrative, political and fiscal attributes designed to provide for democratic participation. As noted by WRI (2005), democratic institutions are an important factor in supporting strong economic growth.

Tanzania has a two-tier system of government consisting of central and local governments. The central government is a unitary republic based on multiparty parliamentary democracy and has three important organs. Firstly, is the executive composed of the president of the United Republic, vice president, president of Zanzibar, prime minister and cabinet ministers. Secondly, is the judiciary that includes the court of appeals of the united republic, high courts for mainland Tanzania and Zanzibar, judicial service commission for Tanzania, magistrate courts and primary courts. And third is the parliament composed of the president of the united republic and national assembly comprising elected members from constituencies and presidential appointees from relevant political parties.

Local governments are established in the form of both urban and rural authorities, and there are currently 114 authorities within 132 districts and 25 regions. As demonstrated by PMO-RALG (2007; 2009), during the first decade of independence from 1961-1971, the central government sought to establish a democratic administrative system that would deliver equitable development to all Tanzanians. The first period of decentralisation officially ran from 1972-1982 with the aim of promoting democracy by transferring the responsibilities and financial resources necessary to deliver public services from the central to local governments. While the decentralisation process encourages democracy through bottom-up planning approaches that are primarily composed of state actors, in contrast, water resources in wetlands are managed by non-state actors. Civil society organisations (CSOs) such as the Water Users Associations (WUAs) are non-state actors that are not recognised or supported by the political structure.

## 1.3 Sustainable Livelihood Options

Sustainable options for wetland-based livelihoods in Pangani are suggested including institutional reforms in linking land and water through co-management from relevant sectors in joint budget planning, revenue collection and cost-benefit sharing. Budget discipline is suggested as a pro-active measure to ensure public service efficiency from central to local government in reducing gender gaps within households and between livelihoods. 'Managed resources protected area model' is proposed to core wetlands such as water sources and catchment areas to promote environmental conservation. Mobilising domestic sources of revenue through investments in technology, human capital and capital formation (tax, credits, water permits) are fundamental in uplifting socio-economic growth and quality livelihoods.

## 1.4 Problem statement and Justification

In many instances, wetlands are considered an overlooked ecosystem that lack specific institutions for their management, and multiple institutions have an interest in their use. There is also a lack of comprehensive laws governing their use, and they therefore do not enjoy any recognition or appreciation for their services (Munishi and Kilungu, 2009). Water and land are the key resources in the wetlands of the Pangani river basin and are poorly managed and developed due to the lack of coordination between the river basin authority and the decentralised political structure. Variance in governance (differences in government jurisdictions) between the Pangani Basin Water Office (PBWO) and the decentralised authority of regional and local government (districts, wards and villages/sub-villages) is the major problem confronting the management of the basin's wetlands and results from unequal power sharing.

These unequal power sharing can be divided into two levels; the first concerns relations between the Donor agencies, which plan and fund development projects in the Pangani river basin, and the central government as the highest political authority; the second level concerns the central government (Ministries, Departments and Agencies), regional authorities, districts, wards and villages/sub-villages.

The first level of unequal power sharing, between donor agencies and the central government, concerning wetland resources in the river basin is characterised by the globally hegemonic neo-liberal ideology. The free market policies introduced in Tanzania in early 1980s in the process of neo-liberalisation resulted in stiff competition over land and water resources by the public and private sectors, leading to land and water grabs. The central government and its institutions failed to position the state to match the country's development priorities using funding received from Donor agencies. The role of Donor funding is crucial for the management of wetland resources in the Pangani basin. However, as noted by Lein (2004), "to manage the water in Pangani river basin in a sustainable and fair way has not been and will not be an easy task". He also noted, "beyond the struggle over use of scarce resources lies also a struggle over meaning linked both to what is the best use of water and how management should be accomplished". Concerning the Donor agencies' attempts to design development to determine the best uses for the water, Lein concluded: "it is perhaps no coincidence that a key water-related conflict today is between a Japanese-funded rice production project and a Nordic-funded hydropower project".

The second level of unequal power sharing is between different governance levels of the political structure (the central and local government) and is essentially rooted in financial limitations, particularly budget constraints and an inadequate capacity to generate

revenues from domestic sources. The decentralisation by devolution principle (D-by-D) is the key feature of the relationship between the central and local government, where power is exercised through the devolution of authority from higher to lower levels of the administrative system. The PBWO authority's water management efforts are based on hydrological boundaries, while local governments' authority is entirely based on administrative regions, from district authorities to the lowest level of wards and villages. The local government Act (1982) highlighted the relevance of local governments that aims to promote democratic governance by transferring the responsibilities and financial resources necessary to deliver public services from the central to local governments, thereby bringing bureaucratic control and management closer to the lower levels of villages and sub-villages.

The institutional frameworks promoted by the river basin model, such as Water Users Associations (WUAs) are not compatible with the operational and functional capabilities of village governments. Village governments and WUAs are two opposing forces, the former representing local government and the latter representing the river basin authority and focused on water users. Structural problems are observed that result in conflicts over strategic powers and rights concerning the authority over wetland management in relation to livelihoods and economic investments in water and land resources. As a result, potential revenues from the use of water and lands where investments have been made are not tapped, and this hampers efforts towards attaining quality livelihoods, as stipulated in the country's development vision 2025. For instance, the water sector faces serious challenges with respect to financial resources due to the lack of coordination between the PBWO authority and local governments on systematic revenue collection, planning and budgeting. Therefore, multi-sector integration in the water sector is more rhetorical than practical. This can be observed in the limited investments made to improve water

abstraction technologies. As illustrated by PBWO/IUCN (2007), 85% of the water abstracted in Pangani is wasted due to the low irrigation efficiency of the traditional furrow system. Approximately 2 000 traditional furrows have existed for centuries and are highly inefficient.

Many scholars, including, Mujwahuzi (2001), Mwamfupe (2001), Lein (2004), Mbonile (2005) and Turpie *et al.* (2005), have assessed the livelihood options and socio-economic roles for wetland resources in the Pangani river basin. These assessments have led to few tangible accomplishments in terms of mobilising domestic sources of revenue, which is crucial for addressing the problem of water scarcity and moving the land governance system towards the sustainable management of wetlands and associated livelihoods. This has constrained the development of sustainable livelihood options, as water and land are key wetland resources that facilitate irrigated agriculture, which represents the main source for the livelihoods of 90% of the population of the Pangani river basin. This study investigated the institutional, environmental and socio-economic options for developing sustainable livelihoods in the wetlands of the Pangani river basin to contribute to the alleviation of poverty in line with the National Strategy for the Growth and Reduction of Poverty (MKUKUTA)[5] and development vision 2025. The investigation is motivated by the need to provide a broader and integrated perspective to identify sustainable options that allow people to earn a living and generate income from wetland resources and how this income can contribute to mobilising domestic revenues sources, which are fundamental to the development of capital investments in water and land resources.

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[5] MKUKUTA is a Swahili acronym for the National Strategy for the Growth and Reduction of Poverty – NSGRP. This strategy is the development framework for the current five year phase (2005-2010). It forms part of Tanzania's efforts to deliver on its national development vision 2025. The focus is outcome oriented and organized within three clusters; growth and reduction of poverty; improved quality of life and social well being; governance and accountability. www.tanzania.go.tz

**1.5 Study Objectives**

**1.5.1 General Objective**

To investigate the institutional, environmental and socio-economic options, for the development of sustainable livelihoods in the wetlands of the Pangani river basin, Tanzania.

**1.5.2 Specific Objectives**

The specific objectives were to;

    i.    Assess the status of wetland resources, institutions and livelihood options.

    ii.    Examine the level of dependence by stakeholders on wetland resources.

    iii.    Examine gender differences and roles in the use of wetland resources.

    iv.    Analyse the socio-economic factors influencing choices of livelihood options.

    v.    Identify livelihood options that are sustainable in the context of wise use.

**1.6 Study Area**

**1.6.1 Location and Size**

The Pangani river basin covers an area of 43 650 km$^2$ and located in the north eastern Tanzania (Fig.1). 95% of the river basin is distributed among four regions of Arusha, Kilimanjaro, Manyara and Tanga and the remaining part of 5% is located in Kenya. Within these, it covers part or all of the fourteen districts and two municipalities of Arusha and Moshi. The major catchments found in Pangani river basin include Kikuletwa, Ruvu, Mkomazi, Luengera and main stem of Pangani. It is estimated that, about 2.6 million people (Appendix 1) live in the river basin, agriculture being the major means of livelihood by 80%. Irrigation contributes to major consumption of surface water in the Pangani by 90% and is contributing to major conflicts in the area due to water scarcity. The river is recorded to be 500 kilometres long (PBWO/IUCN, 2007).
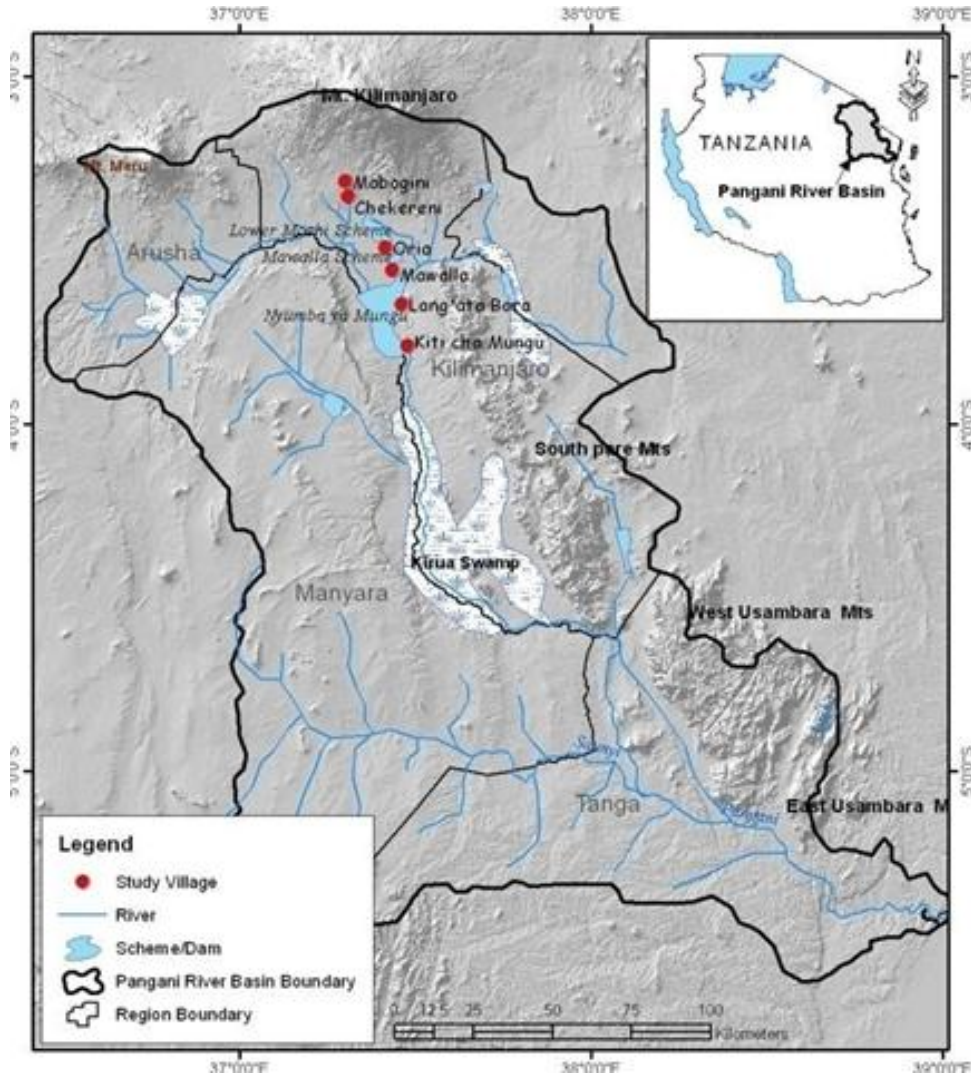
**Figure 1: Map of Pangani river basin showing sampled wetlands and study villages**

The source of Pangani river originate from Mt. Kilimanjaro and Mt. Meru which form Kikuletwa and Ruvu rivers and drain its water in Pare and Usambara mountains and lastly emptying to Indian ocean. The Pangani river falls under the category of fresh water ecosystem and is among the nine river basins found in Tanzania. Major wetlands found in Pangani include Nyumba ya Mungu Dam, Lake Jipe, Kirua swamp and Lake Chala and small wetlands such as Miwaleni springs and irrigated paddy/rice fields which are most located on floodplain wetlands. Mean Annual Runoff (MAR) for Pangani river basin is estimated to reach 1 540 million $m^3$ out of which irrigation account for 550 million $m^3$.

Storage capacity for hydropower generation is 1 140 million m$^3$ equivalent to 71% of the mean annual runoff in Pangani *(ibid)*.

**1.6.1.1 Lower Moshi Irrigation Scheme (LMIS)**

Lower Moshi Irrigation Scheme (LMIS) is located upstream in Moshi rural district, Kilimanjaro region and considered as artificial wetland created for irrigated paddy/rice fields previously recorded as floodplain wetlands. As noted by these authors, Bullock and Acreman (2003) and McCartney *et al.* (2011) modification of wetlands for agriculture has resulted to trade-offs with other ecosystem services. Where people are poor and faced with limited livelihood choices the option of modifying wetlands to generate livelihoods such as irrigated paddy/rice fields is necessary to sustain lives. However the authors suggest that proper understanding of the 'hydro-geomorphological' processes and linking between agriculture development and ecosystems services within particular wetland is fundamental.

According to URT (1998) the scheme was developed specifically for supporting four villages of Mabogini, Chekereni, Oria and Rau covering 2 300 hectares out of which 1 100 hectares were developed for paddy/rice cultivation and the remaining 1 200 hectares for upland and perennial crops. LMIS is a modern improved scheme supported by Japanese International Cooperation Agency (JICA) between the period of 1976 to 1990 under the Ministry of agriculture, food and cooperatives. Of recent the Ministry expanded a new irrigation area to include two villages of Kaloleni and Mandaka mnono in the scheme. The water sources for the LMIS are the Rau and Njoro rivers which are supplied by Mwanangurue, Njoro ya Dobi and Goa springs. The mean monthly discharge at Rau river is 2 880 l/s. Due to climate change, Rau river is now a seasonal river that initially was a permanent river flowing throughout the year. Water permit for the scheme is 1 900m$^3$/sec

and annual water consumption is estimated to reach 65 million m$^3$. LMIS is managed by a civil society organisation known as Lower Moshi Irrigators Association (LOMIA) and approximately about 5 000 households benefit from the scheme.

### 1.6.1.2 Mawalla Irrigation Scheme (MIS)

Mawalla Irrigation Scheme (MIS) is located midstream in Moshi rural district in Kilimanjaro region and considered as artificial wetland previously recorded as floodplain wetland. The scheme covers three villages of Oria, Ngasinyi and Mawalla. The scheme covers an area of 1 426 hectares major economic activity being agriculture and livestock development. Paddy/rice plantations compose the major part in the scheme and smaller part of mixed crops of maize, beans and vegetables. The agriculture production is mainly for food and cash crops. The source of water in the scheme is from the major springs of Miwaleni which has mean monthly discharge of 4 500 l/s. The water permit of 900 m$^3$/sec is granted to the scheme as according to water utilization Act of 1984. Annual water consumption by the scheme is estimated to reach 28 million m$^3$. The scheme is managed by a civil society organisation representing the three villages namely Oria, Ngasinyi and Mawalla (ONGAMA). Approximately about 2 333 households are direct beneficiaries of the scheme.

### 1.6.1.3 Nyumba ya Mungu Dam (NYM)

Nyumba ya Mungu (NYM) dam is an integral part of the Ruvu - Pangani river system that drains water from Kilimanjaro and Meru mountains and from Lake Jipe. NYM dam is artificial wetland created specifically for construction development of dam/reservoir for hydro-electric power generation. The primary sources of water for NYM dam include Ruvu and and Kikuletwa rivers. The NYM dam was constructed in 1960s situated at an altitude of 670M above sea level; latitude 03$^0$ 45's and longitude 37$^0$ 25'E. The dam started operating in 1968 (Ngana, 2001).

NYM dam was constructed for the purpose of hydro-electric power generation and irrigation for agriculture downstream of Ruvu river. However irrigation is totally prohibited in NYM dam only fishery activities are allowed to sustain livelihoods. There are 12 registered villages under three districts that surround NYM dam and are engaged in fishery activities. These include Njia panda, Kiti cha Mungu, Nyabinda, Lang'ata Kagongo, Lang'ata bora and Handeni located in Mwanga district, Kilimanjaro region. Mikocheni A and B and Chemchem villages are found in Moshi rural district, Kilimanjaro region while Spillway, Ngorika, Magadini and Korongo villages are located in Simanjiro District, Manyara region. The storage capacity at NYM dam is estimated to reach 1 140 million $m^3$ with capacity to produce electricity of 8MW. However, reduced to 600 $m^3$ during dry season. The dam is used to generate diversified source of livelihoods for fisheries and livestock sectors and about 20 000 households are direct beneficiaries. Beach Management Units (BMUs), as a civil society organisation is responsible in the management of NYM dam.

### 1.6.2  Topography and Climate

The Pangani River itself has two main tributaries, both of which rise in the basin's Northernmost portions. The first of these, the Kikuletwa, rises on the slopes of Mt. Meru and the southern slopes of Mt. Kilimanjaro, while the second, the Ruvu, rises on the Eastern slopes of Mt. Kilimanjaro and Lake Jipe. These rivers join at Nyumba ya Mungu (NYM) dam measuring about 140 $km^2$ (Røhr and Killingtveit, 2002; IUCN, 2003). A large part of the Pangani river basin's ability to deliver water has to do with its forests. On Mt. Kilimanjaro, for example, an estimated 96% of the water flowing from the mountain originates from the forest belt alone (Lambrechts *et al*., 1992; IUCN, 2003), and Mt. Kilimanjaro is estimated to provide 60% of the inflow to the NYM dam and 55% of the river basin's surface water (*ibid*). The forests of the Pangani River Basin are represented

by five broad types; afromontane forests, mangrove forests, coastal forests, miombo woodland and riverine forests.

The highland area (upstream) is considered to be that land lying ca. 900 m, such as the slopes of Mt. Meru and Kilimanjaro, as well as areas in the Usambara and Pare mountains, which receive between 1 200 and 2 000 mm of rainfall annually. Rainfall is bimodal in these areas, peaking between March and May, with a smaller peak between October and November. Rainfall in the former season may exceed 600 mm a month, and 300 mm in the latter. Above the NYM dam, rainfall has generally declined since record taking began in the early 1930s. Present rainfall patterns typically vary around 10% from the mean (Mkhandi and Ngana, 2001). Land below 900 m (downstream) receives the least rainfall in the basin, declining to as little as 500 mm a year (*ibid*). Infact, 50% of the Pangani river basin is considered arid or semi-arid (Røhr and Killingtveit, 2002).

### 1.6.3   Land Use Practices

Almost 90% of the surface flow in Pangani river basin is used for irrigation and hydro-electric power generation. Other uses of water in the river basin include domestic, fishing, tourism, mining, livestock and processing industries. As noted by Mwamfupe (2001), the only source of livelihood available to many in the river basin is primary i.e. a livelihood based on the direct exploitation of the natural resources, be it forests, fisheries, wildlife resources and most importantly irrigated agriculture. The reasons for irrigation are twofold. In the upstream areas, average plot sizes are between 0.1 and 0.2 hectares and population densities are in the region are estimated to range from 700 – 1 000 people per km$^2$. Downstream in the basin, in the traditional '*shamba*' areas, plot sizes tend to be larger (0.8 – 1.5 hectares), and farming less intense. Rainfall patterns tend to be irregular, and irrigation is practised to mitigate climatic impacts. Water scarcity in the river basin is

threatening the livelihoods dependent on irrigated agriculture and other important contributions to the national economy. This is a resultant of emerging conflicts between various water users. The insecurity of water supply undermines efforts to secure livelihoods and reduce poverty levels in the study area.

## 1.7    Conceptual Framework

### 1.7.1 Overview

Wetland ecosystems in Tanzania face immense use pressures. High demand for wetland products and services has pushed towards unsustainable use leading into degradation of most wetland ecosystems. Water scarcity experienced in wetlands of Pangani is a result of unsustainable use and impacts of climate change that led to limited access to wetland products and services. As noted by URT (2007) degraded wetlands such as Nyumba ya Mungu dam and Lake Jipe in Pangani is a result of over fishing, inappropriate fishing gears, over abstraction of water for agriculture use and agricultural malpractices in mountain slopes of Kilimanjaro and catchment areas in upstream location. This has resulted to reduced water flow downstream and retention capacity in wetlands. The study target wanted to find out if wetland communities have limited access to such resources, are they actually finding options in other economic sectors? Are the options sustainable? In other words, are people who previously engaged in subsistence wetland-based activities are now able to earn cash from other similar activities? If not, how has continued dependence of a shrinking wetland resource-base influenced their livelihoods options and resource management practices?

In order to illuminate these types of specifics, we needed an assessment framework that could address both macro level transformations as well as their specific local impacts and be able to identify livelihood options that are sustainable in wetland communities of

Pangani. A more empirically grounded understanding of such dynamics is essential if we are to realize the laudable vision of unifying wetlands as part of larger ecosystem which perform its role in maintaining hydrological cycle in the river basin and promoting local livelihoods. While investigating access to water and land resources as key controlling factors in wetlands the study goes further and examined whether the resources accessed has contributed to poverty alleviation as well as fostering attitudes and behaviours towards conservation of wetland resources. The UK's Department for International Development (DFID) Sustainable Livelihood framework is especially suited to these kinds of investigations[6].

**1.7.2 DFID Sustainable Livelihood Framework**

The conceptual framework for this study (Fig. 2) was adopted from the DFID sustainable livelihood framework and defines a series of core concepts, including "people-centred", a focus on understanding the struggles of the poor and the need to influence the institutional structures and processes that govern their lives; "holistic", meaning a non-sectoral approach that recognises the existence of multiple sectors with multiple outcomes; "dynamic", meaning the study attempts to understand changes through cause-and-effect relationships; "the analysis of strengths" concerns fundamental skills rather than immediate needs and seeks to build people's potential; bridge the gap between micro and macro levels; and finally, the "dimension of sustainability" concerns the observation of institutional, environmental, and socio-economic aspects.

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[6] See: http://www.livelihoods.org/info/guidance_sheets_pdfs/section2.pdf
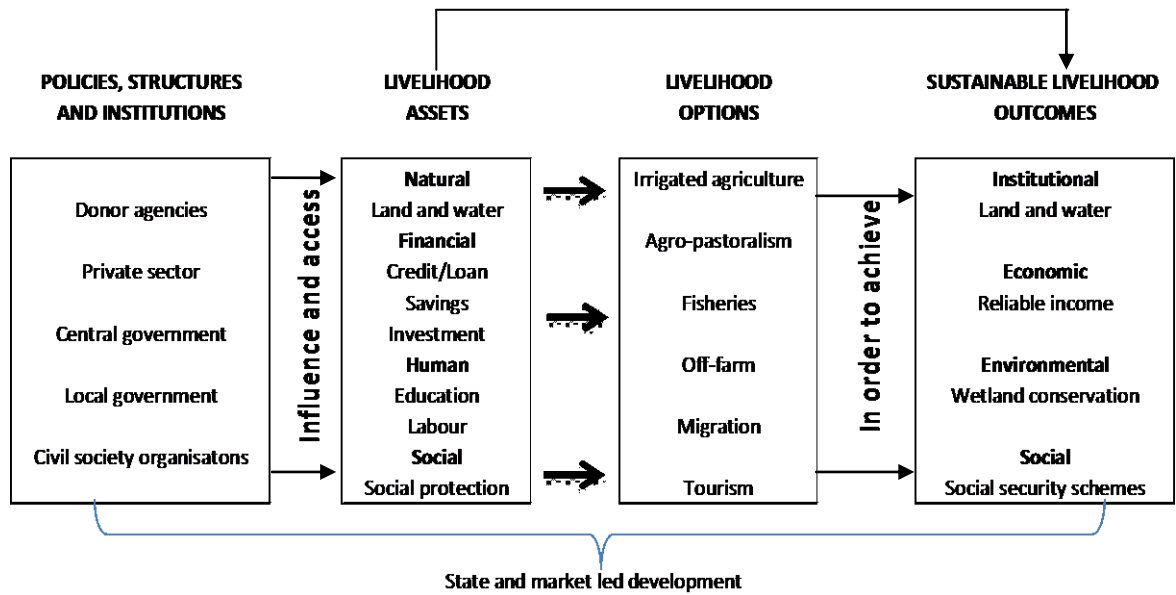
**Figure 2:** **The conceptual framework to design sustainable livelihood options.**
**Source: Modified from DFID (2000)**

The dimension of sustainability is the central focus for this study's attempts to measure livelihood outcomes with respect to institutional, environmental and socio-economic aspects. This framework therefore provides a number of conceptual tools for researchers to identify and analyse the types of variables that will enhance or hamper people's options for pursuing diverse livelihoods of relatively high value.

At the macro level, it emphasise *"transforming policies, structures and institutions"*. These institutions, organisations, legislations, policies, and programmes shape people's livelihood options or the lack thereof. The study analysed Ministries, Departments and Agencies (MDAs) and institutions in the political structure throughout the decentralisation process and investigated the effects the structure has on the design of institutional policies and discourses in the river basin and wetland management. The study analyses the influence of Donor agencies, the private sector, the central and local governments and civil society organisations (CSOs) in shaping the political structure, particularly concerning budgeting and domestic revenues and expenditures. In terms of access to land

and water resources, the study assessed issues such as national land and water legislations, the efficacy of the central government in enforcing legislations at different levels, the state of the water and land markets, tenure practices, and the systems and power relations that influence access to these resources within and between households, local and central governments and at the global level. According to the DFID sustainable livelihood framework, 'policies, structures and institutions' influence people's access to a variety of capital assets. The asset categories and their relationships with livelihood options are discussed as follows:

**Natural Capital:** "Land, water, and other wetland services". This remains the most important type of capital supporting the livelihoods of the majority of people in wetland communities. As a result of neo- liberalisation policies, land grabbing scenarios are emerging where village lands are frequently reclassified as 'unoccupied or unused' general lands available for investment purposes or large scale commercial estates. In the process, wetland communities are denied their previously substantial share of natural capital and forced to convert wetlands to other unsustainable uses such as illegal fishing, over abstraction of water and improper cultivation techniques, which in most cases have resulted in water scarcity and the degradation of wetlands.  The study focused on differences in natural capital, with respect to the gradient between low and high potential agro-ecological zones. Upstream locations, for example hilly and mountainous zones, can exhibit rapid gradient changes over short distances because the water flows are higher, allowing for high spatial diversity in livelihood niches such as irrigated agriculture. However, downstream locations, for example semi-arid, flat terrains, allow for less spatial diversity in human livelihood options such as agro-pastoralism and fisheries because water availability diminishes along with the gradient. Land is also used as collateral to access financial capital such as credit, micro loans or partnerships in other economic investments.

**Financial Capital: "**Cash, credit, and other highly liquid assets (e.g., livestock)". Financial capital provides access to livelihoods through savings, credit and investment. Financial capital is especially important because it can easily be converted into other kinds of capital. It can also be used to reduce food insecurity and gain political influence. Access to financial capital in wetland communities, as well as its liquidity, is highly dependent on natural capital such as land resources for collateral and social protection through voluntary monthly cash contributions through civil society organisations (CSOs). This study considered household savings rates and the particular types of savings. The study also analysed credit and micro loans obtained from CSOs and banking organisations and how these funds are used and invested. Are they reinvested in the household's primary livelihood or used to diversify to other livelihoods? How dependent are household investments on wetland resources? Has the household explored other economic options outside of the wetlands? How does migration, which is frequently used as a coping strategy during droughts or periods of uncertainty, affect access to financial capital? Aspects related to financial literacy regarding access to funding sources and discipline concerning financial management within the household and the formulation of business plans were also explored.

**Social Capital:** "Access to social networks, CSO membership and voluntary social protection schemes". CSOs such as Water Users Associations (WUAs), Savings and Credit Cooperative Societies (SACCOs), Village Community Banks (VICOBA), women's and self help groups continue to demonstrate the relevance of social capital to informal social protection in Pangani's wetland communities. According to URT (2003) social protection schemes in Tanzania primarily cover those employed in the formal sector, representing 6.5% of the population, while the remaining 93.4% fall under informal sector, largely composed of small scale farmers (74% of the population). Monthly

voluntary contributions are the only available option to small scale farmers, apart from banking services, to access credit to sustain livelihoods or diversify into other economic ventures. These types of social networks are based on trust, reciprocity and exchange but suffer from limited funding due to the shrinking wetland resource base in the river basin and the insecurity of tenures for land and water resources.

**Human Capital: "**Education, skills and knowledge". The study investigated education, which is a key determinant in access to land, size of land holdings, securing land tenures and the ability to diversify into other livelihood options that do not depend on wetland resources. Access to education is reflected in different educational levels, ranging from primary to college/university education, as well as the types and orientations of Tanzanian universities, i.e., whether they are based on 'pure or applied research', with respect to primary fields of specialisation. The study explored how education has shaped livelihood choices in wetland communities and its influence on attitudes towards household savings and investments. Due to the application of economic liberalisation, cost sharing was introduced at all levels of education to reduce government expenditures, and the study investigated how this change has hampered or encouraged the development of sustainable livelihoods.

The DFID sustainable livelihood framework acknowledges the need to transcend the boundaries between conventionally discrete sectors (urban/rural, industrial/agricultural, and formal/informal); therefore, the study investigated the options other than agricultural development that have the potential to sustain livelihoods while maintaining individual land ownership. The goal is to strengthen existing livelihoods such as irrigated agriculture, fishing, and agro-pastoralism and to diversify and expand these to other non-farm opportunities, temporary migration and potentially unexplored business ventures such as

tourism. The study investigated sustainable options for wetland-based livelihoods and strategies that contribute to reducing poverty in the Pangani river basin. Livelihood outcomes were measured based on the institutional, environmental and socio-economic aspects of sustainability.

## 1.8 Thesis Organisation

The thesis is composed of five chapters; chapter one contains introduction, research problem, objectives and conceptual framework. Discussion and details of the main objectives are organised in the specific manuscripts in the form of chapters starting from chapter two.

Chapter two addresses the challenges of institutional decentralisation in wetland management of the Pangani river basin, Tanzania. Specifically this chapter assessed challenges of institutional decentralisation of wetland resources in sustaining livelihoods across four governance levels from donor agencies, central and local government to civil society organisations (Manuscript I).

Chapter three demonstrates the critique of decentralised political structure in the management of wetland resources' stakeholders. The objective being to examine the level of dependence by different stakeholders (water and non-water sectors) utilising wetland resources and its effects on revenue generation and environmental degradation (Manuscript II).

Chapter four investigates the gender roles and differentiation in relation to livelihood niches and how decentralisation processes can promote or block the utilisation of productive resources in the wetland communities (Manuscript III).

Chapter five provides an analysis of socio-economic factors that influence livelihood choices and determine whether the decentralisation of wetland governance can promote sustainability of wetland-based livelihoods (Manuscript IV).

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# CHAPTER TWO

## 2.0 CHALLENGES OF INSTITUTIONAL DECENTRALISATION IN WETLAND MANAGEMENT OF THE PANGANI RIVER BASIN, TANZANIA

**(Manuscript I)**

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## 2.1 Abstract

Contemporary development theories advocate for institutional decentralisation as a sustainable mechanism to address institutional challenges in promoting livelihoods with a particular focus on the management of common pool resources (CPRs). This study investigated the artificial wetlands in the Pangani river basin, Tanzania. Institutional decentralisation of wetland resources and their associated livelihoods, especially irrigated agriculture, agro-pastoralism and fisheries, are managed by civil society organisations (CSOs) under common property regime that generate substantial household cash income and food security. The study revealed the existence of fragmented management between the central government's wildlife sector that manages wetlands based on a *'protected area model'* and CSOs under the water sector through river basin authorities that manage wetlands as CPRs based on a *'river basin model'*. This is likely a source of conflicts and fragmented management. Dependence on external donor funding for both wildlife and water sectors lacks coordination and is largely subjected to power struggles that have contributed to the loss of a common development focus on resource management, with water scarcity markedly pronounced in the wetland communities. Institutional development reforms on four way dynamics are suggested and discussed.

**Key words:** Decentralisation; Institutions; Livelihoods; Pangani river basin; Tanzania; Wetlands.

## 2.2    Introduction

Several wetlands in Tanzania are under increasing pressure and are losing many of their important functions at increasing rates with serious consequences, including challenging water regime dynamics, significant conflicts over resource use and loss of livelihood opportunities. The major source of conflicts experienced in wetland communities is the lack of an elaborate institutional framework to facilitate the integration of the various sectoral and cross-sectoral uses of wetland resources among stakeholders (Kangalawe and Liwenga, 2005). The objective of this paper was to assess the challenges of institutional[7] decentralisation in sustaining livelihoods in the artificial wetlands[8] of Tanzania's Pangani river basin. The Millennium Ecosystem Assessment (2005) and Barbier (2011) distinguish four main categories of ecosystem services derived from wetlands: provisioning, regulating, cultural and supporting. Provisioning services constitute the most direct and visible services human populations derive from wetlands. These services are important to human beings as they support livelihoods through the provision of water, land, fish, plants, game, fuel energy and construction materials. Wetlands are a major source of livelihood for many villagers in Tanzania (URT, 2007). They are also reported to be the most commonly utilised ecosystems in Southern Africa, used by local communities for agriculture and livestock production (Rebelo *et al*. 2010; McCartney *et al.* 2011).

In Tanzania, wetlands cover approximately 10% of the total land area of 945 000 km$^2$; 5.5% of its wetland area is presently protected under the Ramsar Convention on Wetlands (URT, 2007). The Wildlife Division of the Ministry of Natural Resources and Tourism

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[7] Institutions in this paper are regarded as rules and regulations that facilitate communication and coordination over resource utilisation and management in the man-made wetlands of the Pangani river basin.

[8] This paper refers wetlands as defined by the Ramsar Convention on Wetlands as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt including areas of marine water, the depth of which at low tide does not exceed 6 metres. This broad definition includes inland wetlands (such as marshes, lakes, rivers, peatlands, forests, karst, and caves), coastal and near-shore marine wetlands (such as mangroves, estuaries, and coral reefs), and artifical wetlands (such as rice fields (paddies), dams, reservoirs, and fish ponds) (MEA, 2005). http://www.maweb.org/documents/document.358.aspx.pdf.

(MNRT) has been charged with facilitating the implementation of the Ramsar Convention for the wise use of wetlands. Although Tanzania is committed to implementing the Ramsar Convention, it is constrained by several factors, including the inadequate, fragmented and uncoordinated nature of information related to the extent, productivity, socio-economic roles and impacts of different types of wetland utilisation (Munishi *et al.,* 2011). Evidence elsewhere in the literature (Mombo *et al.*, 2011) suggests that the current institutional arrangements of the Kilombero Ramsar site in Tanzania, for example, threaten the existence of this important site despite its international recognition. There are clear threats to the wetlands of the Pangani river basin, as shown by Mutayoba (2003) and Turpie *et al.* (2005). Surface water in the Pangani basin is becoming increasingly over-apportioned despite the fact that some current water demands, for example, urban and rural water supplies, have not been met. This has led to a shortfall in available water for the multiple uses in the basin, as demonstrated by the water balance of inflows and outflows from the Nyumba ya Mungu dam, which had a suggested deficit of 2.2 $m^3$/sec (required inflow is 28.5 $m^3$/sec, while observed inflow was 26.3 $m^3$/sec) (Mutayoba, 2003; Turpie *et al*., 2005).

Tanzania's revised wildlife policy (URT, 2007) recognises the role of wetland management and associated resources under the jurisdiction of different land management regimes within a diversified array of government and international institutions as well as private sector and civil society organisations. The subdivided management of wetlands under different institutions perpetuates the problem of resource degradation and limits the mobilisation of domestic revenue sources for wetlands. This situation has been underscored by a sector-based approach where donor agencies and supported sectors lack a joint framework that includes other participating sectors in benefit sharing and revenue generation. As outlined in the revised wildlife policy of Tanzania (2007):

"Wildlife authorities will retain management responsibility of Ramsar sites or part of, which fall under the jurisdiction of wildlife protected areas. Further, the Director of Wildlife will retain the responsibility to administer and coordinate the implementation of the Ramsar Convention throughout the country, including Ramsar sites or part of which fall under the jurisdiction of different land management regimes…..however, the responsibility for management of modified and artificial wetlands will be vested with relevant land management authorities".

The problem of land tenure insecurity under different land management authorities (central and local government) poses an additional threat to the sustainable management of wetland resources, where common property regime are the usual resource access framework in terms of daily livelihoods. As argued by Alden-Wiley (2008), the access to and control of common land is most at risk due to land reallocation to national and foreign direct investment. This argument is further supported by Wisner *et al.* (2012) and Bernstein *et al.* (2000) work on competition for access to 'wetlands in drylands' in Tanzania, showing that confusing land tenure frameworks with exposed experimentation can lead to conflict through granting leaseholds to non-residents and private foreign investors. Alden-Wiley (2008) and Place (2009), cited in Hilhorst (2010) on the role of decentralisation, argue that the administration of land and natural resources should be localised, necessitating the engagement of institutional actors, such as local governments and civil society organisations (CSOs). Commenting along the same line, Sokile *et al.* (2003) argue that the CSOs such as water user associations require innovative institutional reforms that are fundamental to the promotion of institutional learning at the national level, which will in turn ensure sustainable water resource management in the river basins.

This paper demonstrates the role of promoting domestic revenue, in contrast to a reliance on external funding, as fundamental in upholding institutional reforms that will ensure the sustainable conservation and utilisation of wetland resources. The case of the artificial wetlands in Tanzania's Pangani river basin, an area currently threatened by water scarcity and frequent conflicts over water use between sectors (upstream, midstream and downstream), is presented. Approximately 2.6 million people live in the river basin, and irrigated agriculture and hydropower production are the largest consumers of water, accounting for 90% of total water withdrawals. The paper focuses on sustainability principles as the heart of designing sustainable options for wetland-based livelihoods that reflect design principles and institutional structures for common pool resources (CPRs), as outlined (Ostrom *et al.*, 1994; Ostrom, 2008). The main question addressed by this paper is the challenges of institutional decentralisation on wetland management in the Pangani river basin, Tanzania. The paper suggests institutional development reforms under wetland resource management towards realising common development goals, as outlined in the national development vision 2025[9].

## 2.3 Methodology

This study employed the DFID sustainable livelihood framework (Chambers and Conway, 1992; DFID, 2000; Scoones, 2009) that emphasises macro-level relationships between institutions, policies and systems of power relations that influence access to and control of livelihood assets with the aim of strengthening livelihood options and realising outcomes within a decentralised political structure. The key dimensions of sustainability, as described by the DFID framework, are socio-economic, institutional, and environmental (Chambers and Conway, 1992; DFID, 2000; Ellis and Mdoe, 2003; Kadigi, 2006;

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[9] The national development vision of the Government of Tanzania is to alleviate widespread poverty by improving several socio-economic opportunities, good governance transparency and by improving public sector performance through a strategy; it is a successor to its first Poverty Reduction Strategy Paper. This strategy is officially titled the National Strategy for Growth and Reduction of Poverty but is better known by its Swahili acronym of MKUKUTA (Mkakati wa Kukuza Uchumi na Kuondoa Umaskini Taifa). www.tanzania.go.tz.

Scoones, 2009). This paper centres on institutional sustainability and the case study design was applied to three artificial wetlands in the Pangani river basin, sought to reveal the important features of institutional arrangements between donor agencies, central, regional, and local governments and civil society organisations. A comparative design was employed for three livelihood niches (irrigated agriculture, agro-pastoralism and fisheries) across upstream, midstream and downstream users.

Sampling procedures, sampling frame and sample size were based on institutional arrangements and wetland-based livelihoods. According to O'Neil (2010), sample size can be selected based on the representation of the particular phenomenon. Purposive sampling for institutional arrangements was employed for the central, regional and local government. The central government included selected ministries, departments and agencies (MDAs); seven ministries (Natural Resources and Tourism, Water, Fisheries and Livestock Development, Agriculture, Prime Ministers' office – Regional and Local Government Unit, Energy and Minerals, and Finance). Additionally four departments and agencies (the Pangani Basin Water Office (PBWO), Tanzania Electric Supply Company Limited (TANESCO), Energy and Water Utilities Regulatory Authority (EWURA), and Wildlife Division – Wetland Unit) were identified. Regional and local governments included the Kilimanjaro region and two districts, Mwanga and Moshi rural; and civil society organisations included the Lower Moshi Irrigators Association (LOMIA), Oria, Ngasinyi and Mawalla (ONGAMA), and Beach Management Units (BMUs).

Multi-stage cluster sampling was employed for wetland-based livelihoods. This type of sampling was selected because the population of the Pangani river basin is widely distributed among livelihood niches. As illustrated by Bryman (2004), cluster sampling is appropriate and reliable in terms of time and cost saving when dealing with widely

dispersed population. The primary sampling unit was the Kilimanjaro region, due to the high percentage of household population composition in the Pangani river basin (39.3% out of 574 907 total households) relative to the other three regions - Manyara, Arusha and Tanga (Appendix 1). The secondary sampling unit consisted of three wetlands and 6 villages identified within each wetland, out of which two villages per wetland were chosen. The selection was based on purposive sampling designed to capture different livelihoods and to attach gender attributes as they changed according to the gradient from upstream to midstream and downstream locations (Table 1 and Figure 1). The Lower Moshi Irrigation Scheme (LMIS) and Mawalla Irrigation Scheme (MIS) are both located in the Moshi rural district, while the Nyumba ya Mungu (NYM) dam is in the Mwanga district. Participatory Rural Appraisal (PRA) was performed once in each selected village by involving 30 randomly selected members in each village (Table 1 and Figure 1). The PRA exercise was used to identify three groups of livelihoods that acted as a sampling frame for a stratified random sampling of selected households. Livelihood groups of 120 households from each of the three wetlands were selected and interviewed (Table 1), making a total of 360 households. The identified groups or niches were irrigated agriculture, agro-pastoralism and fisheries. The sampling strategy was designed to capture existing differential livelihood options utilising water and land resources, institutions that govern water and land resources under different wetlands contexts and assess variations in payment for water permits among sectors and livelihoods.

Using a statistical formula by Yamane (1967) with a 95% confidence level and 0.05 precision, the sample of 360 respondents was established. The sample was considered adequate for the study, as according to HairJr *et al.* (2006), any sample size usually suffices for descriptive statistics and is therefore considered suitable for rigorous statistical analyses. Sudman (1976) commented that if comparative analysis is to be performed

between or within groups, a minimum number of 100 elements is needed for each group.

Our sample meets this criterion.

The corresponding equation for statistical formula for selected sample is demonstrated below;

$$n = \frac{N}{1 + N(e)^2}$$

Where as;

n       = the sample size

N       = the population size (total number of households)

e       = the level of precision.

**Table 1: Sample villages and production systems**

| Name of the village | Wetlands | Production systems |
|---|---|---|
| Mabogini | Lower Moshi Irrigation Scheme - LMIS | Irrigation (paddy) - throughout the year<br>Dry season - maize and beans.<br>Wet season - rainfed maize, beans, vegetables. |
| Chekereni | Lower Moshi Irrigation Scheme - LMIS | Irrigation (paddy) - throughout the year<br>Dry season - maize and beans.<br>Wet season - rainfed maize, beans, vegetables. |
| Oria | Mawalla Irrigation Scheme - MIS | Irrigation (paddy) - throughout the year<br>Dry season - maize and beans.<br>Wet season - rainfed maize, beans, vegetables. |
| Mawalla | Mawalla Irrigation Scheme - MIS | Irrigation (paddy) - throughout the year<br>Pastoralism - throughout the year<br>Dry season - maize and beans<br>Wet season - rainfed maize, beans, vegetables. |
| Lang'ata bora | Nyumba ya Mungu dam - NYM | Fisheries - throughout the year<br>Pastoralism - throughout the year<br>Dry season - small gardens of vegetables<br>Wet season - Seasonal migration to other fishing sites |
| Kiti cha mungu | Nyumba ya Mungu dam - NYM | Fisheries - throughout the year<br>Pastoralism and zero-grazing<br>Dry season - small gardens of vegetables<br>Wet season - rainfed maize, beans, vegetables.<br>Wet season - Seasonal migration to other fishing sites |

Data collection from both primary and secondary sources was explored. The study employed a combination of qualitative and quantitative methods of data collection, which, as illustrated by Walliman (2006), are appropriate for case studies and comparative designs. Primary data employed the Participatory Rural Appraisal (PRA), a semi-structured questionnaire and participant observation. The semi-structured questionnaire was administered at the household level to a total of 360 households (Appendix 4). The questionnaire was designed to elicit useful information regarding household demographics, education, access to and utilisation of land and water resources, as well as an analysis of the macro context to define structural, historical and institutional elements. The questionnaire was a mixture of both closed and open-ended questions. Secondary sources (policy documents, books, scientific journals, articles, local and national

government reports, published interviews and newspaper clippings) were investigated to reveal important information and historical data from donor funding agencies at the global and African regional level, information on protected areas and river basin models and associated land and water use investments, and on the Joint Assistance Strategy for Tanzania (JAST).

The study combined qualitative and quantitative (Q-square) methods of data analysis (Kanbur, 2001). Institutional analysis as outlined by Blomquist *et al.* (2008) was employed and was focused on decentralising reforms in natural resource management and aimed at identifying the gaps between institutional arrangements from central, regional and local government to CSOs. Data collected from the PRA and physical field visits were mainly qualitative in nature, and a qualitative tool for textual data analysis (Welft QDA) was used. Quantitative data from the semi-structured household questionnaire were analysed using descriptive statistics such as cross tabulations, percentage ratios, trend analysis, and chi-squares to indicate access to land and water resources, membership in CSOs and ownership of wetland resources within the river basin context. Descriptive statistics were derived using SPSS for Windows, version 14.0, and questionnaire variable analysis was performed with the procedure as described in Pallant (2003).
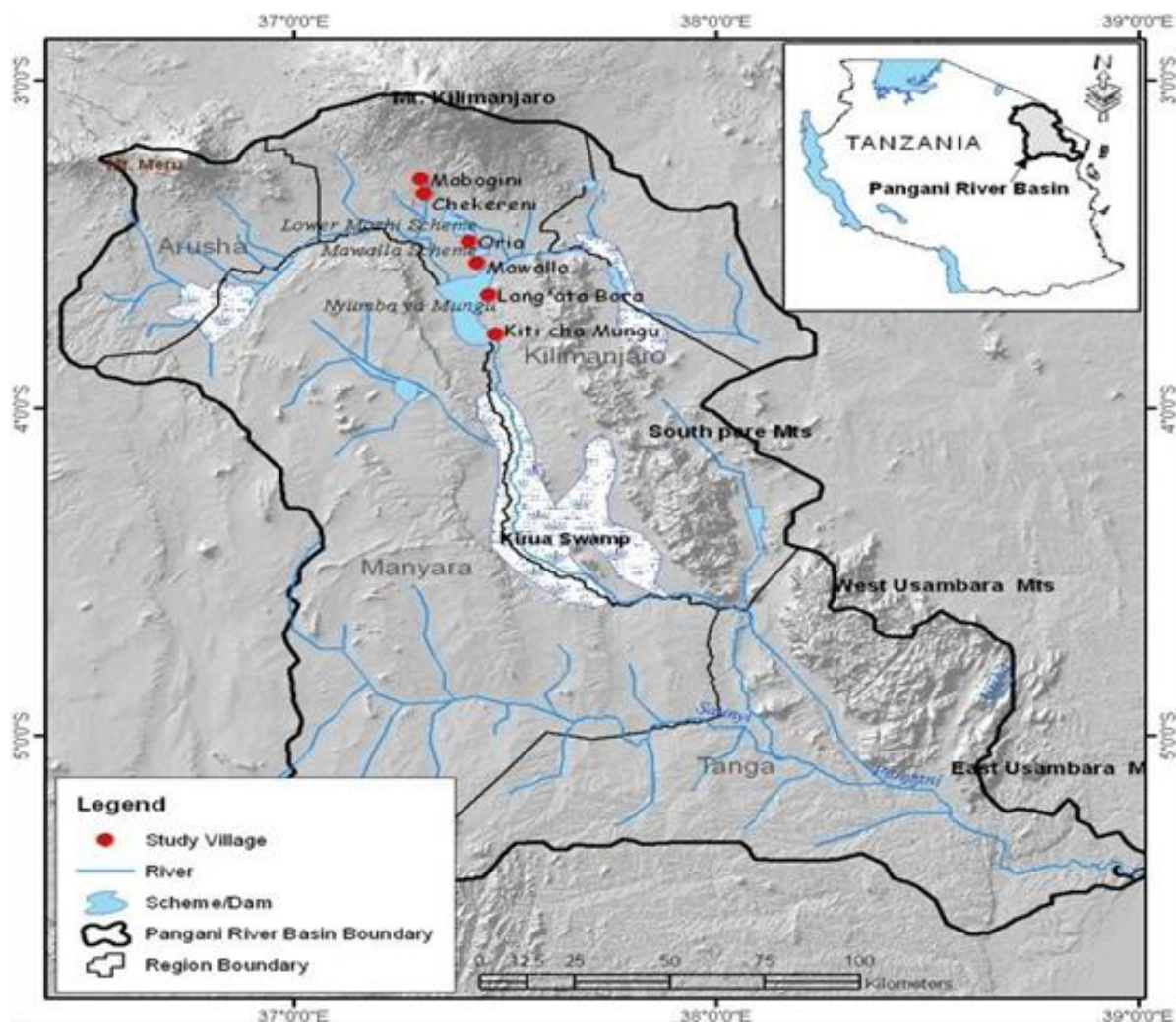
**Figure 1: Map of the Pangani river basin showing sampled wetlands and study villages.**

## 2.4 Results and discussion

### 2.2.1 Donor agencies – Central government: institutional fragmentation

Financial support through grants and loans by donor agencies commonly known as 'Partners in Development' plays an active role in funding individual Ramsar sites (Malagarasi-Muyovosi, Lake natron, Kilombero, Rufiji-Mafia-Kilwa, lake kagera swamp and Usangu) and other wetland sites. The objective being boosting economic growth through promoting anti-poverty measures, securing basic human rights and reducing global inequality (MNRT, 2007). The role of donor agencies is fundamental, and this

study argues that to ensure institutional sustainability, there must be a strong link between a country's ability to generate its own revenue from domestic sources and the effective facilitation of donor-supported loans and grants. Research findings revealed that the lack of donor policy in Tanzania as a recipient country and the resulting institutional fragmentation is limiting the capacity of ministries, departments and agencies (MDAs) in promoting domestic sources of revenue. Institutional fragmentation is evident in most wetlands in Tanzania due to the style of the donor funding system, which uses a single sector approach usually based on geographical location and associated local and international institutions (Fig. 2).

A lack of development focus on wetland resources investment and conservation is significant, with more than 17 major donor agencies supporting wetlands through individual sectors such as fisheries, wildlife conservation, agriculture, water, energy and education (scientific research). Several examples of multiple donor agencies supporting a specific wetland through a diversified single sector approach are demonstrated in Fig. 2. Lake Victoria is supported by four donor agencies: the World Bank, the Swedish International Development Agency (SIDA), the European Union (EU) and the United Nations Development Programme (UNDP). Lake Tanganyika is supported by six donor agencies, namely, the African Development Bank (ADB), the Danish International Development Agency (DANIDA), the Food and Agriculture Organisation (FAO), the Finnish International Development Agency (FINNIDA), the International Union for Conservation of Nature (IUCN) and UNDP.

| DONOR AGENCIES - LOANS AND GRANTS | WETLANDS | | | | |
|---|---|---|---|---|---|
| | ADB | Lake Tanganyika | | | |
| | BELGIUM | Mafia Islands | Kilombero valley | | |
| | DANIDA | Lake Tanganyika | Lake Natron | Usangu | Malagarasi-Muyovosi |
| | DFID | Usangu | | | |
| | EU | Lake Victoria | | | |
| | FAO | Lake Tanganyika | Lake Nyasa | | |
| | FINNIDA | Lake Tanganyika | | | |
| | GTZ | Lake Rukwa | | | |
| | IUCN | Pangani river | Lake Tanganyika | Rufiji delta | Tanga | Mtwara |
| | IRISH AID | Mafia Islands | | | |
| | JICA | Pangani river | | | |
| | NORAD | Pangani river | Mafia Islands | Tanga coastal | Mnazi bay | Rufiji river |
| | SIDA-SAREC | Lake Victoria | | | |
| | UNDP | Lake Tanganyika | Lake Victoria | Lake Nyasa | Lake Natron | Rufiji valley |
| | USAID | Tanzania Coastal | | | |
| | WORLD BANK | Pangani river | Lake Victoria | Rufiji delta | |
| | WWF | Mafia Islands | Usangu | Nyasa | |

**MINISTRIES DEPARTMENTS AND AGENCIES - MDAs**
Wetland unit - Wildlife Division

**REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT**
Wetland District facilitation team

**Figure 2: Donor agencies and supported wetlands.**

**Source: Tanzania - MNRT (2003)**

The Mafia Islands is supported by four donor agencies: the Belgian Embassy, Irish aid, the Norwegian Agency for Development Cooperation (NORAD), and the World Wildlife Fund for Nature (WWF). Finally, the Pangani river basin is supported by 4 donor agencies: Japan International Cooperation Agency (JICA), IUCN, NORAD and the World Bank. The multi-sector approach is not only lacking among sectors in Tanzania but also among donor-supported projects.

The major challenge facing the artificial wetlands of the Pangani river basin is how to link the river basin model to the country's decentralised political structure. The river basin model is rooted in the dominant discourse of Integrated Water Resources Management (IWRM), which is substantially based on neo-liberal approaches designed and controlled by those holding positions of global power. While decentralised political structure, demands democratic participation under the decentralisation by devolution (D-by-D) principle at the national and local levels (Appendix 2). The challenge of linking the IWRM discourse and the D-by-D principle has negatively affected the sustainability of people's livelihoods at a number of different scales due to the inability of the Pangani Basin Water Office (PBWO) authority to influence public policies on land use investments and associated sectors such as agriculture, fisheries, livestock grazing and tourism in the wetlands, which are important drivers of economic growth and income creation.

The Pangani river basin wetlands present a scenario of management fragmentation between the wetlands unit of the Wildlife Division under the Ministry of Natural Resources and Tourism, with a sole mandate to manage wetland resources in Tanzania (URT, 2007). While the Pangani Basin Water Office under the Ministry of Water, with authority to manage water resources and associated wetlands within the river basin boundaries (URT, 2009). The Wildlife Division's wetlands unit has been supported by DANIDA (2003 – 2009), with major emphasis resting on the conservation and protection policies for Ramsar sites located within the boundaries of Game Controlled Areas. The coordination between the Wildlife Division and river basin authorities on wetland investment and conservation is fragmented. Wetland management is diversified, with some donor support promoting wildlife protection and biodiversity conservation policies, while other donor agencies target wetlands within the river basin authority and support the

single sector approach in water, irrigated agriculture and energy (hydro-power production).

Four major observations from this trend are revealed by this study; the ability of the Wildlife Division's wetlands unit to budget and generate untapped sources of domestic revenues from wetland resources is limited. Donor agencies supporting wetlands are fragmented and not clearly linked to Ministries, Departments and Agencies (MDAs), river basin authorities, regional administrations or local governments. The Pangani river basin being managed under the Ministry of Water is poorly linked to the Wildlife Division's wetlands unit, as well as other MDAs such as Energy and Water Utilities Regulating Authority (EWURA) and Tanzania Electric Supply Company (TANESCO). Research institutions and 'think tanks' supporting wetlands management are neither coordinated nor clearly linked to regional and local governments and related sectors in sharing information, networks, innovations and technology. Research institutions are not financially independent and rely to an even greater extent on external sources of funding.

### 2.2.2 Pangani river basin: wetlands institutional arrangement

The study revealed the dilemma facing the Pangani Basin Water Office (PBWO) concerning wetland institutional arrangements between the actors and other stakeholders. PBWO lacks a mechanism to harmonise different land management authorities over land uses and water permits payments. PBWO is the sole authority managing water resources, whereas the land is owned by the central or local government, the private sector or individuals. Access to water resources in the Pangani river basin is governed by water permits as introduced by the Water Ordinance Act 1974 - amended Act no. 10, 1981 (1981) and Water Resource Management Act (2009). However, the existing law is silent on how to manage debtors, although each year, approximately 60% of the water permits

billed are not settled. This study argues for the need to define the water permits system by specific livelihoods within a specific wetland context. Table 2 shows that water permits are paid mainly by small-scale irrigators (66%) while agro-pastoralism paid least often (2.5%) and fisheries not at all. Those who do not pay for water permits were most often fisheries (100%), followed by agro-pastoralists (97.5%) and farmers (34%).

**Table 2: Water permits payment by type of livelihood and wetlands**

| Artificial wetlands | LMIS and MIS n=120 | MIS and NYM n=120 | NYM n=120 |
|---|---|---|---|
| | Irrigated agriculture (%) | Agro-pastoralism (%) | Fisheries (%) |
| Paid for water permits | 66.0 | 2.5 | 0.0 |
| Not paid for water permits | 34.0 | 97.5 | 100.0 |

The artificial wetlands of Lower Moshi Irrigation Scheme (LMIS) and Mawalla Irrigation Scheme (MIS) varied. LMIS is fairly modern, with land use investments coming mainly from farmers with donor support from JICA, while MIS is a traditional scheme with a mixture of farmers and agro-pastoralists. In the case of the Nyumba ya Mungu dam (NYM), fishers and agro-pastoralists invest in land but do not pay water fees because they are responsible for paying a levy to the village government and district authorities. In the case of LMIS and MIS, land is owned by individual farmers while water is utilised as a 'common pool resource'. For the NYM dam, land ownership is vested under PBWO and supported by NORAD, however, water and fish resources are utilised as 'common pool resource' by fishers and agro-pastoralists.

The fragmented scenarios of institutional arrangements are rooted in the gap between donor supported projects and different land management authorities on the one hand, and central and local governments and associated sectors responsible for generating livelihoods on the other. The necessary link between the two is missing and has resulted in

complicated scenarios leading to loss of revenue, degradation and loss of wetlands and livelihood impoverishment.

**2.2.2.1 Conflicting authority between PBWO, central and local government**

Land under the Lower Moshi Irrigation Scheme (LMIS) is individually owned by small-scale farmers, while water is accessed as a 'common pool resource' through user permits from PBWO under the Lower Moshi Irrigators Association (LOMIA). Farmers access the water through LOMIA, paying about Tshs 3 000 (USD 2) per plot per season. Lack of planning and coordination between PBWO and the central and local governments to design sources for domestic revenue to manage PBWO and irrigation schemes contributes to wetland resource degradation. Olemako *et al.* (2011) noted recent efforts by the government to implement the theme of 'KILIMO KWANZA' under the Ministry of Agriculture and to expand LMIS from 1 100 to 1 500 hectares. An increase of 400 hectares was effected, which did not take into account the issue of water availability and how the PBWO would allocate scarce water resources over an expanded area with the shrinking source of water from wetlands. Initially LMIS was targeted for four villages but has recently been expanded to seven villages, all of which use the same water right of 1 939 m$^3$/s for the surveyed 1 100 hectares of rice paddies. Water scarcity is evident in the scheme, with frequent conflicts between farmers, and has led to a 67% reduction in the area for paddy/rice cultivation, from 1 100 hectares to 360 hectares (Olemako *et al.*, 2011). Revenue to small-scale farmers is reduced by more than 50% of the estimated revenue from the surveyed area that is utilised below capacity. The implication of water scarcity for PBWO is reduced revenues from user's fees, which compose 40% to 65% of PBWO's budget.

**2.2.2.2 Conflicting authority between PBWO and local government**

The Mawalla Irrigation Scheme (MIS) is a wetland with low irrigation efficiency located midstream between the Lower Moshi Irrigation Scheme and Nyumba ya Mungu Dam. Paddy/rice cultivation cultivation and agro-pastoralism are the major land uses in the scheme. The scheme is managed by the water user association (WUA) known as ONGAMA, an abbreviation for Oria, Ngasinyi and Mawalla villages. Improper land use planning and zoning are the major problems faced by the scheme, both due to differing land management authorities by central and local government. Competition for land and water resources is evident, and joint plans to coordinate the water, agriculture and livestock sectors managed by local government while utilising water resources managed by PBWO do not exist. Agro-pastoralists pay no fees for water consumption to PBWO because watering points for livestock are not properly established, although it could mitigate some of the conflicts existing in the scheme. Researchers in this study observed large groups of cattle in the schemes searching for water and grazing pastures, however, no proper mechanism is set by local governments and PBWO to ensure that the land carrying capacity for the scheme is implemented or that the 'common property regime' system can be sustained. This has also resulted in land degradation and water scarcity in the wetlands of Pangani. As noted by Olemako *et al.* (2011), the actual paddy cultivation in the MIS is utilised at 58% below capacity of the total surveyed area due to water scarcity. Consequently, revenue is reduced by 60% of the estimated total production capacity in the surveyed area.

**2.2.2.3 Unknown ownership between central and local government**

Uncertain ownership of the Nyumba ya Mungu (NYM) dam due to different land management authorities between the central and local governments is contributing to wetland resource degradation. The study reveals the fragmented approach to cost sharing

between the owner of the NYM dam (PBWO) and other stakeholders with user permits such as TANESCO and fishery communities. In the process, the ownership status for the NYM dam has become unknown for the purpose of monitoring land uses, water permits and illegal fishing activities. The major reason for this is that the donor-supported projects are sector-oriented. For instance, NORAD manages hydro-electric power production in the NYM dam, a project that lacks integration with other stakeholders such as livestock, fisheries and agriculture sectors in terms of cost sharing and management between users. The NYM dam is owned by the PBWO, but the authority to use the dam and to collect revenue lies with central government under the Ministry of Energy and the local government (livestock and fisheries sectors). User fees paid by TANESCO are limited, while fishery and agro-pastoralist communities have never paid water user fees despite the substantial revenue generated from the NYM dam. The contribution of power royalties by TANESCO to PBWO is insignificant compared to what is generated by TANESCO annually. Power royalties paid by TANESCO contributes 15% to 46% of the PBWO budget, although the exact amount varies from year to year because of its dependence on water availability and power plant maintenance.

According to the Water Utilisation Act of 1974, section 38(2), and subsequent amendments, the royalties paid by TANESCO to river basin authorities are set at Tshs 300 000 (USD 200) per 1 MW of installed capacity; for PBWO, with a capacity of 97 MW, this is equivalent to Tshs 29 100 000 (USD 18 420). The 8 MW capacity of the NYM dam totals Tshs 2 400 000 (USD 1 520). This has contributed to low hydro-electric power production particularly during the dry season. The annual installed capacity of the Pangani river basin hydro-electric dams (New Pangani falls, NYM and Hale) may drop from 97 to 32 MW, of which the NYM dam may drop from 8 to 4 MW (Table 3) due to water scarcity and overuse of water by upstream users for irrigation purposes. Hydropower is the

largest source of renewable energy and is highly dependent on dams and reservoirs as artificial wetlands in the river basins.

**Table 3. Annual capacity for hydropower plants in river basins of Tanzania – 2009**

| Dam/reservoir | River basin | Storage capacity Million m3 | Installed hydropower capacity (MW) | Net produced capacity (MW) | Unit Generated (Kwh) |
|---|---|---|---|---|---|
| **HYDROPOWER PLANTS** | | | | | |
| KIDATU | Rufiji | 125 | 204 | 200 | 1 097 834 000 |
| LOWER KIHANSI | Rufiji | 1 | 180 | 180 | 845 615 610 |
| MTERA | Rufiji | 3 200 | 80 | 68 | 451 115 000 |
| NYUMBA YA MUNGU (NYM) | Pangani | 1 140 (0.8 Active) | 8 | 4 | 34 633 670 |
| NEW PANGANI FALLS | Pangani | 1.4 (0.8 Active) | 68 | 68 | 166 674 200 |
| HALE | Pangani | 0.14 (0.13 Active) | 21 | 10.5 | 43 044 890 |
| **TOTAL** | | | **561** | **530.5** | **2 394 564 610** |
| THERMAL STATIONS | | | | | 650 350 230 |
| ISOLATED DIESEL | | | | | 68 802 593 |
| UNIT IMPORTED | | | | | 1 443 035 272 |
| **GRAND TOTAL** | | | | | **4 556 752 705** |

**Source: TANESCO (2011)**

Approximately 52% of electrical energy on the Tanzanian national grid is generated by hydropower (Table 3), with the remainder generated from thermal stations, isolated diesel stations, and imported units from Zambia, Uganda, IPTL diesel plants, Kiwira coal mines and Songa gas plants. According to Tesha (2009), the country's potential for hydropower is 4 500 MW, while its developed capacity is at only 12% of that. Over the last three decades, the country has managed to produce 531 to 561 MW, as indicated in Table 3. The major reason for the difference in the potential and developed capacity is the challenge posed by water scarcity to most hydropower plants due to intense competition for water use between sectors. The situation is further complicated by a lack of investment capital to

develop infrastructure for new power plants and the replacement of old power plants. Power rationing has been a frequent problem in Tanzania, as reported by Reuters (2011), due to production below capacity. Limited power and rationing has limited industrial development, and Tanzania is said to have one of the smallest industrial sectors in Africa, accounting for 21.2% of the GDP, of which 90% is small and medium enterprises in food processing and only 10% is large factories.

### 2.2.3   Civil society organisations: institutional decentralisation

Lack of remuneration for staff in civil society organisations (CSOs) and the absence of extension workers for monitoring and evaluation in the wetlands has also contributed to degradation of these resources. The responsibility to reward CSO staff lies within the powers of their associations, although it is limited by financial and human resources. The decentralisation of authority from the central government to local institutions such as CSOs without the transfer of reliable sources of revenue and budget planning is definitely blocking CSOs' efforts to effectively manage wetland resources in a sustainable way. Access to water and fishery resources for livelihoods in the wetlands of the Pangani river basin is regulated through Water users Association (WUAs), as stipulated in the Water Resources Management Act (2009) and Beach Management Units (BMUs) as indicated in the Fisheries Act No. 22 (2003) respectively. In the context of wetland management, clear lines of authority on the rights, duties and responsibilities across local government authorities, PBWO, the private sector, WUAs, BMUs and the village councils are lacking. The contested rights between actors and stakeholders leave much to be addressed regarding profitable investments for water and land resources that can generate income and sustainable livelihoods for poor people in the wetland communities.

From Table 4, membership in WUAs under MIS and BMUs under the NYM dam is insignificant, at 9% and 0%, respectively. Under LMIS, 42% are members from former beneficiaries (1 876 members) with water permit of approximately 65 million $m^3$ annually, while a recent expansion of the scheme has led to approximately 5 000 beneficiaries not registered under WUA. Membership under MIS is at only 9% of 2 333 beneficiaries with water permitt of 28 million $m^3$ annually, while under NYM, with a storage capacity of 1 140 million $m^3$, the BMUs are at the initial stage and will be developed targeting only fishers.

**Table 4. CSOs membership in the Pangani wetlands**

| Artificial wetland | CSOs | Water permit/storage Million $m^3$ | Suveryed area/ hectares | Beneficiaries household | Members | Percentage Ratio (%) |
|---|---|---|---|---|---|---|
| LMIS | LOMIA | 65 | 1 100 | 1 876 | 794 | 42 |
| MIS | ONGAMA | 28 | 1 425 | 2 333 | 200 | 9 |
| NYM dam | BMUs | 1 140 | 14 000 | 20 000 | Nil | Nil |

Large-scale commercial estates under the private sector, which consume more water than small-scale farmers in the river basin, fall under membership of neither WUAs nor BMUs. The setup of WUAs by PBWO only targets the small-scale farmers under irrigation schemes and ignores potential revenue from agro-pastoralists and fishers as important consumers of water resources from the NYM dam. WUAs should not be confined only to small-scale farmers but rather expanded to all stakeholders who use and consume water resources in the wetlands. Further, PBWO should not only target physical water users such as small-scale farmers but also should focus on land use investments by different sectors as a reference to determine how water is utilised by these stakeholders and set a pricing mechanism and allocation criteria reflecting land uses. The capacity of WUAs is limited financially as well as in terms of human resources in monitoring all users in the wetlands. The WUA as a local institution lacks sustainability because innovation in tapping potential income from water utilisation is missing. Their role in water allocation and fee collection

from small-scale farmers limits their capacity to investigate and diversify into other options for best harnessing water resources to generate profits and savings and to contribute towards sustaining livelihoods.

## 2.5 Institutional model: sharing power and benefits

The proposed institutional model focuses on the decentralisation of the four-way dynamics, reflecting the sharing of power and benefits. The model analyses donor-supported projects and the practical mechanism between donor agencies, the central government, local governments and CSOs on how supported grants and loans can be utilised effectively to build capacity and to promote a domestic source of revenue through joint revenue collection. Hamerlynck *et al.* (2011) and Borrini-Feyerabend *et al.* (2004) report on how the *'sharing power'* approach through consensus building by stakeholders is fundamental in wetland conservation and sustainable livelihoods, as has been applied in Bangladesh and Mekong delta. Furthermore, Maconachie *et al.* (2009) stressed the need to explore the role of power relationships in formulating land use investments and access to wetland resources.

## 2.2.4 Central, regional and local government

As argued by Sandstrom (2009), co-management of natural resources emphasises participation, power and process among stakeholders. The lack of a donor funding policy limits the avenues for bargaining and negotiation of supported grants and loans between different levels of governance and associated sectors under a decentralised political structure. Shifting from state-led development to market-led development marked a new era of neo-liberalism in Tanzania during the 1980s, and foreign direct investment was encouraged as a necessary step to boost economic growth. This necessitates increased land expansion and water use for large commercial estates under privatisation. The need for co-

management between state and non-state actors to engage all land holders, associated livelihoods and economic activities in the wetlands is mandatory for the ease of joint revenue collection.

### 2.2.5 Sectoral integration: wetlands, water and land

Land and water are key controlling resources in wetlands; however, as stipulated in the Tanzania water policy (2002), the water allocation system should distinguish and separate water use permits from the land title, and according to URT (2005) on Strategic Plan for the Implementation of the Land Laws (SPILL), all other laws operating on land utilisation, such as agriculture, water, forests, wildlife, mining and environment, need to recognise land sector laws as primary, while other laws operating on land are regarded as tenant, i.e., a landlord-tenant relationship. The need to join forces under joint revenue collection will facilitate the promotion of untapped sources of domestic revenue. Further research on joint revenue collection between wildlife-wetland unit, water and land sectors is essential to ensure institutional sustainability across governance scales from central to local government.

### 2.2.6 Civil society organisations: public group tenure

Common pool resources in the wetlands of the Pangani river basin with regard to water, land and associated livelihoods (irrigated agriculture, agro-pastoralism, fisheries) are communally owned, but individual management strategies are used to access the resources. Access to land and water are the major driving factors in wetland-based livelihood dependency in the river basin. The model proposes that the common property institutional process for wetlands should be managed as public group tenure while resource-use groups (agro-pastoralists, small scale farmers and fishers) should be based on the definition of their tenurial niche. In this model, institutional sustainability refers to

how land and water resources are managed under the theory of trusteeship, and it calls for capacity building of CSOs to ensure that formal land registration and water membership will be closely linked to enable the process of market-based land transfers. This could offer sustainable options to diversify livelihoods to other off-farm opportunities such as tourism and migration.
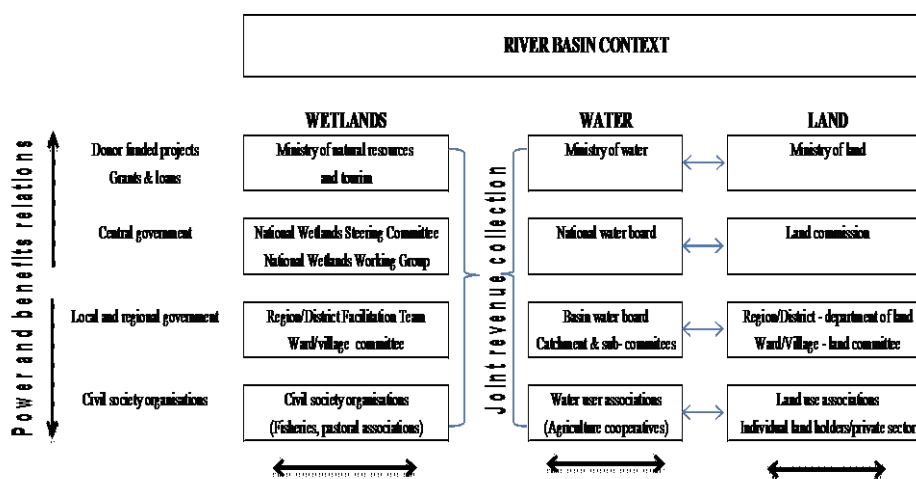


**Figure 3: Institutional model.**

**Source**: Authors' innovation from field survey 2010 – 2011

**2.3 Conclusion**

Donor funding policies in Tanzania should be developed to follow adopted international conventions and agreements by donor agencies regarding natural resources management, including that of wetlands. International conventions in agreement with the Ramsar Convention on the 'wise use of wetlands' in particular are fundamental for the conservation of scarce resources such as land and water. However, it is not a universal solution and in some cases, may hinder the sustainability of economic land use investments and livelihood options. In spite of being a signatory of the Ramsar Convention, Tanzania is subjected to poor implementation of convention guidelines due to

limited financial and human resources at the lower decentralised levels of civil society organisations. The linking of land use investments and water resources in the wetlands within the river basin context should be investigated in further research, as well as the inventory and socio-economic assessment of artificial wetlands. Institutional development reforms of four-way dynamics on sharing power and benefits from donor funded projects are proposed to address policy gaps on power relations, bargaining and negotiations between donor agencies, the state, local government and civil society organisations.

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# CHAPTER THREE

## 3.0 CRITIQUE OF DECENTRALISED POLITICAL STRUCTURE IN THE MANAGEMENT OF WETLAND RESOURCES' STAKEHOLDERS IN TANZANIA: A CASE OF PANGNI RIVER BASIN

(Manuscript II)

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**3.1 Abstract**

This study explores on water resources as key controlling factor in wetlands and how it is being managed and valued by different stakeholders within the decentralised system of political structure in the Pangani river basin, Tanzania. Since 1990, management of water resources in Tanzania was entirely based on the nine river basins that do not follow administrative boundaries as defined under the system of decentralised political structure. The set up of river basin model for managing water resources based on hydrological boundaries in Tanzania has demonstrated weak capacity with particular to financial aspects of revenue collection. Water is a key resource in the wetlands however is not a driver of economic development. Drivers of economic development are outside the water sector such as energy, agriculture, fisheries, livestock and mining. The non-water sectors fall under decentralised political structure from the central government ministries, regional administration to local government authorities. The system of political structure cut across different varieties of governance (differences in government jurisdictions) from central to local government level. Variance in governance within the structure has intensified water scarcity, and reduced household revenue across livelihoods. The comparative research design considered three livelihood niches and examined 360 households. The results indicated reduced revenue due to water scarcity is contributing to destruction of water sources and catchment areas leading to deforestation and environmental degradation. The paper suggests on 'managed resources protected area model' to core wetlands areas. Mobilising domestic sources of revenue across sectors through benefit sharing mechanism is also recommended.

**Keywords:** Decentralisation; Pangani, river basin; Tanzania; water scarcity; wetlands.

**3.2 Introduction**

Wetlands cover about 6% of the earth surface out of which 88% is occupied by wetlands in freshwater environments (Ramsar, 2000). Wetlands in Tanzania cover 10% of the total land area, of which 5.5% is presently for four Ramsar sites (URT, 2007). The objective of this paper is to examine the level of dependence by stakeholders from wetlands of Pangani river basin and its effects on livelihoods systems and environmental conservation. This present study is focusing on water as one component of wetlands and how this resource is managed and valued by different stakeholders within the decentralised system of political structure. Wetlands are becoming one of the key environmental conflict areas in many parts of Eastern Africa (Kamukala, 1993; Southgate and Hulme, 2000; Dixon and Wood, 2003; Munishi *et al.*, 2011). The major source of conflicts experienced in the wetland communities is a result of water scarcity due to lack of elaborate institutional framework to facilitate the integration of the various sectoral and cross sectoral uses of wetland resources among stakeholders (Kangalawe and Liwenga, 2005; Munishi *et al.*, 2011).

According to URT (2002) the concept of river basin was introduced as a present management system in the water sector of allocating water based on hydrological boundaries. As noted by World Bank (2004) water scarcity in Tanzania became a national issue in early 1990 and administration of water resources under river basins was meant to address the situation. Since 1990 management of water resources in Tanzania was entirely based on the nine river basins that do not follow administrative boundaries as defined under the system of decentralised political structure. Water is a controlling factor and a key resource in the wetlands however, is not a driver of economic development. Drivers of economic development are from non-water sectors such as agriculture, fisheries, livestock, energy, mining and do provide varied livelihood options in wetland communities of Pangani. The non-water sectors fall under decentralised political structure

from the central government ministries, regional administration to local government authorities. As questioned by Lein (2009) on how practical can a river basin model be applicable within political and administrative boundaries and as concluded by Barham (2001) in Lein (2009) adoption of the model will often lead to conflicts with democratic rights.

Variance in governance (differences in government jurisdictions) between water and non-water sectors has contributed to water scarcity and conflicts in wetlands of Pangani. Water scarcity hinders the effectiveness of the adopted river basin model as competition of water use between hydropower production and irrigation is critical. These authors note that, almost 90% of the surface flow water in Pangani is used for irrigation and hydropower production and the main conflicts which exist are between upstream and downstream users (Mujwahuzi, 2001; Mbonile, 2005; Turpie *et al* 2005; PBWO/IUCN, 2007$_b$). On attempt to implement strategies under the National Growth Strategy for Growth and Reduction of Poverty commonly known as MKUKUTA in Swahili, since 1996 the Prime Minister's Office – Regional Administration and Local Government (PMO-RALG) undertook major reforms within local government authorities and among many was the critical issue of governance. However the reforms did not unpack governance issues within and between sectors and leave a lot to be desired. Governance problems as outlined by PMO-RALG (2009) originate from three categories; antagonistic relationship between political leaders from central to lower levels; weak representation of the views and key issues at the central government level; and financial constraints and limited capacity of human resources. The paper addresses the following questions; What effects do this structure has in facilitating the integration of the water and non-water sectors' uses of wetland resources among stakeholders? And what effects the water scarcity has in revenue generation and environmental conservation? The paper suggest on

'managed resources protected area model' and mobilisation of domestic source of revenue between water and non-water sectors.

### 3.2.1 Evolution of decentralisation in Tanzania

Tanzania has a two tier system of government that is the central and local government. Local government is established both in urban and rural authorities. As demonstrated by PMO-RALG (2007; 2009) the first decade of independence from the period of 1961-1971, the central government aimed at establishing democratic administration system of bringing equitable development to all Tanzanians. The first period of decentralisation started officially from 1972-1982 with the aim of promoting democratic system by transferring responsibilities and financial resources to deliver public services from central to local government. However in the process this led to collapse of local government authorities. Decentralisation of the central government through deconcentration system was applied to replace the local government system and this resulted in merging both central and local government responsibilities. From the period of 1983-1995 reinstatement of local government authorities was considered mandatory to strengthen aspects of democracy and good governance. Enactment of local government Act of 1982 was approved and local authorities were re-established in both rural and urban areas. Local government reforms evolved from the period of 1996-2005 as a result of major obstacles in governance particularly related to financial constraints and limited human resource capacity. Decentralisation by devolution principle (D-by-D) is the major driver of the reforms and Opportunities and Obstacles to Development (O and OD) methodology is used as bottom-up planning approach at the local level.

### 3.0   The study area

The Pangani River Basin covers an area of 43 650 square kilometres and located in the North Eastern Tanzania (Figure 1). The river basin is distributed among four regions of

Arusha, Kilimanjaro, Manyara and Tanga and the remaining part of 5% is located in Kenya. The major catchments found in the Pangani river basin include Kikuletwa, Ruvu, Mkomazi, Luengera and main stem of Pangani. It is estimated about 2.6 million people live in the river basin agriculture being the major source of livelihood by 80%. Irrigation is the major consumption of surface water in Pangani by 90% and is contributing to major conflicts in the area due to water scarcity. The river is recorded to 500 kilometres long (PBWO/IUCN, 2007[a]). The source of Pangani river originate from Mt. Kilimanjaro and Mt. Meru which form Kikuletwa and Ruvu rivers and drain its water in Pare and Usambara mountains and lastly emptying to Indian ocean. The paper presents a case study of artificial wetlands Lower Moshi Irrigation Scheme (LMIS), Mawalla Irrigation Scheme (MIS) and Nyumba ya Mungu (NYM) dam in the Pangani river basin which contribute significantly in generating household cash income and food security.

### 3.3.1   Lower Moshi Irrigation Scheme (LMIS)

Lower Moshi Irrigation Scheme (LMIS) is located upstream in Moshi rural district, Kilimanjaro region. The scheme was developed specifically for supporting four villages of Mabogini, Chekereni, Oria and Rau covering 2 300 hectares out of which 1 100 hectares was for rice/paddy cultivation an dthe remaining 1 200 hectares for upland and perennial crops. LMIS is a modern improved scheme supported by Japanese International Cooperation Agency – JICA between the period of 1976 to 1990 under the Ministry of Agriculture, food security and cooperatives. The Ministry is now expeanding a new irrigation area to include two villages of Kaloleni and Mandaka mnono in the scheme. Water permit for the scheme is 1 900 $m^3$/sec and annual water consumption is estimated to reach 65 million $m^3$ and the water is abstracted from rau river and Njoro springs. The scheme is managed a civil society organisation known as Lower Moshi Irrigators

Association − LOMIA and currently about 5 000 households benefit from the scheme due to expansion previously 1 876 households were registered as direct beneficiaries.

### 3.3.2   Mawalla Irrigation Scheme (MIS)

Mawalla Irrigation Scheme (MIS) is located midstream in Moshi rural district in Kilimanjaro region. The scheme is composed of three villages of Oria, Ngasinyi and Mawalla and covers an area of 1 426 hectares major economic activity being agriculture and livestock development. Rice/paddy plantations compose the major part in the scheme and smaller part of mixed crops of maize, beans and vegetables. The agriculture production is mainly for food and cash crops. Abstraction of water in the scheme is from the major springs of Miwaleni with a granted water permit of 900 $m^3$/sec. Annual water consumption by the scheme is estimated to reach about 28 million $m^3$. The scheme is managed by a civil society organisation Oria, Ngasinyi and Mawalla (ONGAMA). About 2 333 households are direct beneficiaries of the scheme.

### 3.3.3   Nyumba ya Mungu dam (NYM)

Nyumba ya Mungu dam (NYM) is distributed in three districts of Moshi rural, Simanjiro and Mwanga within Kilimanjaro region and covers 14 000 hectares and its construction was completed in 1966 for the purpose of hydro-electric power generation and floods control. The storage capacity at NYM dam is estimated to reach 1 140 $m^3$ however reduced to 600$m^3$ during dry season with capacity to produce electricity of 8MW. The dam is used to generate diversified source of livelihoods for fisheries and livestock sectors and about 12 villages bordering the dam and about 20 000 households are direct beneficiaries. Beach management units (BMUs) as a civil society organisation, is responsible in managing utilisation of the dam by the local people.
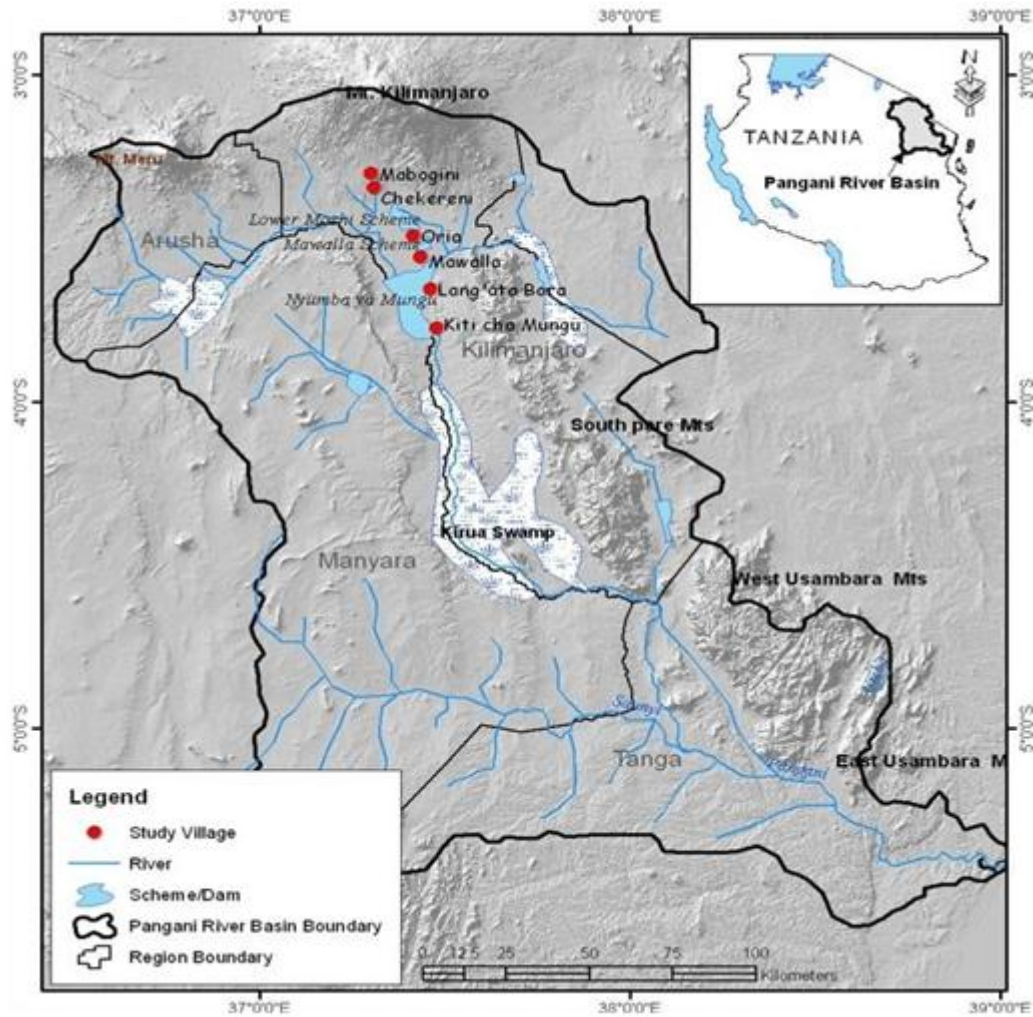
**Figure 1. A map of Pangani river basin showing the location of study area.**

## 3.4 Methodology

This study employed the DFID sustainable livelihood framework that emphasises macro-level relationships between institutions, policies and systems of power relations that influence access to and control of livelihood assets with the aim of strengthening livelihood options and realising outcomes within a decentralised political structure. The key dimensions of sustainability, as described by the DFID framework, are socio-economic, institutional, and environmental (Chambers and Conway, 1992; DFID, 2000; Ellis and Mdoe, 2003; Kadigi, 2006; Scoones, 2009).

Multi-stage cluster sampling was employed for wetland-based livelihoods. This type of sampling was selected because the population of the Pangani river basin is widely distributed among livelihood niches. As illustrated by Bryman (2004), cluster sampling is appropriate and reliable in terms of time and cost saving when dealing with widely dispersed population. The primary sampling unit was the Kilimanjaro region, due to the high percentage of household population composition in the Pangani river basin (39.3% out of 574 907 total households) relative to the other three regions - Manyara, Arusha and Tanga (Appendix 1). The secondary sampling unit consisted of three wetlands and six villages identified, out of which two villages per wetland were chosen. The selection of wetlands was based on purposive sampling designed to capture different livelihoods as they changed according to the gradient from upstream to midstream and downstream locations. The Lower Moshi Irrigation Scheme (LMIS) and Mawalla Irrigation Scheme (MIS) located in Moshi rural district, and Nyumba ya Mungu (NYM) dam in Mwanga district were selected. A comparative design was employed for three livelihood niches across upstream, midstream and downstream users.

Using a statistical formula by Yamane (1967) with a 95% confidence level and 0.05 precision, the sample of 360 respondents was established. The sample was considered adequate for the study, as according to HairJr et al. (2006), any sample size usually suffices for descriptive statistics and is therefore considered suitable for rigorous statistical analyses. Sudman (1976) commented that if comparative analysis is to be performed between or within groups, a minimum number of 100 elements is needed for each group. Our sample meets this criterion.

The corresponding equation for statistical formula for selected sample is demonstrated below;

$$n = \frac{N}{1 + N(e)^2}$$

Where as;

n        = the sample size

N        = the population size (total number of households)

e        = the level of precision.

Primary data employed the Participatory Rural Appraisal (PRA), a semi-structured questionnaire and participant observation. The semi-structured questionnaire was administered at the household level to a total of 360 households (Appendix 4) and focused to collect data on household revenue across livelihoods. In-depth interview was administered and data was collected from 50 personnel and local staff representing institutions from seven ministries from water and non-water sectors, Pangani Basin Water Office, Moshi and Mwanga districts and civil society organisations (Lower Moshi Irrigators Association (LOMIA), Oria, Ngasinyi and Mawalla association (ONGAMA) and Beach Management Units (BMUs). Literature review was consulted from budgets reports, departmental reports and journal related articles. The interview process focused on fiscal decentralization, water reforms, water permits, trade-offs for water allocation and cross-sectoral interests. The stakeholders were confined to government and local institutions from central government to the local level. Stakeholder consultation and engagement was also conducted.

As noted by Kanbur (2001), White (2002) and Ellis and Mdoe (2003) a combination of both qualitative and quantitative methods can help to solve problems that are associated with each type of method taken separately. Qualitative methods employed network

analysis between stakeholders as described by Schiffer and Waale (2008) to address governance of environmental resources in the existing political structure and Pangani Basin Water Office. The objective being to identify stakeholders with high and low level of influence in water and environmental governance. The analysis came up with three groups; Central government, stakeholders with power, high influence and interest; Region, river basin and local goverment, stakeholders with defined mandate, interest and low influence; civil society organisations, stakeholders with high ratio of dependency for water resources but with bounded mandate and no influence. The analysis reflect that as you approach down to the lower level of the structure, the influence is low and and in some cases non-existent.

Under quantitative methods the study employed gross margin analysis and trend analysis to demonstrate budget planning, revenues and expenditures as well as production in the sampled wetlands. The gross margin is the ratio of gross profit to revenue where as gross profit equals revenue less cost of goods sold (Perkins, 2009). According to Perkins, the higher the gross profit margin, the larger the stream of cash available to fund daily operations and investment in future growth and the lower the gross profit margin, the smaller stream of cash flows, and less investment in the future.

Corresponding equation for gross margin is calculated as follows:

Gross margin = $\dfrac{\text{Gross profit}}{\text{Revenue}}$

Gross margin = $\dfrac{\text{Revenue} - \text{cost of goods sold}}{\text{Revenue}}$

## 3.5 Results and Discussion

## 3.5.1 Trade-offs for water resources: stakeholders' perspective

The need to analyse trade-offs in the Pangani river basin is mandatory to develop a range of potential scenarios and their consequences between stakeholders so as to come up with different development pathways and strategies for the future (PBWO, 2007[b]). Kashaigili *et al*. (2005) demonstrate a case of Great Ruaha river, Tanzania and emphasise on the need for trade-offs analysis to reflect about balancing water demands between sectors of which requires a good understanding of the value for water in its different uses and the opportunity costs of water transfer from one sector to another. World Bank report (2011) on 'Zambezi river basin Multi-sector investment opportunities analysis' attempt to design practical operational tools and how integrated water resource management can facilitate 'benefits of cooperation' in the region. Trade-offs analysis for hydro-electric power generation and irrigation were discussed.

Total water withdrawal in Tanzania as per year 2002 was estimated to reach 5 142 million $m^3$. From the total water, agriculture development accounts for 4 624 million $m^3$ out of which irrigation consumes 4 417 million $m^3$ (85%) and 207 million $m^3$ (4%) for livestock. 493 million $m^3$ (10%) accounts for domestic sector and the remaining 25 million $m^3$ (1%) is consumed by the industry sector. According to PBWO/IUCN (2006) Mean Annual Runoff (MAR) for Pangani river basin estimated to reach 1 540 million $m^3$ out of which irrigation account for 550 million $m^3$ equivalent to 13% of the total irrigation water in the country. Storage capacity for hydro-electric power generation is 1 140 million $m^3$ equivalent to 71% of the mean annual runoff in Pangani. Water used for hydro-electric power generation is non-consumptive although a smaller portion of consumptive use is through evaporation and is released back to the environment. However for the case of Pangani the released water goes directly to Hale and new Pangani hydro-electric power

stations. PBWO/IUCN (2006) indicate consumptive use demand in Pangani river basin is estimated to be 3 201 million $m^3$ while water supplied account to 2 301 million $m^3$ thus deficit is observed by 900 million $m^3$.

### 3.5.2 Drivers of economic development: water and non-water sectors

Despite of the fact that water is a key resource that facilitate irrigated agriculture its contribution to GDP is ranked the least. Results indicate from year 2000 to 2008 water sector contribution ranked the least ranging from 0.4 to 0.5 percent under industry and construction sector (Table 1).

**Table 1: Shares of Gross Domestic Product (GDP) by economic activity**

| ECONOMIC ACTIVITY | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| **Agriculture, hunting and forestry** | **29.5** | **29** | **28.6** | **28.7** | **29.5** | **27.6** | **26.2** | **25.8** | **25.7** |
| Crops | 21.7 | 21.4 | 21.4 | 21.8 | 22.4 | 20.5 | 19.2 | 19 | 19 |
| Livestock | 5.1 | 5 | 4.8 | 4.7 | 4.8 | 5 | 4.8 | 4.7 | 4.7 |
| Hunting and forestry | 2.7 | 2.5 | 2.4 | 2.3 | 2.3 | 2.2 | 2.2 | 2.1 | 2 |
| Fishing | 1.8 | 1.7 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.3 | 1.2 |
| **Industry and construction** | **17.9** | **18** | **19.6** | **21** | **20.8** | **20.8** | **20.8** | **21.2** | **21** |
| Mining and quarrying | 1.5 | 1.8 | 2.1 | 2.4 | 2.6 | 2.9 | 3.2 | 3.5 | 3.4 |
| Manufacturing | 8.8 | 8.4 | 8.3 | 8.3 | 8.1 | 7.9 | 7.8 | 7.8 | 7.8 |
| Electricity, gas | 2.1 | 2.2 | 2 | 1.9 | 1.8 | 1.7 | 1.5 | 1.6 | 1.7 |
| Water supply | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Construction | 5.2 | 5.2 | 6.8 | 8 | 7.9 | 7.8 | 7.8 | 7.8 | 7.7 |
| **Services** | **45.3** | **45.5** | **44.2** | **42.7** | **42** | **42.5** | **43.3** | **43.3** | **43.8** |
| Trade and repairs | 12.8 | 13 | 12.4 | 12 | 11.4 | 11 | 11.4 | 11.5 | 11.6 |
| Hotels and restaurants | 2.8 | 2.8 | 2.6 | 2.4 | 2.3 | 2.5 | 2.6 | 2.7 | 2.6 |
| Transport | 5.5 | 5.4 | 5 | 4.8 | 4.6 | 4.4 | 4.3 | 4.2 | 4.2 |
| Communications | 1.2 | 1.2 | 1.2 | 1.3 | 1.5 | 1.7 | 2.1 | 2.3 | 2.5 |
| Financial intermediation | 1.6 | 1.5 | 1.7 | 1.7 | 1.6 | 1.7 | 1.7 | 1.6 | 1.6 |
| Real estate and business services | 10.7 | 10.3 | 9.7 | 9.4 | 9.1 | 9.5 | 9.6 | 9.5 | 9.6 |
| Public administration | 6.6 | 7 | 7.2 | 7.2 | 7.7 | 8 | 8 | 7.9 | 8.2 |
| Education | 2.1 | 2.1 | 2 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 |
| Health | 1.2 | 1.3 | 1.5 | 1.4 | 1.4 | 1.5 | 1.5 | 1.6 | 1.5 |
| Other social and personal services | 0.9 | 0.9 | 0.8 | 0.7 | 0.7 | 0.7 | 0.7 | 0.6 | 0.6 |
| Gross value added before adjustments | 94.6 | 94.2 | 94.1 | 94 | 93.7 | 92.3 | 91.7 | 91.6 | 91.6 |
| less FISIM | -1 | -0.9 | -0.9 | -0.9 | -0.9 | -0.9 | -0.9 | -0.1 | -0.1 |
| Gross value added at current basic prices | 93.5 | 93.3 | 93.3 | 93.1 | 92.8 | 91.4 | 90.7 | 90.7 | 90.6 |
| add Taxes on products | 6.5 | 6.7 | 6.7 | 6.9 | 7.2 | 8.6 | 9.3 | 9.3 | 9.4 |
| **GDP (At current market prices)** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |

**Source: National bureau of statistics (2009)**

Contribution to GDP from agriculture sector as non-water sector ranked from 25.7% to 29.5% and services sector ranked the top from 42% to 45% (Table 1). Under agriculture, crops (19% - 21.8%) ranked the highest followed by livestock (4.7% - 5.1%) and fisheries (1.2% - 1.8%) ranked the least. Agriculture sector is the major consumer of water resources in wetlands of Pangani and its contribution to GDP is relative significant however, it is not re-invested to the water sector particularly in the infrastructure development which is very inefficient. Electricity and gas contribution to GDP is fairly low (1.5% - 2.1) however its production is challenged with water shortage especially in dry seasons as noted in NYM dam under study. The GDP trends calls for people to diversify livelihoods to other options in the services sector such as transport, communications, trade and local industries which is not common in the study area, mostly contributed by the low level of technical education by respondents. Out of 360 respondents, 235 are educated to the primary level, while 85 respondents have never been to school, and only 32 and 6 respondents managed to reach secondary schools and colleges respectively.

### 3.5.3 Central government: budget constraints

The central government as the highest level within the political structure has significant role in strengthening governance among sector ministries however as a state is considered weak in capacity since approximately 50% of the budget is funded by Donors (URT, 2010). The central government under the Ministry of finance has a key role to strengthen governance when it comes to budget allocation among sectors including water. Public expenditure review (PER) under the Medium term expenditure framework (MTEF) cross sector strategy is used to prioritize sectors requirements according to Poverty Reduction Strategy Paper (PRSP) objectives (Table 1). However as noted by URT (2009) "there is a problem of integrating water sector resource requirements from regions and local

government authorities into the Ministry's input of the water sector to the budget guidelines". From year 2004/05 to 2008/09 the budget allocated for water sector has been ranging from 309.1 to 397.6 billion Tshs equivalent of 3% to 5% of the total budget and ranks the least in priority compared to other sectors (Figure 2).

**Figure 2. Budget allocation among sectors**
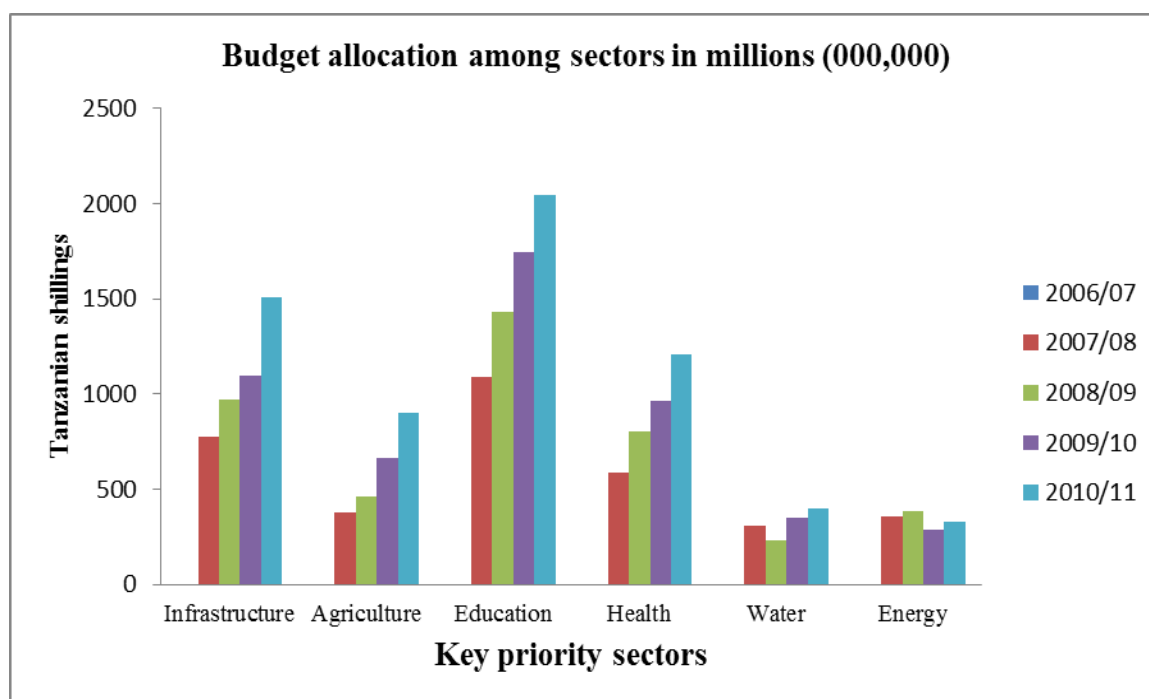


Source: URT, Ministry of finance 2010.

Trend analysis on country's budget specifically to revenue and expenditure from year 2004/05 to 2008/09 as shown in Table 2, indicates the trend has been more or less the same with minor slight changes especially in year 2008/09. The percentage ratio for domestic revenue from total revenue in year 2004/05 ranks 52% while Donor contribution in form of loans and grants was 43%. In year 2008/2009 percentage ratio for domestic revenue was 60% while that of Donors ranks 32%. Slight improvement in domestic revenue generation in year 2008/09 however it is important to note how revenue generated is spent in recurrent and development expenditures. Year 2004/05 indicates 63% was

spent in recurrent expenditures while 37% was allocated to development projects. Out of this 37% for development projects 19% came from local sources while 81% from Donor funding. Likewise in year 2008/09 percentage ratio for recurrent expenditure was 70% while development expenditures recorded 30%. And out of 30% of development projects, 42% came from local sources while 57% came from Donor funding. This scenario indicates more revenue is spent on recurrent expenditures more than 50% and less is allocated to development projects. Dependence on Donor funding for development projects is highly pronounced and this attitude is blocking innovation from local as well as central government to design mechanism on how to tap potential revenues from sector ministries including water and land resources. Table 2, indicates nothing substantial is collected from local government authorities (LGAs) and this is due to poor collection and unsystematic recording system of revenue collection. Difficulty of collecting property tax on land is the major source contributing to poor revenues in LGAs. Further, water has never been considered as potential source of revenue for LGAs.

**Table 2. Actual budget frame from year 2004/05 to 2008/09 (Tshs in millions)**

|  | 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|---|---|---|---|---|---|
| **TOTAL REVENUE** | **3 364 730** | **4 131 946** | **4 504 371** | **5 269 042** | **7 055 811** |
| Domestic revenue | 1 733 709 | 2 124 844 | 2 739 022 | 3 634 581 | 4 240 074 |
| LGAs own source | Nil | Nil | Nil | Nil | Nil |
| Foreign loans and grants | 1 460 687 | 1 635 968 | 1 699 706 | 2 348 203 | 2 228 764 |
| Borrowing | 0 | 261 436 | 65 644 | -713 742 | 541 973 |
| Privatisation on proceeds | 0 | 33 309 | 0 | 0 | 45 000 |
| **TOTAL EXPENDITURE** | **3 364 730** | **4 131 946** | **4 504 371** | **5 269 042** | **7 055 811** |
| Recurrent expenditure | 2 124 580 | 2 788 580 | 3 167 160 | 3 458 070 | 4 925 442 |
| **Development expenditure** | **1 240 150** | **1 343 366** | **1 337 211** | **1 810 972** | **2 130 368** |
| Local source of funds | 239 651 | 296 100 | 503 291 | 567 421 | 906 023 |
| Foreign source of funds | 1 000 499 | 1 047 266 | 833 920 | 1 243 551 | 1 224 345 |

Source: URT, Ministry of finance 2010.

### 3.5.4 Regional administration and local government: bridging the gap

Regional administration and local government act as a bridge between central government and communities. The case of Pangani wetlands presents different scenarios of managing water in the river basin (Table 3) and the study revealed the structure lacks self autonomy and widen the gap between regions, local government, Pangani Basin Water Office (PBWO) and communities.

**Table 3. Annual Production Systems by Stakeholders Year – 2009 (Tshs/US$)**

| Artificial wetlands | Surveyed area hectares/acres | Utilised area hectares/acres | Revenue surveyed area | Revenue utilised area | Revenue PBWO |
|---|---|---|---|---|---|
| **LMIS** | 1 100 /2 727 | 360 /889 | 5 434 000 000 | 1 778 000 000 | 1 900 000 |
| | | | $ 3 881 429 | $ 1 270 000 | $ 1 357 |
| **MIS** | 1 425 /3 520 | 594 /1 467 | 7 040 000 000 | 2 9434 000 000 | 993 384 |
| | | | $ 5 028 571 | $ 2 095 714 | $710 |
| Livestock development | | | Nil | Nil | Nil |
| **NYM dam** | 14 000 | 14 000 | 5 437 486 190 | 5 437 486 190 | 2 240 000 |
| | | | $ 3 883 919 | $ 3 883 919 | $ 1 600 |
| Fisheries | | | 1 151 542 832 | 1 151 542 832 | Nil |
| | | | $ 822 531 | $ 822 531 | Nil |
| Livestock development | | | Nil | Nil | Nil |

LMIS – Lower Moshi Irrigation Scheme; MIS – Mawalla Irrigation Scheme; NYM – Nyumba ya Mungu Dam; PBWO – Pangani Basin Water Office.

Paddy plantations: I acre = 30 bags of rice (if well developed ); 1 acre costs of production (rice) = 1 400,000 shs; 1 bag of rice = 100kg; 1 kg = 800shs ; Revenue estimated for 2 seasons after deduction of production costs; Electricity revenue: 34 633 670 Kwh produced @ Kwh 195shs (gross revenue). Exchange rate: 1 USD = 1 400 Tshs

Gross margin analysis = Revenue – cost of goods of goods sold/revenue = gross profit/revenue

The first scenario presents a case of top-down approach from central government to lowest level in Lower Moshi Irrigation Scheme (LMIS). Due to water scarcity the area for rice/paddy cultivation is currently reduced to 67% from 1 100 to 360 hectares (Table 3) and the remaining area is now used for mixed crops instead of rice/paddy. The scheme is also loosing revenue by more than 50% of the estimated revenue from surveyed area which is utilised below capacity. In comparison of revenue generated by LMIS and what is paid to PBWO is not proportional. PBWO gets 0.1% of the net profit generated from actual cultivation. Currently the Ministry of agriculture is expanding the scheme from

1 100 to 1 500 hectares an increase of 400 hectares and do not take into account the issue of water availability.

The second scenario presents a case of conflicting sectors between agriculture and livestock development. Mawalla Irrigation Scheme (MIS) is located midstream developed specifically for rice/paddy cultivation. The scheme is not improved still using traditional furrows for water abstraction. The area is also utilised for livestock keepers and is used as a dry season refuge by pastoralists from neighbouring regions and districts. The actual cultivation is utilised below capacity by 58% (Table 2) of the total surveyed area. The revenue generated is also reduced by 60% of the estimated total production from the surveyed area. Conflicts between farmers and pastoralists are intese in the area.

The third scenario presents a case of conflicting authority between central government and PBWO. Nyumba ya Mungu dam (NYM) was developed specifically for hydro electric power generation with capacity to produce 8MW however during dry season the production may drop to 50% due to water scarcity resulting by over abstraction of water by upstream users. The dam is owned by PBWO but the authority to use the dam and revenue collection lies with central government under ministries of energy, livestock and fisheries. For the year 2009 NYM dam produced 34 633 670 Kwh however the revenue generated goes directly to central government through Treasury. PBWO gets royalty of USD 200 (Tshs 300 000) per 1MW produced from Tanzania Electric Supply Company Ltd. (TANESCO) for using the dam and gets nothing from livestock and fisheries sectors (Table 2). TANESCO is using the dam and maintenance and development of the dam is left to PBWO. Additionally, to the recent study done in Great Ruaha river by Kadigi (2006) indicates hyroelectric power production attained the highest net benefits about Ths 247,332 or USD 230 million per annum which goes directlty to central government.

### 3.5.5 Water Users Association (WUAs)

Decentralisation advocates devolution of authority, power and resources from central government to local level governance. As discussed by Oakley (1991) devolution of authority involves transferring policy formulation and implementation, powers and resources from central to local levels. The study revealed that, some of the policy directives approved by the central government impinge directly livelihoods of the people. However the influence by the civil society organisation such as WUAs, as a local network to higher levels of authority is tiny. WUAs under Lower Moshi and Mawalla, is mainly focused to farmers under irrigation schemes. According to water resource management Act No.11 (2009) "the members of the association shall be villagers, companies, communities, institutions or any person natural or legal as may be users of water sources located within the area of the responsibility of the association". Further, the Act did not take into consideration the issue of migration to the area which is a major problem in holding temporary members accountable and largely contributing to environmental degradation. The study noted that most members in WUAs are passive and the reason being the linkage between water resources management and existing economic activities from wetlands apart from irrigated agriculture such as fisheries and livestock development is missing. Additionally, the capacity by WUAs is lacking and poses a threat to Pangani river basin authority since as local institutions are responsible in collecting water fees on behalf of farmers and other users in the community.

### 3.5.6 Environmental degradation

Reduced revenue experienced from water scarcity is contributing to environmental degradation in core wetlands such as water sources and catchments areas. Mostly noted in Lower Moshi Irrigation Scheme (LMIS) and Mawalla Irrigation Scheme (MIS) where people are forced to cultivate nearby the source of water such as Rau and Njoro rivers as

well as Miwaleni springs. According to Ramsar (2010) degradation and loss of wetlands within the river basin has led to disruption of hydrological cycles which threatens sustainability of livelihoods to human population through the loss of accessible wetland ecosystem services such as water and land. Water scarcity as a result of degradation and loss of wetlands not only hampers provisioning services in sustaining livelihoods but also deteriorate other important functions of regulating ecosystem services and processes such as water recharge and discharge, soil formation and buffer management against floods. Water scarcity and reduced access to water for domestic and economic investments are key factors limiting development in many countries with particular to developing countries where more than 68% of its water is utilized for agricultural development (MEA, 2005; Ramsar, 2010).

Fig. 3, indicate results from assessment done by stakeholders on population growth, reduced household revenue and absence of environmental impact assessment (EIA) being major drivers to environmental degradation. Large scale investments and deforestation also ranked high. From the assessment, siltation of NYM dam, biodiversity loss, destruction of water sources/catchments and water pollution were considered as major threats to environment in wetlands of Pangani. Agriculture is among the land uses that can impact the quality and quantity of water and the hydrological regime in the river basin through agrochemicals, agricultural wastes and over abstraction of water for irrigation purposes. Large scale estates in Pangani amounting to over 202 530 hectares are considered as threat to maintain environmental flows and quality of water due to massive consumption of water for irrigation and application of agrochemicals.

**Proximate threats to environment**

H  - High

M  - Mid

L  - Low

| Major drivers | Destruction of water sources/catchments | Siltation of NYM dam | Biodiversity loss | Water pollution |
|---|---|---|---|---|
| Land renting | M | L | L | M |
| Large scale investments | L | H | H | H |
| Deforestation | H | H | H | L |
| Destruction of fish breeding areas | | | H | |
| Migration | H | M | M | M |
| Population growth | H | H | H | H |
| Reduced household revenue | H | H | H | H |
| Absence of EIA | H | H | H | H |
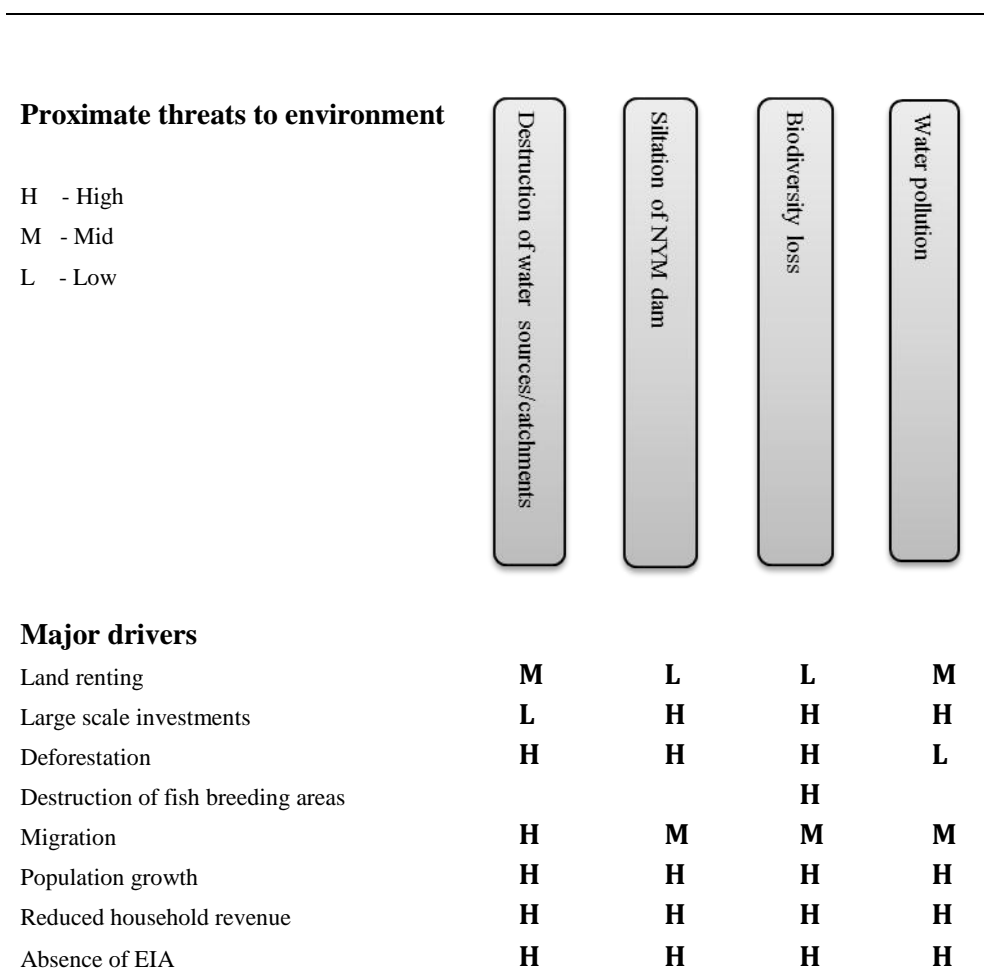
**Figure 3. Proximate drivers and threats**

Due to limited revenue people are faced with limited livelihood options and are forced to utilise forest products for charcoal and firewood production. The results indicate frequency of firewood consumption for selling, drying fish and domestic purposes and mostly found in agro-pastoral and fishery communities. Firewood was noted to be highly consumed by all livelihood niches: 60.8% of irrigated agriculture households, 80% of fishers and 83.3% of agro-pastoralists. Charcoal is used to complement firewood in 36.7% of irrigated agriculture households, 19.17% of fishers and 11.7% of agro-pastoralists. Through observation, frequency of youth groups in Mawalla Irrigation Scheme (MIS) and Nyumba ya Mungu (NYM) dam were noted as highly engaged in selling 'firewood' to

fishers for drying fish and charcoal to nearby towns in large scale estates and Moshi town. Forest degradation is mostly noted in Mawalla and NYM dam which has resulted in the siltation of the dam, especially during the wet season.

## 3.6 Benefit sharing: cross-sectoral collaboration

Considerable efforts are now emerging in the field of benefit sharing for water between regions, states, countries and sectors. As proposed by Philips *et al.* (2006) and Turton (2003) that, a new direction of water resource management towards negotiation and sharing of benefits has to be explored. Water has economic value and should be regarded as economic good. From the case study of Pangani wetlands, efficiency in water governance will only be sustainable if benefits are shared reflecting on utilisation, allocation and type of economic activity between water and non-water sectors. River basin authority should be seen as one of the important bridge in the structure to facilitate stakeholders working in the water and non-water sectors to reach desired ends as outlined in Tanzania development vision 2025. And for benefit sharing mechanism to take effect the need to institutionalise the structure is imperative. Central government has the lead role to play towards facilitating institutionalisation of the structure. Decentralisation process is blocking efforts of the institutions to work independently and ability to tap potential revenues generated from utilising water. Water should not be seen as independent variable but rather dependent variable and economic activities performed by non-water sectors has a direct effect towards building foundation of good governance in the water sector. For the river basin authority to lead the road then ability to mobilise domestic funding by both sectors, strengthen capacity of civil society organisations and demonstrate value for water in promoting economic development and sustaining livelihoods is mandatory.

## 3.7 Conclusion and policy implications

The system of decentralised political structure had the objective of shifting power and responsibilities from central government to local government. The study revealed the need to understand the relationship between the structure itself and the operations of different institutions within the structure. With particular to wetland resource management, the water sector faces serious challenges regarding to financial dimension of governance. Systematic planning and budgeting by regions and local government is lacking and therefore cross-sectoral integration in the water sector is more of rhetorical rather than practical. From a practical policy perspective decentralisation system within the political structure should target more on setting grounds for mobilising domestic sources of revenue. 'Managed resources protected area model' is proposed to ensure sustainable use of wetlands ecosystems, maintenance of biological diversity and environmental flows, while at the same time providing a sustainable flow of natural products and services to meet community needs. Diversification of livelihoods within a protected area model such as tourism development will add value to sustain livelihoods, generate income and maintaining ecological integrity of wetlands. Additionally, benefit sharing mechanism pose as a promising departure point towards mainstreaming non-water sectors into the water sector towards mobilising domestic sources of revenue.

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**CHAPTER FOUR**

**4.0 ENGENDERING WETLAND-BASED LIVELIHOODS THROUGH DECENTRALISATION IN TANZANIA**

(Manuscript III)

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## 4.1 Abstract

The National Strategy for the Growth and Reduction of Poverty (MKUKUTA) promotes gender equality as central to the attainment of sustainable livelihoods in Tanzania. Apparently, decentralisation by the devolution principle, is advanced as fundamental to addressing gender equality by transferring powers and resources to regional and local governments such that men and women can participate equally in development processes. This study investigated gender roles and differential access to and control of productive resources as key factors in reducing gender gaps in the wetlands of the Pangani river basin in Tanzania. The study questions the underlying drivers of gender inequalities within a decentralised political structure. The comparative research design considered three livelihood niches and examined 360 households. The findings revealed poor linkage between political and sectoral decentralisation, inadequate public services and inequality across livelihood niches are the major driving sources of gender inequalities. The engendering livelihood model is proposed and options discussed.

**Key words:** Decentralisation; Gender; Gender equality; Livelihoods; Pangani river basin; Tanzania.

## 4.2    Introduction

Gender is a part of the broader socio-cultural context, which takes into account factors such as class, race, marriage, economic status, ethnic group and age. Adopting a gender perspective in national strategies for poverty reduction under a decentralised system facilitates linkages between gender and ownership of productive resources, thereby achieving a better analysis of knowledge and skills related to patterns of use, access to and control of these resources in efforts to promote sustainable livelihoods. The purpose of

this paper is to investigate gender roles and differentiation in relation to livelihood niches and how decentralisation processes can promote or block the utilisation of productive resources in the wetland[10] communities of the Pangani river basin in Tanzania. As defined by the World Bank (2012), gender refers "to socially constructed and learned female and male roles, behaviours and expectations. All cultures interpret and translate the biological differences between men and women into beliefs about what behaviors and activities are appropriate for each gender as well as their rights, resources and power". Gender therefore shapes one's life, one's role in the family, and one's role in society. Gender affects how one goes about building a livelihood. A key aspect of gender is that it defines the social relations and power balances between men and women. In reality, men and women have different roles and positions within the household in relation to access to and control of productive resources. A multi-sector country gender profile (2005) refers to access to and control of productive resources – everything that supports men and women in promoting their livelihoods and reducing poverty levels such as land, labour, financial capital and political and negotiation resources (e.g., education, health facilities, leadership, participation). In the Tanzanian context, differentiated gender roles are closely linked with existing cultural contexts and livelihoods, as well as with the decentralised system of resource governance.

As emphasised by Sen (2008) on understanding how gender relations operate, there is a need to investigate the differentiated roles and conflicts between men and women within households and to screen how structures and institutions function involving both state and

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[10] This paper refers to wetlands, as defined by the Ramsar Convention on Wetlands, as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water, the depth of which at low tide does not exceed 6 metres. This broad definition includes inland wetlands (such as marshes, lakes, rivers, peatlands, forests, karst, and caves), coastal and near-shore marine wetlands (such as mangroves, estuaries, and coral reefs), and human-made wetlands (such as rice fields (paddies), dams, reservoirs, and fish ponds) (MEA, 2005). http://www.maweb.org/documents/document.358.aspx.pdf.

non-state actors.  Gender relations in the wetland communities of the Pangani river basin are highly characterised by the dominant existence of patriarchal structures in most families with men having maximum influence over decisions affecting family land, property and income. Women, however, are forced to dominate decisions concerning financial expenditures related to family and domestic issues. To address gender inequalities across different dimensions, several initiatives – the Tanzania National Development Vision 2025, the National Women and Gender Policy (2000[b]), the National Strategy for Gender and Development (2002[b]), the Multi-Sector Country Gender Profile (2005) and the MKUKUTA[11] – all advance equal representation in policy forums and interventions. These initiatives call for special parliament seats for women members and similar policies in the lower levels of village councils and resource governance committees. However, gender gaps are still prevalent, particularly with respect to access to and control of productive resources at the household level.

As observed by Agarwal (2010[a], 2010[b]), the participation of women at the household level makes a critical difference and demonstrably benefits all aspects of resource governance. Nevertheless, the proportional capacity of women to participate in policy formulation is, amongst other factors, highly determined by economic class other than numbers.  As further suggested by several scholars, strong economic growth is the major determinant factor in achieving gender equality.  Significant correlation between economic growth and gender equality has been supported by Morrison, Raju, and Sinha (2008) on the relationship between levels of poverty and gender equality. The authors suggest that countries with higher gender equality tend to have lower poverty rates. Furthermore, as

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[11] MKUKUTA (Mpango wa Kupunguza Umaskini na Kukuza Uchumi Tanzania) is a Swahili acronym for the National Strategy for the Growth and Reduction of Poverty (NSGRP). This strategy is the development framework for the current five-year phase (2005 – 2010). It forms part of Tanzania's efforts to deliver on its National Vision 2025. The focus is outcome-oriented and organized within three clusters: growth and reduction of income poverty, improved quality of life and social well-being, and governance and accountability.  www.tanzania.go.tz/vision_2025f.html

indicated in the Human Development Report (2007/2008), the gender-related development index (GDI =1) ranks higher in developed countries than in less developed countries, with the highest recorded economic growths in such countries as Iceland (0.962), Australia (0.960) and Norway (0.957) with life expectancy ranging from 83 years for females and 79.9 for males. Tanzania ranks 159th out of 177 countries with a GDI of 0.464 and a life expectancy of 52 and 50 years for females and males, respectively. The structure of the Tanzanian economy is predominantly based on agriculture. More than 25% of the GDP in Tanzania comes from the agricultural sector, which employs more than 80% of the population workforce, which is highly characterised by small-scale farmers. The agricultural sector in Tanzania relies heavily on the production of primary commodities such as coffee, tea, cotton, sisal, tobacco, cashew nuts, cloves, fish and fish products. Furthermore, exports are limited to a few commodities; thus, unable to optimise market share and cannot compete in the world market with others such as countries in Asia and Latin America. Poor infrastructures for product destinations, inadequate supply of water and land tenure insecurity are major obstacles in the Tanzanian agricultural sector. These circumstances have resulted in weak links in global supply chains and generated an agricultural sector in which small-scale farmers cannot profit.

This study reflects gender inequalities emanating from poor economic growth that resulted from unequal power sharing between macro-level interventions from global funding policies (i.e., those emanating from the central government and donor agencies) based on single-sector approaches and micro-level interventions (i.e., those directed towards men and women at the household level) that attempt to balance national economic interests and local livelihoods in the context of river basin management. Scoones (2009) considers the political analysis of livelihood perspectives with respect to the limitations of single-sector approaches in solving complex development problems. Further evidence is also put

forward (Beez, 2005, as cited in Lein and Tagseth, 2009) on how water scarcity created in the Pangani river basin resulted from single-sector approaches in hydropower production and irrigation development. According to the authors, Scandinavian hydropower production in the Pangani river basin supported by NORAD in 1995 cost US$ 136 million (850 million NOK), while Japanese paddy production in the Lower Moshi Irrigation Scheme (LMIS) in 1992 cost US$ 31 million. These projects necessitated the consumption of massive volumes of water, which led to water scarcity in the river basin that ultimately threatened livelihoods and perpetuated poverty at the household level, which had a differential impact on women who were heavily affected in their role of maintaining the welfare of the family and children.

Apparently, decentralisation (Crook 2003; PMO-RALG, 2007; Palloti 2008; PMO-RALG, 2009; Olemako *et al*., 2011) has been featured as essential to encouraging the democratic participation of men and women in efforts to reduce poverty in Tanzania. This is implemented by promoting full and equal rights through transferring functions, resources, and varying degrees of political and fiscal autonomy to regional and local governments (e.g., municipalities, districts, wards and villages/sub-villages). Decentralisation by the devolution principle (D-by-D) is considered as fundamental to promoting democracy and popular participation by both men and women. Governance of productive resources such as land, water, forests, and financial capital is shifted to the lower levels of management such as village councils and civil society organisation (CSOs). This thinking is illustrated by the International Union of Local Authorities' Declaration on Women in Local Government – No. 10 (2002) in the following: "Local government is in a unique position to contribute to the global struggle for gender equality and can have a great impact on the status of women and the status of gender equality around the world, in its capacities as the level of governance closest to the citizens, as a service provider and as an employer".

Contrary to optimistic attitudes on the capacity of decentralisation to promote gender equality, the capacity of the process to foster economic growth and democratic participation has been questioned, as gender gaps are still evident across a variety of dimensions. Kemper *et al.* (2007) presented a comparative analysis of worldwide surveys from eight river basin case studies and concluded that the combination of Integrated Water Resources Management (IWRM) as the cornerstone of river basin management and decentralisation approaches is unlikely to deliver quick, significant results. The authors provide, for example, the case of the Murray-Darling basin in Australia, where it took nearly a century to achieve the expected outcomes.

The study therefore adopted the DFID sustainable livelihood framework as a tool for gender analysis focusing on poverty elimination in poorer countries. Gender analysis in this study focused on investigating the drivers of gender inequalities in access to and control of productive resources, as this access and control is fundamental to the construction of livelihoods within the decentralised governance levels in the political structure[12] of the country. The engendering livelihood model is proposed at the lowest appropriate levels with the aim of building a gender inclusive society through the development of effective and targeted policies that support gender equality outcomes across governance levels in the context of river basin management.

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[12] Political structure refers to institutions or groups and their relations to each other, their patterns of interactions with regard to policies, regulations, laws and norms within the political system. The political structure of Tanzania is rooted in democratic principles of administration wherein decentralization by the devolution principle (D-by-D) is at the centre of democracy promotion. The structure has five governance levels: central government, regional authorities, districts authorities, wards, and villages and sub-villages. The bottom-up approach in development planning through opportunities and obstacles to development (O and OD) from the village level to the central government is key to ensuring that all citizens are equal before the law and have equal access to the legislative process.

**4.2.1   Gender Equality: The meaning and application**

Gender equality refers to the "equal and fair treatment of women and men members of community in provision and access to goods and services required to meet their social needs.  It includes fair treatment before the law, the undeniable right to life by each member of the community" (URT, 2002$_b$). This paper draws on experience, as outlined in the World development report on gender equality and development (Kabeer, 1996; Sen, 1999; Booth and Nolen, 2009; Croson and Gneezy, 2009; Gneezy *et al*., 2009; World Bank, 2012), which elaborates on whether the measurement of gender equality should be based on equality of outcomes or equality of opportunities.  The argument is based on philosophical and economic debates over gender with respect to equality of opportunities and equality of outcomes. Proponents of the equality of opportunities perspective assert that differences of choice and preference between men and women are influenced by factors beyond the control of individuals that contribute to inequality between men and women (e.g., biological factors). They conclude that differential access to opportunities cannot be directly linked to differential outcomes. The equality of outcomes view, however, holds that differences between men and women are shaped by environments and cultures that are internalised by individuals as social norms and taboos within families, tribes and societies. Learned social norms and attitudes are passed from one generation to the next, and this process creates inequalities between men and women. They further argue that equality of opportunities cannot be measured separately without considering equality of outcome.

This paper adopted the Gender and Development (GAD) approach, as put forward by Sigot *et al.* (1995) and URT (2002$_b$), which supports the equality of outcomes perspective. The GAD approach emphasises that gender inequality between men and women is not biologically or inherently determined but is rather a social construct. The GAD approach

suggests that efforts to address the strategic needs of women be directed towards access to and control of productive resources. Access to and control of productive resources will enable women to diversify the sources of their livelihoods and gain more equitable outcomes through the reduction of poverty. The GAD approach's emphasis on empowering women as the most disadvantaged group encountering problems of unequal relations and inequitable distribution of power and control over productive resources, however, has been challenged (Johnsson-Latham, 2004) as unable to quantify measurable data due to the qualitative nature of power-related social dynamics and the constraints faced by women.

### 4.2.2 The problem

Recent efforts concerning decentralisation have focused on decentralisation by the devolution principle (D-by-D) with the aim of transferring power, functions and resources to regions and local governments and thus providing equal opportunities for men and women to participate in development activities that affect their livelihoods. However, decentralisation has failed to address gender gaps with respect to access to and control of productive resources such as land, water, credit, labour, and social protection. The major sources of this problem are inadequate institutional capacity, limited financial resources and unclear roles and responsibilities for the central government, regional and local government (due to, for example, the lack of a direct political link between central government ministries, departments and agencies), which weakens the decentralisation process and efforts to address gender inequalities across different dimensions. In the process, gender inequality is created, and poverty is experienced more severely by women than men due to biological and socio-cultural vulnerabilities. Addressing gender equality is justified as fundamental in the Tanzania National Development Vision 2025, the

MKUKUTA and the National Strategy for Gender and Development (2002$_b$), all of which consider access to and control of productive resources to be of paramount importance to the attainment of sustainable livelihoods and a gender-inclusive society.

## 4.3 Methodology

This study employed the DFID sustainable livelihood framework, which posits that livelihood assets (e.g., natural, financial, human and social capital) form an important productive resource base and that access to and control of these assets is shaped by the policy processes and institutions (formal and informal) of the state, market and family within a decentralised system of political structure and gender relations in specific cultural contexts towards realising gender outcomes. According to Chambers and Conway (1992), DFID (2002), and Scoones (2009), the Sustainable Livelihoods Approach (SLA) was introduced by the DFID in the 1990s and is rooted within several underlying principles, for example, people-centred, multi-level, responsive and participatory, dynamic, partnership-driven and sustainable. A reflection of gender analysis in access to and control of productive resources is fundamental to providing insights on how the gender differentiated impact of development interventions moves a society towards livelihood sustainability.

The study was conducted in the Pangani river basin in Tanzania, which currently faces declining water flow amidst competing needs and interests over water resource utilisation. A comparative research design across upstream, midstream and downstream users was employed. The aim of this design was to compare three livelihood niches to seek an explanation for the similarities and differences in gender equality and to gain a deeper understanding of social reality in different contexts. As elaborated on by Bryman (2004),

the key factor to comparative design is the ability to distinguish the characteristics of two or more cases that may act as a supporting base for theoretical reflections on the contrasting findings. The comparative design utilises both quantitative and qualitative research to present a better understanding of social phenomena. Multi-stage cluster sampling was employed because the population of the Pangani river basin is widely dispersed in four regions. As illustrated by Bryman (2004), cluster sampling is appropriate and reliable in terms of time and cost savings when dealing with widely a dispersed population such as that of the river basin under study.

The primary sampling unit was the Kilimanjaro region due to its high percentage of household population (39.3% out of 574 907 total households) relative to the other three regions (Appendix 1). The secondary sampling unit consisted of three wetlands and six villages identified around each wetland, out of which two villages were chosen per each wetland. The selection was based on purposive sampling designed to capture differential livelihoods and attach gender attributes as they changed according to the gradient from upstream, midstream to downstream locations. The sampling was as follows; upstream (Lower Moshi Irrigation scheme (LMIS): Mabogini and Chekereni villages) paddy/rice plantations with rice as the wetland crop and the remainder as perennial crops such as maize, beans and vegetables; midstream (Mawalla irrigation scheme (MIS): Oria and Mawalla villages) paddy/rice cultivation and pastoralism; and downstream location (Nyumba ya Mungu (NYM) dam: Lang'ata bora and Kiti cha mungu villages) with hydropower production, fisheries and a dry season refuge for pastoralists from neighbouring regions. The LMIS and MIS are both located in the Moshi rural district, while the NYM dam is in the Mwanga district. The selection of households based on a participatory rural appraisal (PRA) survey from focus group discussion, time-series analysis and transect walks was conducted in both villages and identified three livelihood

niches: irrigated agriculture, agro-pastoralism and fisheries that acted as a sampling frame for a stratified random sampling. In each livelihood group (i.e., niche), 120 respondents were selected, which entailed a total of 360 households for the whole study.

The sampling strategy was designed to capture gender relations among men and women performing differential livelihood options directly from wetland resources. Using a statistical formula by Yamane (1967) with a 95% confidence level and 0.05 precision, the sample of 360 respondents was established. The sample was considered adequate for the study, as according to HairJr *et al.*, (2006), any sample size usually suffices for descriptive statistics and is therefore considered suitable for rigorous statistical analyses. Sudman (1976) commented that if comparative analysis is to be performed between or within groups, a minimum number of 100 elements is needed for each group. Our sample meets this criterion.

The corresponding equation for statistical formula for selected sample is demonstrated below;

$$n = \frac{N}{1 + N(e)^2}$$

Where as;

n        = the sample size

N        = the population size (total number of households)

e        = the level of precision.

Primary sources came from our own field survey and secondary sources (e.g., scientific journals, websites, official documents, reports and books) from the period between 2010

and late 2011. The research study employed a combination of both qualitative and quantitative methods (Kanbur 2001; White 2002; Ellis and Mdoe 2003). Qualitative methods were used to address the policy and institutional context for multi-sector gender strategies, civil society organisations (CSOs), water, land and finance policies, decentralisation and governance levels. Quantitative methods were used to address gender-disaggregated data on household income, land holdings, credit schemes, education, savings and investments.

A semi-structured questionnaire was administered at the household level to the 360 respondents. The questionnaire was designed to provide useful information regarding household demographics (e.g., age, gender, marital status, household size, education, head of household), asset endowments, livelihood capital (e.g., natural, social, human, financial), gender roles, main livelihood options and contributions to household economies.

Data collected from the PRA and physical field visits are mainly qualitative in nature, and qualitative data analysis was used. Data from the semi-structured questionnaire were analysed using descriptive statistics (e.g., frequencies, mean, percentage of variables, and cross tabulation − chi square). Descriptive statistics were derived from the Statistical Package for Social Science (SPSS) for Windows, version 14.0. Questionnaire variable analysis was conducted with the procedure described in Pallant (2003).

## 4.4    Results and Discussion

### 4.4.1    Political and sectoral decentralisation

Decentralisation in Tanzania has become the centre of development theories and practice over the past three decades. Its focus has been more on promoting political

decentralisation under five levels of governance: the central government, regional governments, districts, wards and village councils with poor direct links to sectoral decentralisation. Further, very few studies have explored the practical consequences of the poor linkage between the two phenomena and how this circumstance has impacted gender relations at the household and individual levels within the river basin context. Qualitative research findings revealed that the practical consequences of the poor linkage can be categorised under three levels (Fig. 1): first, between Ministerial levels, such as Ministry of Community Development Gender and Children and existing sector ministries within the river basin context (e.g., land, water, energy, agriculture, fisheries, livestock (agro-pastoralism), finance) and the Prime Ministers' Office – Regional Administration and Local Government (PMO-RALG). Secondly is between sector ministries under regional administration and local government (e.g., districts, wards and villages/sub-villages) and the Pangani Basin Water Office (PBWO[13]. And third, between associated sector committees under village council and civil societies organisation (CSOs).

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[13] The water utilization Act (Control and Regulation) Act No. 42 of 1974 and its subsequent amendments govern the present water resources management system. Amendment (Act No. 10 of 1981) introduced the concept of managing and allocating water based on hydrological boundaries (river basin). The Pangani Basin Water Office (PBWO) was subsequently established in 1991. Its main duties being to control and regulate uses of water in the river basin and the entire basin (irrigation, hydropower production, fisheries, livestock development and domestic uses) both in terms of quality and quantity.
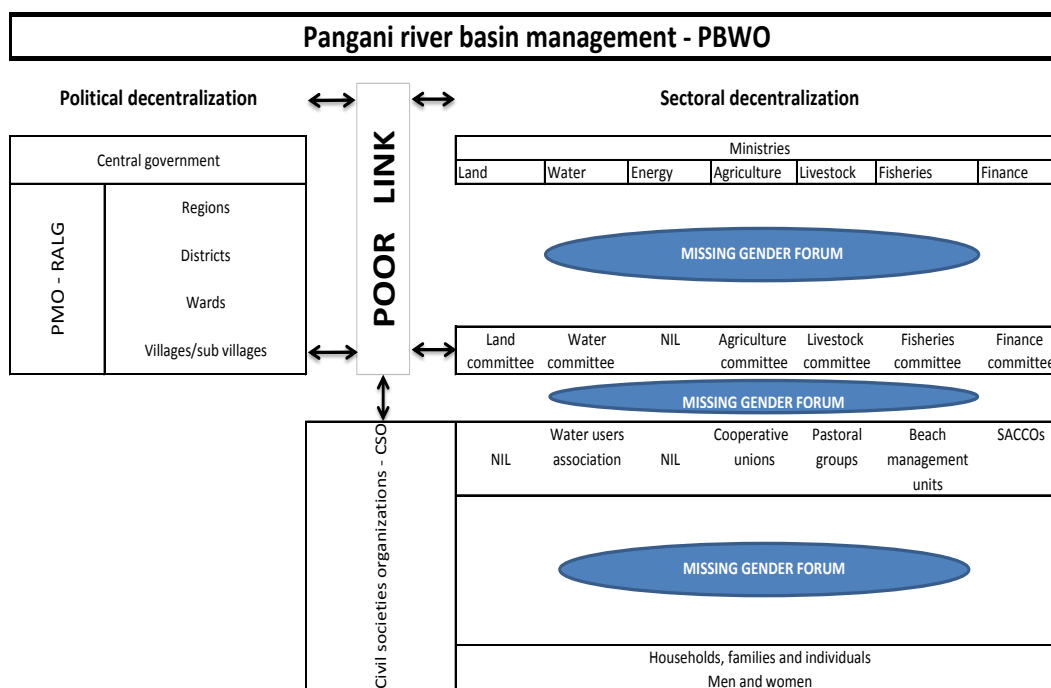
**Figure 1. Political and sectoral decentralisation.**

The first level reflecting the capacity of the decentralisation system (political and sectoral) as a traditional approach for productive resource governance fails to absorb global models such as the river basin under study. The multipurpose objectives of adopting the river basin model in Pangani such as hydropower production to fuel industrial enterprises, control of destructive floods and irrigated agriculture development have never been realised to their full potential due to water scarcity problems. The major reason for this circumstance is the inability of the decentralisation system to link political and sectoral components. Within the Pangani river basin, sectoral decentralisation under the central government is composed of sector ministries in charge of water and other associated sources of livelihoods (e.g., agriculture, fisheries, livestock development) and public services (e.g., energy, land and finance). Where as political decentralisation is coordinated under the PMO-RALG involving the central government (e.g., cabinet ministries,

parliament and judiciary) and regional and local government (e.g., districts, wards and villages).

The mainstreaming of gender issues across sector ministries within the river basin context is challenged by the limited availability of gender disaggregated data from specific sectors. Further, inadequate funding and the absence of a point person on gender issues to organise gender forums in which the needs and aspirations of men and women from the grassroots level can be addressed at the level of the ministerial position to coordinate decision making and financial budgets. Such a gender forum is missing, and 75% of respondents (n=360) from the study area indicated an urgent need for such forums as fundamental for discussion and feedback (i.e., vertical and horizontal relationships) on gender-related issues. Apparently, gender is considered as a cross-cutting issue that must be addressed in all sectors, and this circumstance requires gender-mainstreaming skills and innovative mechanisms, which are still lacking under coordination of the Ministry of Community Development, Gender and Children.

Evidence from the study area demonstrates the poor link between political and sectoral decentralisation in the cases of the Pangani Basin Water Office (PBWO), the Tanzania Electric Supplies Company (TANESCO), and Energy and Water Utilities Regulatory Authority (EWURA) for regulating the prices of oil, electricity and water. All of these issues are coordinated by sector ministry departments and agencies as separate entities or parastatal organisations at the central level; therefore, these issues do not follow the political decentralisation under governance levels from central to local government. Basic social needs and critical issues facing men and women are planned under a popular bottom approach at the village level i.e., opportunities and obstacles to development (O and OD). Under political decentralisation, however, the critical sectoral issues facing poor families

such as water, electricity and oil prices coordinated by EWURA, PBWO and TANESCO are centrally organised and cannot be reflected in regional governments, districts and village councils – not even CSOs such as water user associations.

Oil prices, for instance, are the major burden faced by respondents. Any income generated is spent on financing rising fuel prices (e.g., petroleum, diesel and kerosene) for transportation, transactions of goods and services and domestic expenses (e.g., cooking, lighting, and milling machines), as power rationing and limited coverage of electricity is critical, especially in rural areas. Out of the 360 respondents, 90% stated that they spend more than 60% of their monthly income to finance expenses related to 'rising oil prices'. This circumstance ultimately affects both men and women within households with women experiencing severe burdens while carrying out domestic duties. 'Gender inequalities' are currently considered 'poverty inequalities' with women experiencing higher poverty levels than men due to their differential roles in the family and raising children.

The second level is between sector ministries under regional administration and local governments (e.g., districts, wards, villages/sub-villages) and the PBWO. There is no clear coordination or communication channels between the water sector and livelihood-associated sectors (e.g., land, agriculture, fisheries, and livestock development) under political decentralisation within regional and local government authorities on specific roles and responsibilities concerning gender-related issues. The water sector is managed by the PBWO, while other livelihood-associated sectors are managed by regional and local governments. Joint planning and budgeting for a gender forum between the community development officers at the PBWO and the officers of regional- and district-level authorities have not occurred.

Apparently, community development officers are assigned to deal with gender-related issues. Though however, the nature of multi-sector integration in the river basin context requires that more coordinated efforts between the PBWO, regional and local governments. This will ensure mobilisation for financial resources and manpower for critical issues and problems of water scarcity, land tenure insecurity, property ownership, user rights to fisheries and water – issues that place disproportionately heavy burden on women take place. Qualitative findings from the field survey indicate that budget constraints both on the PBWO and on regional and local governments impede the collection of gender disaggregated data and sources of livelihoods, which increase gender gaps.

The third level is the grassroots level between village councils and civil society organisations (CSOs). Village councils are considered state actors, while CSOs are considered non-state actors. The CSOs' network presents the lowest level where self-help groups for men and women alike are found to be mostly based on livelihood niches and associations of friends and relatives. The CSOs in the study area are mandated by law to govern resources such as the following: water users associations, as outlined in URT (2002$_a$) and Water Resources Management Act No.11 (2009); beach management units for fisheries resources, as per Fisheries Act No 22 (2003$_a$); and savings and credit co-operatives societies (SACCOs), as indicated in Cooperatives Societies Act No. 15 (1991) and micro-finance policy (2000$_a$). However, land resources are managed by village councils, as stipulated in the Village Land Act No. 5 (1999). Gender-related constraints and strengths can be easily addressed through the CSOs' network. However, a gender forum in the village councils for communication and relationship reporting, which is necessary for CSOs to function appropriately as non-state actors, is lacking. Legally, CSOs are empowered under sectoral decentralisation, although they are not officially

recognised under lower levels of political decentralisation such as village councils. Relevant evidence from the field survey indicates a fragmented approach and an antagonistic relationship between village councils falling under political decentralisation and CSOs concerning beach management units, water users associations, and SACCOs falling under sectoral decentralisation.

Revenue sharing from water and fisheries, for example, has been a source of the antagonistic relationship. Village councils want to maintain all of the revenue sources, while sectoral ministries have diverted some of the revenue collection to CSOs to ensure proper administration and governance of these resources. This development has led to increasing gender gaps because harmonisation of gender-related matters, as far as resources governance is concerned, is not coordinated and financial resources are misused and poorly collected. Additionally, the study noted significant constraints to addressing gender issues in CSOs meetings from family members and individuals. Several explanations by female respondents indicate that advocacy for gender equality threatens their marriages. In African families, men are considered the heads of families; they own the productive resources and property. Fighting for equality in sharing resources and properties, places the role of marriage at a crossroad, as the institution of marriage greatly influences gender relations, even after a marriage ends through divorce or death. Efforts on gender-related issues in Tanzania, as well as in the study area, have been widely reflected to increase opportunities for women to participate in parliament positions, as well as regional, district and village forums. However, evidence from the field survey revealed that this is not a panacea. The study argues that gender forums that reflect the global picture on macroeconomic issues are fundamental to either blocking or promoting the country's economic growth and will have trickle down effects in addressing gender inequalities at the household and individual levels. Subsidisation of oil prices, promoting

home-based manufacturing industries and developing a strong foundation of revenue sources for regional and local governments are critical measures by which to address global inequalities such as 'lack of economic democracy'. Additionally, these measures will reduce gender gaps across individuals and families.

### 4.4.2   Public services and basic needs

Following the local government reforms programme (1998-2008), the decentralisation process has been designed to reduce the power of central authorities and to promote local autonomy at the lower levels. Decentralised public services have been poorly provided to the community since the implementation of the Structural Adjustment Policies in the 1980s. This circumstance is also partly due to the current budgetary constraints facing the financial sector in Tanzania. The reduction of public expenditures and the privatisation of state enterprises to ensure a competitive economy were among the policy instruments implemented under the SAPs as the result of neoliberal economic policies and globalisation. Reduced spending on major public services has contributed to the uneven ground between men and women in access to and control of productive resources such as natural (e.g., land and water), human (e.g., education, skills and knowledge) and financial (e.g., cash, credits and liquefiable assets) capital as revenues generated from private activity are used to pay for public services and basic needs (i.e., a cost-sharing system) such as education, electricity, water, shelter and fuel energy.

Findings from the field survey (Fig. 2) present household sizes among the livelihood niches, which vary considerably. Irrigated agriculture (n=120) and fisheries (n=120) composed of households of one family (father, mother and children) by 93.4% and 97.5%, respectively.   Household size for agro-pastoralists (n=120) ranges from one family

(16.7%), two families (37.5%), three families (27.5%) and four families (18.3%) under the same compound sharing the same resources, which implies that women take on greater burdens with respect to domestic chores in agro-pastoralist households than in irrigated agriculture or fishery households.
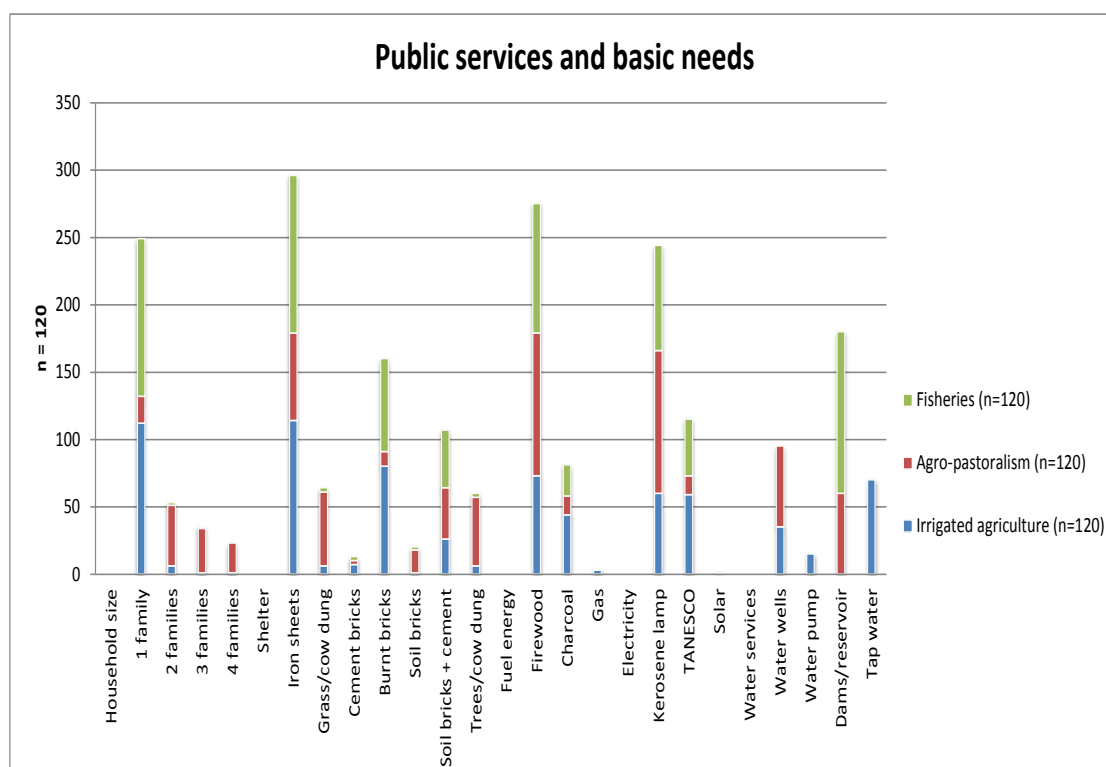


**Figure 2: Public services and basic needs.**

Furthermore, food consumption per day is greater for agro-pastoralists than for other livelihood niches. Standards for shelter vary between livelihood niches and are mostly shaped by differential access to building materials, affordability and the nature of livelihood activities associated with family culture. Iron sheets (i.e., roofing materials) continue to dominate in most houses – 95% in irrigated agriculture households, 97.5% in fishery households and 54.17% in agro-pastoralist households. Agro-pastoralists ranked the last with some houses still using thatching grass and cow dung, which are easy to afford. Burnt bricks are popular construction materials highly used by small-scale farmers

– 66.7% in irrigated agriculture households, 57.5% in fishery households and 9.2% in agro-pastoralist households. Soil bricks plastered with cement are another material used to upgrade houses; wide use was noted by 21.7% of irrigated agriculture households, 35.8% of fishery households and 31.6% of agro-pastoralist households. Pit latrines are also widely used by 58.3% of irrigated agriculture households, 92.5% of agro-pastoralist households, and 83.3% of fishery households. Indian toilets are also widely used by irrigated agriculture households (32.5%), fishers (11.7%) and agro-pastoralists (7.5%) (Fig. 2).

Firewood remains one of the most important reliable sources of energy that is easily accessible and affordable for cooking, drying fish and lighting. It was noted to be highly used by all livelihood niches: 60.8% of irrigated agriculture households, 80% of fishers and 83.3% of agro-pastoralists. Charcoal is used to complement firewood in 36.7% of irrigated agriculture households, 19.17% of fishers and 11.7% of agro-pastoralists. Other sources of fuel energy such as gas and electric cookers are not common due to low availability and affordability. The workload for women in collecting firewood still blocks efforts to reduce poverty in terms of the amount of time that could be spent in productive work. Further, forest degradation is mostly noted in the Mawalla Irrigation Scheme (MIS) and the Nyumba ya Mungu (NYM) dam, which has resulted in the siltation of the dam, especially during the wet season (Fig. 2).

Electricity remains a problem in Tanzania. According to Reuters (2011), power rationing in Tanzania was declared a national disaster after a prolonged drought and reduced water levels in 2011 following a deficit of 233MW, which is equivalent to 33% of the total net produced 700MW. Further, one-fifth of all generated electricity is wasted during transmission and distribution due to wear and tear on transmission equipment. Findings

from the field survey on access to electricity supplied by the Tanzania Electric Supplies Company (TANESCO) indicate that upstream and midstream small-scale farmers in irrigated agriculture are better off in terms of electricity access (49.17% have access), while downstream fishers and agro-pastoralists do worse with 35% and 11.7%, respectively, having access. Kerosene lamps are commonly used and easily accessible; however, they have become expensive due to rising oil prices. The price for one litre of kerosene is almost equivalent to 2 USD, and large families can consume up to 2 litres per day. The figures for kerosene lamp usage were as follows: irrigated agriculture, 50%; fisheries, 65%; and agro-pastoralists, 83.3%. Use of solar power is not popular due to affordability constraints (Fig. 2).

Access to domestic uses of water is still a major problem facing a majority of respondents in the study area (Figure 2). Upstream users in irrigated agriculture enjoyed the highest availability of tap water (58.3%), water wells (29.2%) and water pumps (12.5%), while fishers entirely depend on fetching water directly from the NYM dam (100%). Approximately 50% of agro-pastoralists fetch water from the NYM dam, while the other 50% use water wells. Women in the fishing community spent a lot of time fetching water from the NYM dam. This circumstance contributed to poor hygiene, as the dam is used for fisheries, watering livestock and domestic uses. Outbreak of cholera and bilharzia is common around the NYM dam, which implies greater health costs to the family and a greater burden on women to look after the sick people.

Three major observations come from the research. First, variation in budgets targeted to different regions, local governments, sectors and departments is what creates inequality in regions and local government and, in the process, unequal provision of public services. Second, inequality of staff salaries between those working in the central, regional and

local governments and those working in ministries, departments and agencies kills work morale in the former group as the latter is highly paid, enjoys proper training programmes with adequate facilities, and good working conditions. Third, the CSOs are slow in focusing on conflict resolution, resource governance and providing significant outcomes such as operationalised schools, hospitals and social protection services. This has contributed to the poor provision of public services and basic needs that has widened gender gaps.

### 4.4.3 Livelihood niches

Why do livelihood inequalities matter with respect to gender issues? Livelihood inequalities not only widen gender gaps and social divisions between men and women but also within women and men. Additionally, feelings of nationalism, patriotism, national integration and economic prosperity fade away when a certain fraction of society feels they are less privileged than others. The presence of corruption and frequent conflicts regarding productive resources such as land is a consequence of inequalities. Livelihood inequality in this paper is reflected in access to and control of productive resources across livelihood niches in reference to livelihood assets (e.g., natural, human, financial and social capital). How men and women access and control livelihood assets is of paramount importance to understand linkages between gender relationships and patterns of exploitation of productive resources, thereby achieving a better analysis of patterns of use, knowledge and skills to build a gender-inclusive society.

### 4.4.1.1 Land investment as important natural capital

Natural capital represents natural resource stocks from created wetlands (i.e., human-made), the resource flows of which are used to generate livelihoods (i.e., land, water,

fisheries, forests products, biodiversity and environmental resources). Land is the basis of human life, and all Tanzanians should have the right to access for valuable investments and for future generations (URT 1995; 1999a; 1999b). The patriarchal system still dominates in many families in the study area; however, gender relations, roles and differentiation vary within and between livelihood niches. In African families, men are considered as the heads of the families and owners of the productive resources and property, as indicated by land ownership in Figure 3 (irrigated agriculture 90.8%: n= 76; agro-pastoralism 100%: n=76; fisheries 92.9%: n=70). While the percentage of land ownership of women is less significant (irrigated agriculture 18.2%: n= 44; agro-pastoralism 0%: n=44; fisheries 18%: n=50), co-ownership of land is more pronounced under irrigated agriculture in the Lower Moshi Irrigation Scheme (LMIS) and partly in the Mawalla Irrigation Scheme (11%: n= 120) than in agro-pastoralism (0%: n=120) and fisheries (9%: n=120).
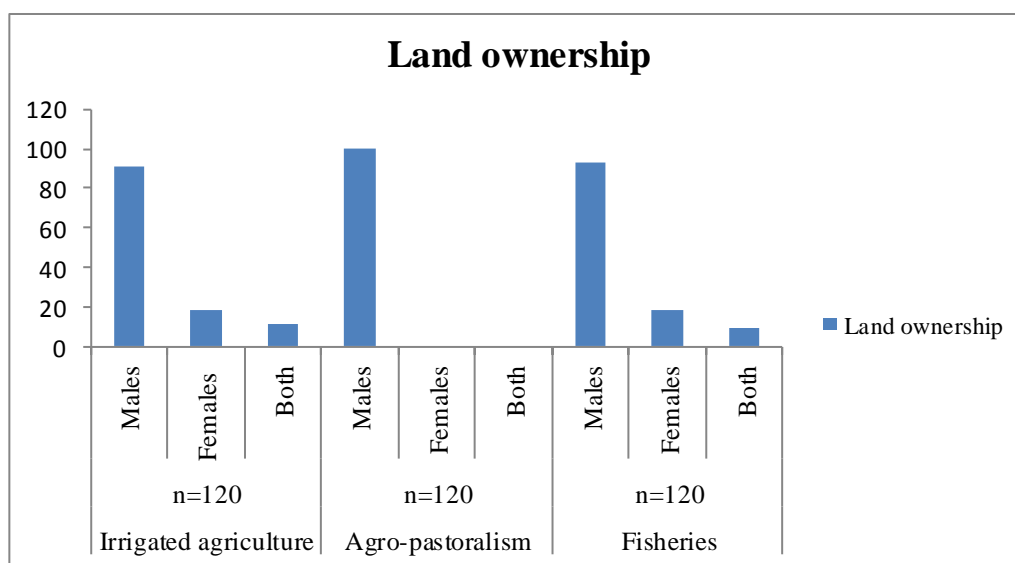


**Figure 3. Land ownership across livelihoods**

The results indicate that heterogeneity of household structures is rooted in livelihood niches and that the reason for this is the ability of women to invest in land through farming and selling agriculture produce. Women in fishery and pastoralist communities do not own fishing and grazing sites completely. The scenario in the NYM dam presents the utilisation of artificial wetland for hydropower production, fisheries and livestock keeping. Land ownership of the NYM dam belongs to the Pangani Basin Water office (PBWO), while fishers and pastoralists are granted user rights for fishing and watering points for livestock. The users' rights are neither legally defined nor promoting women to access and own the land and associated resources. Under fishery communities, the 'Mawela system[14]' is popular and owned by powerful men, while watering points adjacent to the dam are open access. Women in fishery communities mainly deal with fish processing, drying and selling, while women in pastoral communities are more involved in selling milk and petty trading in handicrafts and artefacts to sub-towns and the tourist town Moshi. Decision making and land investments over NYM dam do not involve women, regardless of the fact that women have an equal number of positions as men in the CSOs such as beach management units and village councils.

According to URT (2002b), the establishment of the Human Rights and Good Governance Commission has facilitated the development and review of laws with regard to protection of women, girls and children. The Land Act No. 4 and the Village Land Act No. 5 of 1999 were among the reviewed laws. The land laws and the constitution of the United Republic of Tanzania provide for complete gender equality in ownership of, access to and control over land and recognise the rights of men and women to own properties. According to

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[14] 'Mawela system' is the land holding system in Nyumba ya Mungu dam (NYM) where by powerful and influential males illegally own fishing sites and do incur costs in clearing the bushes and trees below the water levels for easy access and smooth fishing. Renting system does exist in NYM dam by the illegal owners under 'Mawela system' as per agreement usually based on fishing season, monthly or weekly periods. The owner of NYM dam is Pangani Basin Water Office (PBWO).

URT (2005$_b$.), "Land tenure shall put more emphasis on gender equity. It has been underscored that titles to land be framed in the names of all spouses (co-ownership of land rights) unless one willingly opts out of this arrangement. In addition, conflicts of land heritage can seriously be reduced with the introduction of a personal identification system. Every person can then be treated, by the land administration system, as an identified individual". Ignorance of the law and the ability to harmonise legal matters pertaining to land and properties with gender-related matters within the marriage institution are still a challenge in the study area.

Livelihood inequalities are featured within and between livelihood niches. Poverty is more pronounced in fishery and pastoralist communities than in irrigated agriculture communities, as diversified options are limited with particular to market-based land transfers. Furthermore, unclear legal user rights on common property arrangements have resulted in overfishing, illegal fishing, siltation of the dam due to the overstocking of large groups of cattle and a permanent migratory lifestyle for fishers and agro-pastoralists. Common property arrangements with fishers and agro-pastoralsits have resulted in resource degradation combined with the over-abstraction of water by upstream users in irrigated agriculture, which has led to water scarcity. Water scarcity is evident in the study area with frequent conflicts between farmers, which has led to a 67% reduced area for paddy/rice cultivation (from 1 100 to 360 hectares in the Lower Moshi Irrigation Scheme (LMIS). Initially, the LMIS was targeted for 4 villages; recently, it was extended to 7 villages using the same water right of 1 939 m$^3$/s for 1 100 surveyed hectares of paddy plantations. The scheme is also losing revenue by more than 50% of the estimated revenue from the surveyed area, which is utilised below capacity.

Likewise, for the Mawalla Irrigation Scheme, the actual paddy/rice cultivation is utilised below capacity by 58% of the total surveyed area due to water scarcity (reduced from 1 425 to 594 hectares with a water right of 900 m$^3$/s). The revenue is reduced by 60% of the estimated total production from the surveyed area (Olemako *et al.*, 2011). Hydropower plants in the Pangani river basin are located downstream of irrigated farms, and this has been a major source of conflict between hydropower producers and irrigation developers in Pangani. During the dry season, the installed capacity of the Pangani river basin may drop from 97MW (installed capacity) to 32MW (net generated capacity), out of which the NYM dam may drop from 8MW (installed capacity) to 4MW (net generated capacity) due to the water scarcity that results from the over-abstraction of water by upstream users. The NYM dam under study was purposely established for hydropower production since 1965; however, it is highly utilised to generate the livelihoods of more than 20,000 households for fishers and agro-pastoralists.

This scenario has several implications for the Pangani Basin Water Office (PBWO) such as reduced revenues from user fees, which comprise 40% to 65% of the PBWO's budget, and reduced income by more than 50% to household families and individuals of estimated revenue from surveyed areas utilised below capacity. Gendered livelihoods are also threatened, with women more heavily impacted by reduced income, limited food supply and migration patterns – particularly for women associated with fishery and agro-pastoralist households who depend heavily on wetland resources from the NYM dam. The results indicate that water scarcity and dry season patterns force people to migrate to other nearby regions to search for fish resources (fishers (70%: n= 120)) and pastures for cattle (agro-pastoralists (90%: n=120)), while small-scale farmers in irrigated agriculture have permanent settlements and must reduce the cycle of cultivation from 3 to 2 times or once per year. The implication with respect to gender roles for families of fishers and agro-

pastoralists is an expanded level of poverty, as the majority of men flee to other nearby regions to search for fish and pastures for the cattle. The burden of raising the family is left to women, as men can spend more than half a year away from home.  Furthermore, our findings suggest that there is a strong correlation between migration and the prevalence of HIV/AIDS, which was mostly noted in fishery communities. This circumstance drains financial resources, and the time women take to care for the sick relatives in the family could be invested in other productive work. Land tenure insecurity to men and limited land ownership to women is posing a threat to sustainable livelihoods – particularly to fishers and agro-pastoralists because the NYM dam is owned by the PBWO and the user rights to fishers and agro-pastoralists are not legally defined.

### 4.4.1.2 Human capital:  Dependency on family labour

Human capital represents skills, knowledge, and ability to labour, which are important in the pursuit of different livelihood options. Dependency on family labour is highly dominant in the study area, with fishers and agro-pastoral communities ranked the highest in promoting child labour for fish processing, selling and looking after cattle. According to URT (2005$_a$), child labour is prevalent with 1.2 million reported children labourers in 2000 and 2001. Child labour is evident in the study area and cited as the major source of labour power in irrigation fields, grazing and fishing sites. Among agro-pastoralists, children are quite often used as cattle herders. The study revealed that this practice is passed down from one generation to the next, limiting the young generation's access to formal education and the ability to diversify to other livelihood options. The situation is worse for fishers and agro-pastoralists located midstream and downstream compared to irrigated agriculture located upstream.  Percentage ratios indicate that out of 360 respondents, 71% with a primary-level education or below (i.e., education – none) depend

on family labour, out of which agro-pastoralists rank the highest (41%), followed by fishers (36%) and small-scale farmers in irrigated agriculture (23%) (Fig. 4).
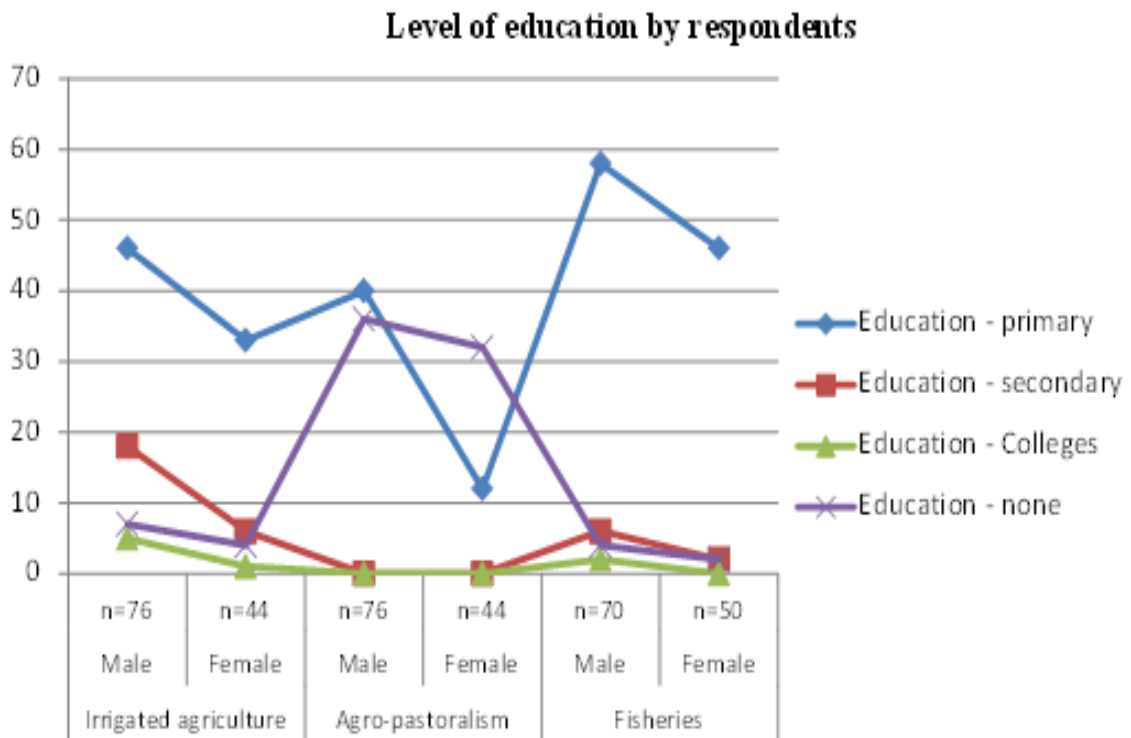


**Figure 4. Education levels by respondents, whole sample.**

Out of 120 (males=76; females=44) respondents in irrigated agriculture, 60.5% and 23.7% of males accessed primary school and secondary education, respectively, while 75% of females possessed a primary school education and 13.6% advanced to secondary school. In the agro-pastoralist community, 52.6% of males accessed primary school education with 0% attending secondary school and 47.4% having never been to schools, not knowing how to read and write, while 27.3% of females accessed primary school education with 0% attending secondary school and 72.3% not knowing know how to read and write. In the fishery community, 82.8% of males possessed a primary school

education and 8.6% advanced to secondary school, while 92% of women had been to primary school and 4% to secondary school.

Budget priorities in the provision of public services such as water, education, health, transport and social protection are fundamental to ensuring that quality livelihoods are attained in Tanzanian society. As put forward by URT (2010), inadequate domestic revenue to finance development projects and social services such as education, health, water and agriculture has been cited as among the budgetary challenges facing the financial sector in Tanzania. The situation has affected the education sector, forcing a majority of Tanzanians to depend on a shrinking natural resource base, particularly in the wetlands within river basin where common pool resource arrangements are still practiced. These circumstances have numerous implications for respondents with a primary education level or below in relation to their livelihoods. First, these people are unable to diversify to other sources of livelihoods and depend solely on access to village land and water resources to sustain their daily lives. Second, there is lost government revenue, as indicated by URT (2010), on the existence of a large informal sector of approximately 90% of the working population in Tanzania that is not adequately integrated into the formal economy. Third, women are more highly affected than men as gender gaps are widened with more hours worked by women and children. As put forward by URT (2002$_b$), both men and women are involved in reproductive, productive and community roles. However, women in rural and urban areas are subjected to a heavy burden as men restrict them to engage in other productive work. Women in rural areas spend between 16 to 18 hours per day working, compared to men who work between 8 to 10 hours per day. Traditions, culture and low levels of education are the main causes of the unequal division of labour between women and men.

### 4.4.1.3 Financial capital:  Financing public services

Financial capital refers to the financial resources (e.g., savings, the supply of credit, remittances and pensions) that are available to people and provide opportunities for livelihood diversification.  Micro-finance institutions, as put forward by URT (2000$_a$) and (2005$_a$), were initiated following major financial sector reforms in 1991 to promote the poverty reduction strategies outlined in the National Strategy for Growth and Reduction of Poverty (MKUKUTA), which were designed to reduce poverty for both men and women in urban and rural areas.  The reduction of income poverty, as elaborated in micro-finance policy (2000$_a$), will assist the individual households – women, in particular – in financing major public services that are mostly privatised and operate under a cost-sharing system. The gender inequality gap is widened by women impacted by a high level of income poverty, as financial capital under micro-finance initiatives aimed to boost business enterprises is used to finance public services that are poorly provided in the society. Furthermore, financial capital accessed under micro-finance institutions in the form of credit is not fully recovered, and the advancement of business enterprises remains at the same level with limited growth. Reproductive and socio-cultural roles place women in disadvantaged and vulnerable positions, taking care of the children and ensuring the welfare of the family, which means most of their income is spent on health, energy, transport, water and education. Financial capital provides a linkage to livelihoods through savings, credit and investment and is especially important as it can be easily converted into other forms of capital. Access to financial capital in wetland communities, as well as its convertibility, is highly dependent on natural capital such as land resources for collateral and social capital through voluntary monthly cash contributions under civil society organisations (CSOs).

The results (Table 1) from the study indicated that out of 360 respondents, 225 (62.5%) accessed credit (138 males and 87 females). The irrigated agriculture community ranked the highest with 46.7% of respondents accessing credit (males 68: females 37), while 36.4% (males 48: females 34) of agro-pastoralists and 16.9% (males 22: females 34) of fishers accessed credit.

**Table 1. Livelihoods, credits and micro-finance institutions**

| Livelihoods | Micro-finance institutions | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Credit amount | Irrigated agriculture | | Fishing n=225 | | Agro-Pastoralism | | SACCOs | | Banks | | NGOs/Projects n=225 | | Friends/Relatives | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| 1 – 50 000 | 3 | 3 | 0 | 1 | 4 | 7 | 7 | 5 | 0 | 0 | 0 | 0 | 0 | 6 |
| > 50 000 – 150 000 | 12 | 9 | 4 | 2 | 12 | 6 | 25 | 11 | 1 | 0 | 1 | 0 | 1 | 6 |
| >150 000 – 300 000 | 12 | 12 | 9 | 8 | 13 | 11 | 31 | 22 | 0 | 0 | 0 | 0 | 3 | 9 |
| >00 000-600 000 | 12 | 4 | 6 | 3 | 7 | 6 | 25 | 8 | 0 | 1 | 0 | 1 | 0 | 3 |
| >600 000 – 1 000 000 | 4 | 3 | 1 | 1 | 5 | 2 | 9 | 3 | 1 | 2 | 0 | 0 | 0 | 1 |
| >1 000 000 – 1 500 000 | 8 | 3 | 1 | 1 | 5 | 1 | 8 | 2 | 6 | 3 | 0 | 0 | 0 | 0 |
| >1 500 000 – 4 000 000 | 17 | 3 | 1 | 0 | 2 | 1 | 2 | 1 | 17 | 3 | 1 | 0 | 0 | 0 |
| TOTAL | 68 | 37 | 22 | 16 | 48 | 34 | 107 | 52 | 25 | 9 | 2 | 1 | 4 | 25 |

Note: Credit amount in Tanzanian shillings - Tshs (1 USD = Tshs 1,585)

The study investigated the sources of credit availability in the area. Savings and credit co-operatives societies (SACCOs) ranked the highest (males 77.5%: females 60%), while loans from the bank ranked second (males 18.1%: females 10.3%), followed by credits from friends or relatives (males 3%: females 28.7%) and credits from non-government organisations (males 1.4%: females 1%). The amount of credit provided by SACCOs and bank organisations ranged from 50 000 to 4 000 000 Tanzanian shillings; however, these figures were limited by cash flows and seed money. The mean credit amount provided between 50 000 – 600 000 Tanzanian shillings accessed by the majority of respondents, out of which irrigated agriculture community ranked by, almost 53% for males while for females 68% while fisheries ranges from 73% for males and 81% for females and agro-pastoralists ranges from 67% for males and 68% for females. However, in the irrigated agriculture community, 25% of males accessed 4 000 000 Tshs, which is higher than that of the other livelihood niches. At the household level, the study investigated how frequently people save money. The results indicated the following: irrigated agriculture (males n=76: 57%; females n=44: 45%); agro-pastoralism (males n=76: 58%; females n=44: 34%); and fisheries (males n=70: 49%: females n=50: 68%).

The study revealed four major issues pertaining to micro-finance institutions as sources for financial capital. The first observation is that low levels of education, combined with a lack of financial literacy and discipline, block the efforts of decentralised micro-finance initiatives to the lower levels of villages and households. The findings indicate that for fishers, who ranked the lowest in terms of access to credit, the major reason for this phenomenon is poor repayment rates due to multiple open lines of credit per individual. This was the case for both men and women.  This was also noted as a hindering factor to other interesting micro-finance institutions to invest in the study area. The second observation is that the amounts of credit provided by the banks, SACCOs and other relative

networks are not significant (Table 1) to establish meaningful business ventures. The third observation is that the micro-credit obtained by the respondents was mostly used to finance public services such as education, health, food and shelter. It was not used to improve livelihood bases. This was noted mostly in fishery communities, while, in agro-pastoralist communities, men used most of the credit to buy cattle and women used it to cover basic necessities for domestic expenditures. The fourth observation is that land ownership is enjoyed more by men than women – particularly with respect to small-scale farmers in the irrigated agriculture community relative to fishers and agro-pastoralists operating under common property arrangements. Land ownership makes it possible to obtain loans from the bank, as can be observed from the results (Table 1) in which irrigated agriculture ranked higher in terms of credit amount relative to other livelihood niches. Further dependency on family labour blocks the possibility to generate large business ventures that extend beyond the family.

Developing financial literacy and discipline, efforts that must take place at the primary-school level, is fundamental if efforts towards poverty reduction are to be effective. Decentralisation of authority to local governments should focus on improving quality for school curriculum that can build a nation with financial consciousness and discipline in planning and executing their livelihoods and business ventures. Additionally, laws regarding the financing of domestic expenditures for children and the family should be enacted and enforced to rescue women such that they can advance and invest in financial capital to promote their business undertakings or any other available options.

**4.4.1.4 Social capital: Voluntary social protection**

The link between gender and social protection matters because women are responsible for taking care of the old and the sick. Enacting social security schemes and other cash

transfers to the sick and the old will reduce the burden on women and increase the welfare of the family, as women will have time to engage in other economic activities to generate income. According to social security policy (2003$_b$), the social security funding system in Tanzania covers three categories: social assistance schemes, mandatory schemes and voluntary or supplementary schemes. The major challenge facing this system is low coverage in Tanzanian society, the lack of regulatory framework, and the fragmentation of legislation in the social security system of informal social protection. According to (URT, 2003$_b$; ILO 2008), the status of formal and informal sectors indicates that, out of 16 million working people, only 6.5% are covered under formal social protection, while the remaining 93.5% fall under informal social protection, out of which 74.2% are of the agricultural sector. Furthermore, the ILO reports that Tanzania is highly dependent on donor funding – 33% of social expenditures come from donor funding – and further suggested the extension of social protection coverage to the informal sector. However, the nature of the informal sector varies from small-holder agriculture, small-scale mining, agro-pastoralism, fishing to petty businesses. These circumstances require an independent approach to address each category according to the income generated and the nature of the occupation. The findings from the study area suggest the need to put more effort into informal social protection, as it is non-existent. The trend indicates that informal social protection is currently funded by the self-help initiatives of individuals and credit schemes. CSOs, however, are subjected to low coverage, the lack of a regulatory framework, a fragmented approach by different organisations and poor linkage between CSOs, local governments and social protection programs. This area requires further research for baseline information and sources of income in the informal sector.

**4.5      The engendering livelihood model: "lowest appropriate levels**

This model adopts the 'River basin management at the lowest appropriate levels' approach as defined by Kemper et al. (2007) within the Pangani river basin context, emphasising the need for decentralisation of decision making to stakeholders at different governance levels. The need to allocate power and authorities to the lowest appropriate levels, while retaining the authority at the central level (e.g., ministries, departments and agencies) where necessary for national interests is emphasized. The model aims to analyse the social reality with the active involvement of stakeholders and to address key issues of gender relations, decentralisation of resources and property regimes and gender outcomes. The conceptual underpinning of this model is socio-constructivism – that human knowledge is constructed. It emphasises the need to combine efforts from state and non-state actors towards closing gender gaps in the effort of engendering livelihoods and poverty reduction. CSOs such as village community banks (VICOBA), water user associations (WUAs), savings and credit cooperative society (SACCOs), beach management units (BMUs), pastoral networks and other self-help groups for both men and women should reflect the real basic needs, aspirations, and practical solutions of different livelihood niches. This should range from small-scale farmers, pastoralists, fishers, brokers and petty traders.

**Global policies** ⟷ **Pangani river basin management - PBWO**

**Political decentralisation**    **Sectoral decentralisation**

Central government — Water

Regions — Land

**GENDER OUTCOMES**

Districts — Agriculture

Fisheries

Gender multi-sectoral forum 'zoning scheme'

Wards — Livestock

**Non-state actors**

CSOs & NGOs

Energy

'Lowest appropriate levels' Gender forum

Private sectors

Villages/sub villages — Social protection

Researchers — Household & families men and women

State actors
Gender focal person

Non-state actors
Gender focal person

**Figure 5. Engendering livelihood model**

*Source:* Author's innovation (2011)

To achieve gender equality, a combined approach between state actors (political and sectoral decentralisation) and non-state actors (e.g., CSOs, NGOs, researchers and private sector) is of paramount importance for the provision of quality public services, access to and control of domestic markets and ownership of productive resources by both men and women and a gender-inclusive society. Point persons on gender-related issues from both the district level and the CSOs will be useful for reporting and feedback relationships between regional and local governments, the Pangani basin water office (PBWO) and the CSOs. This development will ensure critical and important gender-related matters with regard to public services and livelihood niches that are forwarded to higher levels in

specific sectors, ministries, departments and agencies are addressed for budget planning and implementation of gender outcomes to be realised.

### 4.5.1   Zoning scheme: Gender multi-sector forum

A gender multi-sector forum is about balancing the powers between global funding policies, the ruling elite, the working class, CSOs and other key stakeholders. A cost-benefit sharing approach is proposed to promote multi-sector collaboration in the river basin and to strengthen domestic sources of revenue generation. With sufficient budgets, inequality across livelihood niches will be addressed more adequately, which will ultimately address the needs and aspirations of men and women. The model proposes an 'authority zoning scheme' to define the boundaries of decentralisation between stakeholders from both the state and non-state actors within the context of the river basin. The zoning scheme is designed to assess and define the contribution of each player, reflecting the roles and responsibilities in revenue contribution, cost sharing and conservation of the natural resource base. This will enable to have clear indications of the contributions of state and non-state actors from each specific sector, which can be organised under a consolidated funding scheme within the river basin organised by the PBWO. The scheme will facilitate better market surveys for agricultural, livestock and fisheries products, sufficient credit facilitation to individuals and proper infrastructures for water, roads and energy. Improved services and clear lines of authority and management regarding access to and the utilisation of productive resources will automatically improve the welfare of men, women and children. Engendering livelihoods requires equipping systems with reliable sources of revenue generation to maintain a healthy river ecosystem and sustainable livelihoods. Evidence put forward by (Tendler, 1997 as cited in Crook, 2003) on successful decentralisation efforts in the Brazilian state of Ceara on the three-way

dynamics between the local government, state and CSOs was highly successful in innovative rural preventive health and the generation of employment policies.

### 4.5.2 Gender outcomes

The gender outcomes are measured on proper delivery of quality public services and basic needs (e.g., efficient supply at affordable prices of water, oil and electricity; quality services for education, health and social protection; secured tenurial rights for land and common property arrangement; and protected domestic markets for agricultural, fisheries and livestock products). Trade-offs between political and sectoral decentralisation need to be taken into account to harmonise power relations towards the provision of quality public services and basic needs that will ultimately promote gender equality and improve the welfare of individual families and society at large.

### 4.6    Conclusion

Decentralisation is not a panacea and does not automatically benefit women and men equally with respect to the complex problems facing the political and sectoral integration in engendering livelihoods. However, it is likely to contribute to sustainable livelihoods when it is linked to the democratic aspirations of women and men and responds to local political, social, economic, and cultural needs and conditions. Gender equality must reflect larger global economic agendas, whereas power relations between the global funding policies, the ruling elite, the working class and CSOs are the reflection of inequalities in political and sectoral approaches, as well as the lower levels of individual families and households. Economic growth is key to addressing gender inequalities and associated discriminatory practices against women, which are, to a great extent, due to increased levels of poverty. If

these issues are addressed for further research and policy reforms, the promising future of a gender-inclusive society is certain to happen.

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# CHAPTER FIVE

## 5.0   ASSESSMENT OF THE SOCIO-ECONOMIC FACTORS INFLUENCING LIVELIHOOD CHOICES IN THE DECENTRALISED SYSTEMS OF PANGANI  RIVER BASIN, TANZANIA

**(Manuscript IV)**

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## 5.1 Abstract

Tanzania Development Vision 2025 calls for high-quality livelihoods and the ability of people to make their own choices regarding development processes. This paper presents an assessment of the socio-economic factors that influence livelihood decisions under the decentralised wetland governance of the Pangani river basin in Tanzania. The results from multinomial logistic regression indicate that, education and family labour dependency are key significant variables (chi-square 248.94: p-value < 0.001) in influencing choices of livelihoods across wetlands. Embedded autonomy is suggested through co-management by state and non-state actors to promote efforts of decentralisation and empower people to own development process that directly affect their livelihoods.

**Keywords**: CSOs: Decentralisation; Livelihoods; Pangani river basin; Tanzania; Wetland governance.

## 5.2    Introduction

The attainment of quality livelihoods, as articulated in Tanzania Vision 2025 and the National Strategy for the Growth and Reduction of Poverty (MKUKUTA)[15] depends on understanding why people engage in different livelihood activities and what factors influence their choices. The objective of this paper is to assess the socio-economic factors that influence livelihood decisions and to determine whether the decentralisation systems of wetland[16] governance can promote the diversification of livelihoods in the Pangani river

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[15] MKUKUTA is a Kiswahili acronym for the National Strategy for the Growth and Reduction of Poverty (NSGRP). This strategy is the development framework for the current five year phase (2005 – 2010). It forms part of Tanzania's efforts to deliver on its national vision 2025. The focus is outcome oriented and organized within three clusters; growth and reduction of income poverty; improved quality of life and social well being; governance and accountability. www.tanzania.go.tz/vision_2025f.html

[16] This paper refers wetlands as defined by the Ramsar Convention on Wetlands as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt including areas of marine water, the depth of which at low tide does not exceed 6 metres. This broad definition includes inland wetlands (such as marshes, lakes, rivers, peatlands, forests, karst, and caves), coastal and near-shore marine wetlands (such as mangroves, estuaries, and coral reefs), and artificial (such as rice fields (paddies), dams, reservoirs, and fish ponds) (MEA, 2005). http://www.maweb.org/documents/document.358.aspx.pdf
Irrigation schemes for paddy cultivation (Lower Moshi & Mawalla irrigation schemes and Nyumba ya Mungu dam/reservoir) are both considered as man-made wetlands however for irrigation schemes before infrastructure development of irrigation canals the areas used to be categorized as flood plain wetlands.

basin in Tanzania. Understanding how different choices of livelihood affect livelihood pathways or trajectories is an important concern for both the state and non-state actors.

Shivji (2009) argues that the development role of state actors is dormant because they are unable to transform the forces of neo-liberal and development discourses, which centres the policy making process around a broad holistic development agenda for the country. The introduction of civil society organisations (CSOs)[17] was meant to address critical issues of governance through decentralisation by making state actors more accountable to the public. The World Bank supports the efforts of thousands of CSOs carrying out local development and poverty reduction initiatives through country-based social funds and community development projects in Tanzania and in other developing countries. In April of 2009, the World Bank organised a meeting in Washington DC that included 200 leaders of CSOs from 18 sub-Saharan African countries. One of the challenges the World Bank posed to the CSOs was to build the strong coalitions and partnerships that are fundamental to holding governments and development partners (donor agencies) accountable for delivering the promise of development. As noted by Maconachie *et al*., (2009) report that decentralisation actually constrains local institutions, such as CSOs, because of continued political intervention by state actors. CSOs such as water users associations (WUAs) are responsible for resources allocation, revenue collection and overall management, however decentralised wetland governance in Pangani poses a threat to sustainability of livelihood choices because the CSOs lack capacity, legal status, financial resources and organisational strength. As noted by Lankford (2003), one dilemma facing irrigation development in

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[17] The World Bank defines 'Civil Society Organizations (CSOs)' as a wide array of non-governmental not for profit organizations that have a presence in public life expressing the interests and values of their members or others based on ethnical, cultural, political, scientific, religion or philanthropic considerations. This includes a wide of array of organizations: community groups, non-governmental organizations (NGOs), labour unions, indigenous groups, charitable organizations, faith-based organizations, professional associations and foundations. Water Users Associations (WUAs) according to the Water resources management Act No. 11 of 2009 and Beach Management Units (BMUs) according to the Fisheries Act No. 22 of 2003 and Savings and Credit and Co-operatives Societies (SACCOs) as stipulated in the Micro-finance policy (2000) are both considered as CSOs governing wetlands of the Pangani river basin.

Tanzania is that development requires support from the central government, but the management of irrigation schemes is left to CSOs, which are responsible for major decisions.

A fragmented, decentralised governance approach that includes state actors (local government authorities) and non-state actors (CSOs) is evident in the wetlands of the Pangani river basin and perpetuates the problem of land tenure insecurity. This problem blocks opportunities for the diversification of livelihoods, reducing off-farm livelihood options and leading to increased poverty. Poverty reduction has been central to MKUKUTA strategy, although, poverty levels remain high in Tanzania. Decentralised governance is fragmented because of a lack of formal working links and vertical-horizontal reporting relationships on two levels: first is between village land councils/district land offices and CSOs managing water, fisheries and micro-finance activities; and second, between CSOs working in different sectors such as water, fisheries and micro-finance.

Village councils control land governance, according to Village Land Act No. 5 (1999$_b$), while water user associations (WUAs) manage water resources. WUAs are the lowest level of water governance in the river basin. The National Water Policy (2002) and Water Resources Management Act No. 11 (2009) set a legal and institutional framework for managing the water resources in Tanzania on five main levels, from the national level to the basin, catchment, district and community levels (WUAs). The decentralisation of fisheries management takes the form of beach management units (BMUs), community based associations for managing the conservation and protection of fish resources in collaboration with government as defined by the Fisheries Act No. 22 (2003a). The development of Savings and Credit and Cooperatives Societies (SACCOs), as stipulated in the Micro-finance policy (2000) and Cooperative Societies Act (2003$_b$) are related to

micro-finance initiatives intended to decentralise financial services at the micro-level to reduce poverty and reduce income inequality. WUAs, BMUs and SACCOs form part of the CSOs network in the wetlands of the Pangani river basin. However, a lack of integration between village land councils and CSOs and between CSO networks makes it difficult to effectively address the problem of land tenure insecurity that harms the livelihoods of the poor. The Strategic Plan for the Implementation of the Land Laws - SPILL (2005) calls for the implementation Land Act No.4, Village Land Act No.5 and Land Disputes Courts Act No.2 and outlines land use policies that can reduce poverty in rural areas. However, SPILL suggests that land tenure insecurity in all settlements in Tanzania is rampant and poses a particularly strong threat to village land, which is subjected to frequent expansion to reserve land for private investments and other national interests. This trend hampers poverty reduction efforts and prevents people from attaining high quality livelihoods as outlined in the National Development Vision 2025 and the National Strategy for the Growth and Reduction of Poverty (MKUKUTA). Promoting embedded autonomy between state and non-state actors is fundamental to the attainment of quality livelihoods without undermining the wetland resource base.

## 5.3 Methodology

The study was conducted in the Pangani river basin, which covers an area of 43 650 km$^2$; with 5% of the area located in Kenya and the remaining part distributed over four regions of Tanzania, namely Arusha, Kilimanjaro, Manyara and Tanga. Pangani is a water-stressed basin currently faced with declining water flow amidst competing needs and interests regarding wetland resource utilisation. The river is 500 kilometres long, and approximately 2.6 million people live in the river basin. Approximately 80% of the population depends on agriculture as their main source of income (PBWO/IUCN, 2007).

Multi-stage cluster sampling was employed for this study because the population of the Pangani river basin is widely dispersed in four regions. As illustrated by Bryman (2004), cluster sampling is an appropriate and economical method for dealing with a widely dispersed populations like that living in the river basin under study. The primary sampling unit was the Kilimanjaro region that ranks highly populated (39.3% of 574 907 total households) compared to other regions. The number of households in each of the regions varies considerably; Manyara is the least populated with 5.7% of the total households, even though its share of the river basin area is 41.47%. Each region's percentage of total households and total geographical area is as follows: Arusha (32.2%: 5.49%), Kilimanjaro (39.3%: 23.97%), Manyara (5.7%: 41.47%), Tanga (22.8%: 23.67%), Ocean (0.02%) and Kenya (5.4%) (Appendix 1).

The secondary sampling unit was a selection of three wetlands and six villages around each wetland. Of these six villages, two were chosen for each wetland. The selection was based on purposive sampling to capture differential livelihoods, which vary according to location on the river. Upstream villages (Lower Moshi Irrigation scheme (LMIS): Mabogini and Chekereni villages) contain paddy/rice plantations and perennial crops such as maize, beans and vegetables. Midstream villages (Mawalla Irrigation scheme (MIS): Oria and Mawalla villages) engage in paddy/rice cultivation and agro-pastoralism. Downstream locations (Nyumba ya Mungu dam (NYM): Lang'ata bora and Kiti cha mungu villages) composed of power plants for hydro-electric power generation, fisheries and are also a dry season refuge for pastoralists from neighbouring regions. The LMIS and MIS are located in Moshi rural district and NYM dam is located in Mwanga district. A comparison of these three locations helps to explain variation resulting from socio-economic factors that influence livelihood choices, as they change according to gradient of river flow, and to gain a greater awareness and a deeper understanding of the social reality in different contexts.

The third sampling unit was a selection of households. A Participatory Rural Appraisal (PRA) survey (focus group discussions, a time-series analysis and transect walks) were conducted in both villages to identify three livelihood groups: irrigated agriculture, agro-pastoralism and fisheries. These groups acted as a sampling frame for a stratified random sampling. In each livelihood group, 120 respondents were selected, creating a total of 360 households in the study. The locations of the study sites are shown in Figure 1.

Using a statistical formula by Yamane (1967) with a 95% confidence level and 0.05 precision, the sample of 360 respondents was established. The sample was considered adequate for the study, as according to HairJr *et al.* (2006), any sample size usually suffices for descriptive statistics and is therefore considered suitable for rigorous statistical analyses. Sudman (1976) commented that if comparative analysis is to be performed between or within groups, a minimum number of 100 elements is needed for each group. Our sample meets this criterion. The corresponding equation for statistical formula for selected sample is demonstrated below;

$$n = \frac{N}{1 + N(e)^2}$$

Where as;

n      = the sample size

N      = the population size (total number of households)

e      = the level of precision.

Multinomial Logistic Regression (MLR) was employed to analyse the factors influencing choices of livelihoods in the study area. Johnson and Bhattacharyya (2006) explain that

multinomial logistic regression is useful for modelling relationships in which the response depends on two or more predictor variables. The model is used when the dependent variable is nominal and consists of more than two categories. The MLR assumes that data are case specific, that each case has a single value for the independent variable and that the dependent variable cannot be perfectly predicted by any of the independent variables. The dependent variable in the model was identified livelihood categories commonly practised in the area (irrigated agriculture, agro-pastoralism and fisheries) generated from the PRA survey and a cluster analysis. The independent variables in the model include (education, family labour and size of land holdings). Descriptive statistics such as chi-square, cross tabulations and percentage ratios were used to relate choices of livelihoods with household characteristics such as demographics (household size, gender, education, age of the head of household) size of land holdings, credit schemes and CSOs engagement. The results of the statistical analysis provide information about livelihood choices in the sample; the results are not applicable on a national scale.

The corresponding equation for the multinomial logistic regression (MLR) is demonstrated below;

**Equation 1:**

$$Log \frac{Pr\ (Y = Identified\ livelihood\ -\ 1)}{Pr\ (Y = Reference\ livelihood)} = \alpha + \beta_1\ X_1 + \beta_2\ X_2 + \ldots\ldots + \beta_k\ X_k$$

$$Log \frac{Pr\ (Y = Identified\ livelihood\ -\ 2)}{Pr\ (Y = Reference\ livelihood)} = \alpha + \beta_1\ X_1 + \beta_2\ X_2 + \ldots\ldots + \beta_k\ X_k$$

**Equation 2:**

$$Log \frac{Pr\ (Y = J\ )}{Pr\ (Y = J^!)} = \alpha + \beta_1\ X_1 + \beta_2\ X_2 + \ldots\ldots + \beta_k\ X_k$$

**Equation 3:**

*Log* <u>Pr (Y = Irrigated agriculture)</u>  =  $\alpha + \beta_1$ education $+ \beta_2$ family labour $+ \beta_3$ size of land holding

Pr ( Y = Agro-pastoralism)


*Log* <u>Pr (Y = Fisheries)</u>  =  $\alpha + \beta_1$ education $+ \beta_2$ family labour $+ \beta_3$ size of land holding

Pr (Y = Agro-pastoralism)


Where as;

Y        = Dependent variables

$\alpha$        = Constant

$X_1 X_2$   = Independent variables

$B_1 B_2$   = Coefficients or multipliers

K        = Total number of predictors

J        = Identified livelihood category

$J^!$        = Reference livelihood category
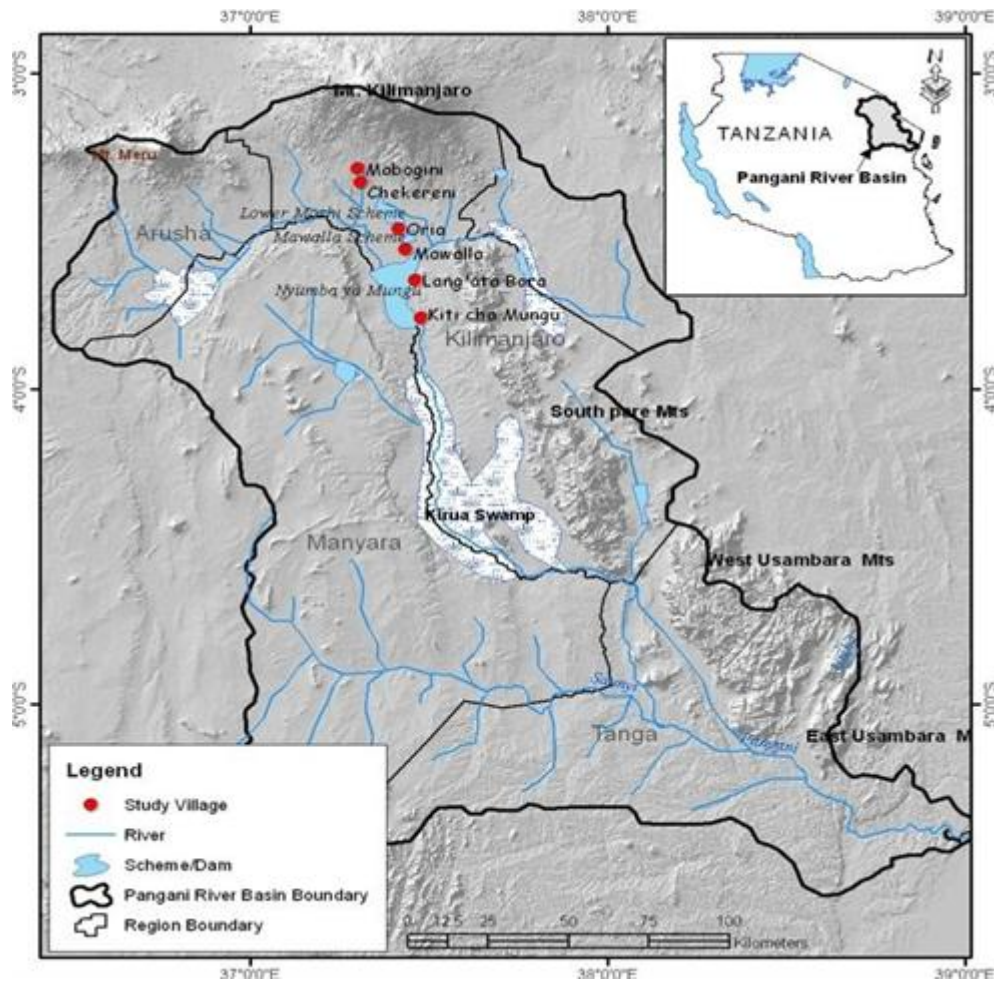
**Figure 1. Map of Pangani river basin showing sampled wetlands and study villages.**

## 5.4 Results and Discussion

### 5.4.1 Socio-economic factors

The research findings from multinomial logistic regression model (Appendix 3) where three livelihood categories (irrigated agriculture, agro-pastoralism and fisheries) acted as dependent variables were tested against independent variables (education, family labour dependency and size of land holding) to determine socio-economic factors influencing choices of livelihoods. The findings from the model indicated; the likelihood ratio chi-square of 248.94 with a p-value $< 0.001$ tells us that our model as a whole fits significantly better than an empty model (i.e., a model with no predictors).

Education is a significant factor influencing the choices of livelihoods in the study area. Controlling for other factors in the model, a one-unit increase in the variable education is associated with a 1.88 increase the likelihood of people to prefer irrigated agriculture over agro-pastoralism while a one-unit increase in the variable education increases the likelihood of engaging in fisheries over agro-pastoralism by 3.97. Further, the dependency of family and child labour is a relatively significant factor influencing the choice of livelihoods in the study area as well. Controlling the other factors in the model, a one-unit increase in the variable family labour dependency is associated with a 1.27 decrease the likelihood of preferring irrigated agriculture over agro-pastoralism while one-unit increase in the variable family labour dependency is associated with a 0.48 decrease the likelihood of preferring fisheries over agro-pastoralism. Generally, an increase in the amount of family labour dependency will be more favoured by agro-pastoralists compared to farmers and fishers (Appendix 3).

The findings indicate a strong correlation between the level of education and family labour dependency as highly significant ($P < 0.05$) with agro-pastoralists more depending on family and child labour for cattle herding and recorded the highest (84%: n=360) illiteracy rate (cannot read and write) compared to the other livelihood niches such as irrigated agriculture (13.5%: n=360) and fisheries (2.5%: n=360) (Fig. 2). Further qualitative findings revealed high level of illiteracy is directly associated to 'cheap land deals' sold to foreign investors by wetland communities since development, access and control to formal contracts by individuals is limited. Additionally, valuation of land and associated economic investments is unknown. The findings revealed 'land leasing' is more practised among farmers, in contrast to fishers and agro-pastoralists where land is frequently sold to investors as a result of migratory lifestyle searching for fishing sites and grazing access.

Findings indicate, permanent settlement as practised by farmers is a prerequisite to access quality education, discourage family labour and fosters land resources protection.

Out of 10,397 registered village lands in Tanzania only 7 percent equivalent to 753 of Tanzanians have received land certificates. The results revealed that, out of 360 respondents only 15 percent are registered with formal certificates of land titles while 85 percent are not registered and operates under the village land and inherited land plots (Table 1).

**Table 1: Access of by different levels of education across wetlands/livelihoods**

|  | Primary school n=235 (%) | Secondary school n=32 (%) | Colleges n=8 (%) | Never gone to school n=85 (%) |
|---|---|---|---|---|
| **Access to land** |  |  |  |  |
| Inheritance | 20 | 48 | 13 | 12 |
| Purchased land | 7 | 14 | 75 | 0 |
| Land lease | 5 | 27 | 0 | 0 |
| Village land | 68 | 11 | 12 | 88 |
|  |  |  |  |  |
| Registered land | 15 | 34 | 75 | 1 |
| Unregistered land | 85 | 66 | 25 | 99 |
|  |  |  |  |  |
| **Livelihoods systems** |  |  |  |  |
| Irrigated agriculture | 34 | 75 | 75 | 13 |
| Agro-pastoralism | 22 | 0 | 0 | 80 |
| Fisheries | 44 | 25 | 25 | 7 |
|  |  |  |  |  |
| **Wetlands** |  |  |  |  |
| LMIS | 34 | 75 | 75 | 13 |
| MIS | 5 | 0 | 0 | 60 |
| NYM dam | 62 | 25 | 25 | 27 |

The study assessed several variables as to what influence access to land and ownership grouped under four categories of 'inheritance', 'purchased', 'rented' and 'allocated land' by village council. Education was highly pronounced as variable with a driving force

under these four categories. Table 1, indicates out of 360 respondents 65.2% have completed primary school education while those who have never been to school ranks 24% out of which 80% compose of pastoralists engaged in agro-pastoralism meaning practicing pastoralism with small scale cultivation. Most of small scale irrigators and fishermen have completed primary education and very few advanced to secondary and college education. It's implication to respondents with primary education level and below in relation to livelihoods; first is inability of these people to diversify to other options of livelihoods and only depend to access village land and water resources to sustain their daily lives largely based under informal sector.

Second is loss of revenue to the Government as indicated by the URT (2010) on the existence of large informal sector approximately 90% of the working population in Tanzania which is not adequately integrated in the formal economy subsequently contributing to limited sources for domestic revenues. Third, family labour with particular to children is evident in the study area and cited as major source of labour power in irrigation fields, fishing sites and most popular among pastoralists as cattle herders (Figure, 2). The study revealed this practice is passed from one generation to the next limiting the young generation to access formal education and later to diversify to other options of livelihoods.
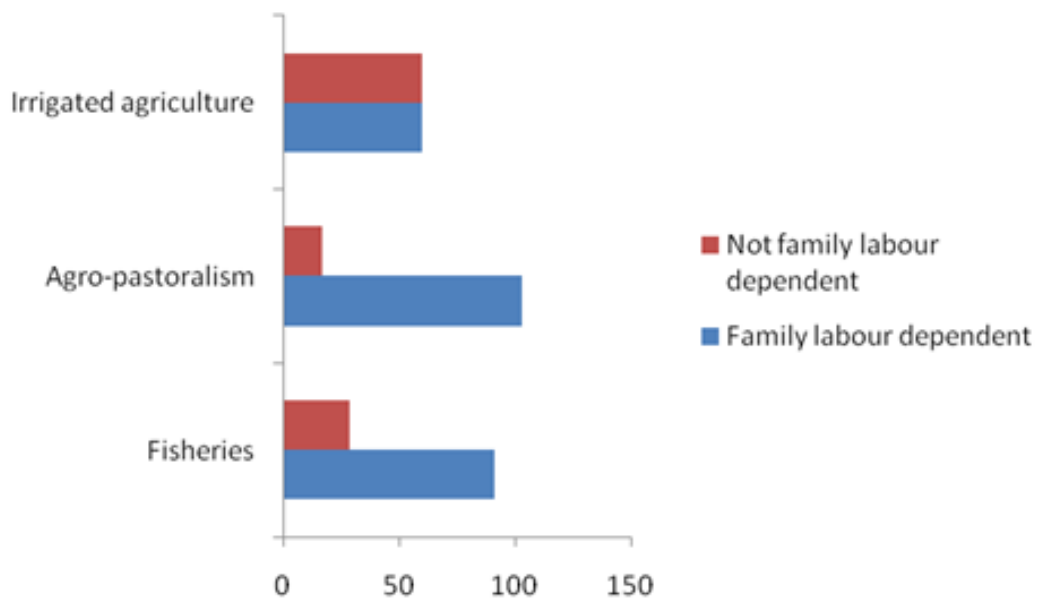
**Figure 2. Family labour dependency, whole sample.**

The study shows that livelihood choices are shaped by the prevailing system of decentralised political structure, where governance of resources such as wetlands is devolved to the lower levels of village councils and civil society organisation (CSOs), however not a panacea to promote quality livelihoods. High level of illiteracy, limited capacity of human resources and shrinking of wetland resource base where most livelihoods depend limit the choices and denies diversification to other economic ventures. Access to and control of wetland resources by more literate and exposed people, particularly land, will sustain livelihood choices and pave the way to off-farm options, creating opportunities to generate higher incomes. However, with the combination of other capital such as human, financial, and social capital, the chance to obtain a good income is greater.

**5.4.1.1 Financial literacy: education as human capability**

According to Walker (2005) considers education as a basic capability and its potential linkage to development, quality of life and freedom. Walker further demonstrates on generation of valued capabilities through provision of quality education by the state, market and civil, society organisations (CSOs). Findings revealed, financial literacy on how to access sources of funds, how to formulate a business plan and how cash is managed and spent within the household is lacking in all livelihood groups, which limits options for diversification to other off-farm opportunities. This deficit stems from the national education system and low levels of literacy in the communities in the study area. Table 2 depicts the level of education by different livelihoods and the paper concludes that implementation of Structural Adjustments Policies has highly affected the education sector through a reduction in public spending on education.

Out of 360 respondents, 65.4% have completed primary school education, 8.8% have completed secondary education, 2.2% have gone to college or university and 23.6 have never been to school. Agro-pastoralists alone accounts for 80% of the people who have never been to school. Illiteracy makes it impossible for people to understand financial systems, interests rates and the purchase of shares. It also makes it difficult to compare banking services and other micro-finance institutions and therefore limits financial opportunities and livelihood choices.

**5.4.1.2 Decentralisation of financial services: promoting social protection**

The decentralisation of financial services as a prerequisite to promote social protection under micro-finance institutions is hampered by poor administrative systems, weak financial control and multiple membership in financial institutions by households, which results in poor accountability for loan repayment and less ability to save. The absence of a

networking system for micro-finance initiatives under CSOs such as Savings and Credit Co-operatives Societies (SACCOs); Village Community banks (VICOBA) and Non Governmental Organisations (NGOs) projects results in the misuse of financial capital because some households can access credit from more than four institutions while other households have no access to credit. The study area is characterised by limited bank services, with just two national micro finance banks (NMBs) in Moshi town and Mwanga districts. Other available financial services are micro-finance institutions. Two decades have passed since Tanzania's government undertook financial sector reforms and witnessed the inauguration of the Cooperatives Societies Act (1991) and subsequent amendment (2003) and the development of equity-based institutions such as the SACCOs. Of 360 respondents in the study, only 225 (62.5%) accessed credit. Of those, 70.6% registered under SACCOs, 15.1% used banks, 12.8% used informal self-help group systems (relatives and friends) and 1.3% registered under NGOs/projects such as VICOBA. Figure 3 presents credit and micro-finance institutions in relation to existing livelihoods. The results indicate that most households depend on SACCOs for credit. Banking services are accessed primarily by farmers in the Lower Moshi Irrigation scheme, while fishers and agro-pastoralists in the Mawalla Irrigation scheme and at Nyumba ya Mungu dam are less favoured with banking services and rely on networks of friends and relatives. The effects of NGOs and donor projects that support micro-finance activities in the study area are not sustainable because these projects are time bound and it is difficult to trace the trickle-down effects of the credit they provide and wider implications for livelihoods and other development initiatives.
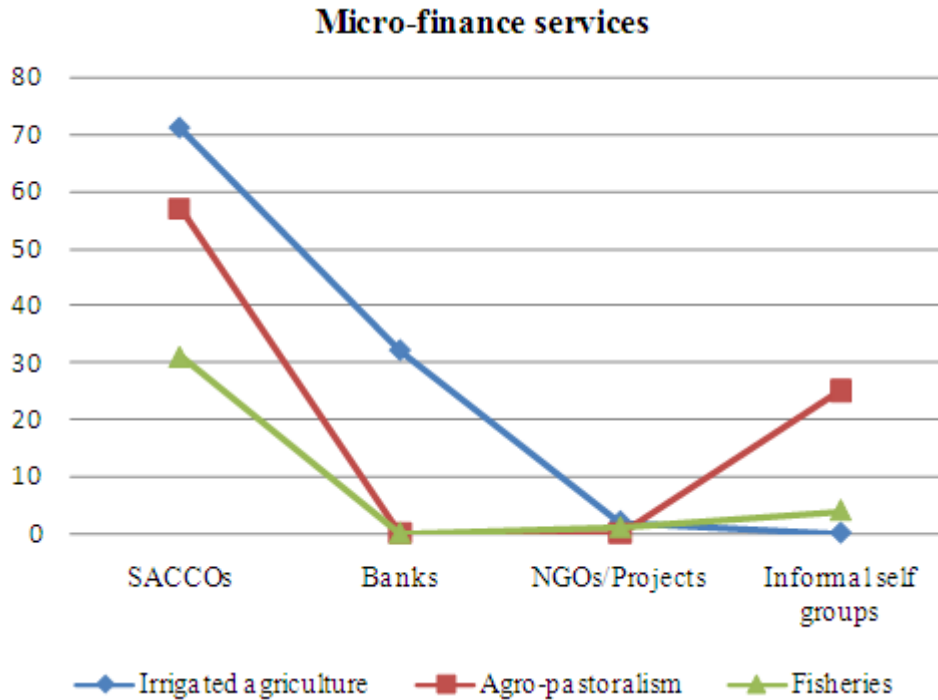
**Figure 3. Micro-finance services.**

Financial capital provides improved livelihoods and fosters social protection through savings, credit and investment and can easily be converted into other types of capital. It can also be used to reduce food insecurity and to gain political influence. Access to financial capital and services in wetland communities and the convertibility of the capital, is highly dependent on natural capital such as land resources for bank collateral and social capital through voluntary monthly cash contributions under CSOs such as SACCOs, VICOBA and self-help groups. The study investigated how credit obtained from CSOs and banking organisations is used and invested. Is it invested in main livelihoods or used to diversify and pursue other livelihoods? Additionally, how are household investments funded? Are they dependent on wetland resources or have other off-farm options have been explored? Migration is used as a coping strategy during times of drought or uncertainty; how does migration affect access to financial capital? The study a noted lack of major public services such as schools, health services, transportation and energy infrastructure, which has a

strong impact on households and can affect credit use and application. Of 360 respondents, members of 225 households accessed credit; of those, 137 (60.8%) used it for multipurpose activities such as paying school fees, health, transportation, energy, communication and home repairs, while 85 (37.7%) used it as a capital to strengthen their livelihoods with farm inputs, fishing gear or veterinary drugs and 3 (1.3%) used it to purchase transportation equipment such as a motorcycle or a bicycle (Table 2).

**Table 2.  Credit expenditures by households**

| Micro-finance institutions | Credits expenditures | | | |
|---|---|---|---|---|
| | **Farm inputs** | **Multi-purpose** | **Transport equipment** | **Total** |
| SACCOs | 34.6 | 62.5 | 1.9 | 100 |
| Bank | 79.4 | 20.6 | 0 | 100 |
| NGOs/projects | 66.7 | 33.3 | 0 | 100 |
| Informal/self groups | 0 | 100 | 0 | 100 |
| **Total** | **84** | **138** | **3** | **225** |

Most of the borrowed funds are not invested in profit generation and are instead used to settle bills for shelter, education, health, energy and communication. Most households are therefore unlikely to repay the loan. Mobile phones and recharge vouchers, which consume significant portion of household income for communication expenditures, were widely used and purchased by the respondents in the study. Owning a mobile phone raises individual status within the society regardless of whether the phone is used to generate income for the household.

## 5.4.1.3 Decentralisation of land governance: conflicting approach

Decentralisation of land governance in the study area gives land management power to the village councils, while water, fisheries and micro-finance resources are managed by CSOs.

This fragmented approach limits success in effectively governing land and other resources such as water and fisheries. Land is important natural capital upon which most households in the study area depend for their income and other investments. The Strategic Plan for the Implementation of the Land Laws - SPILL (2005) says that land sector laws take precedence over all other laws involving land utilisation, such as laws about agriculture, pastoralism, water, forests and fisheries. Other laws that address land are regarded as governing landlord-tenant relationships. An absence of formal working links and reporting relationships between village land councils and CSOs accelerates the problem of land tenure insecurity. There is no communication or feedback on land disputes and resolutions or on how livelihoods are affected; the whole process is treated as 'confidential'.

The land tenure system recognised by law in Tanzania contains two systems: the granted right of occupancy and the customary right of occupancy (URT, 1999b). Land tenure insecurity still poses a challenge to land governance. The quantitative results of the research indicate that, of 360 respondents in the study area, only 15% have formal land title certificates. In the country as a whole, out of 10 397 registered village landholdings in Tanzania, only 7% of landholders (equivalent to 753 Tanzanians) have received land certificates (URT, 2005). The study raises a fundamental question about whether decentralisation has provided a foundation for a democratic approach to land governance and reduced land tenure insecurity through village councils and CSOs. According to Land Act No. 4 of (1999$_a$), land in Tanzania is grouped under three categories: village land (70%) that is managed under the jurisdiction of the village council, reserve land (28%) that is managed by the natural resources and conservation authorities and general land (2%), which is surveyed land administered by the commissioner for lands. The Ministry of land has the mandate to convert land from one category to another, mostly for national interest or for investment purposes, and can revoke rights of occupancy if the land is not being used

wisely or is used in unintended ways. Qualitative results revealed that there has been a significant expansion of village land, reducing the amount of reserve land for national interests such as private investments, national projects and conservation without compensation to the landholders. Insecure land tenure perpetuates poverty, and CSOs do little to influence policy on land matters and investments.

Land holdings have been a central focus for this study, reflecting a democratic approach to land governance. According to URT (2005), land laws approve a minimum of 10 hectares (24.7 acres) for each peasant and three times as much for herders or pastoralists. Village councils were questioned in this study about the criteria for allocating ceilings based on individual land holdings to sustain livelihoods. There is a lack of transparency in the implementation of land laws regarding land redistribution and allocation; in most cases, decisions rely on the integrity of village leaders and village government. There is wide variation in the size of land holdings in upstream and downstream locations and, both within and across wetlands. Figure 4 depicts a spurious relationship between the size of land holdings.

Of 120 respondents from fishing communities, 88% own 1 to 3 acres of land and 12% own 4 to 5 acres. Agro-pastoralists have larger landholdings than communities based on irrigated agriculture and fishing; 91% of agro-pastoralists hold 2 to 10 acres of land and the remaining 9% hold 11 t to 25 acres. Two agro-pastoralists in the study owned 20 and 25 acres of land in Lang'ata bora around NYM dam.
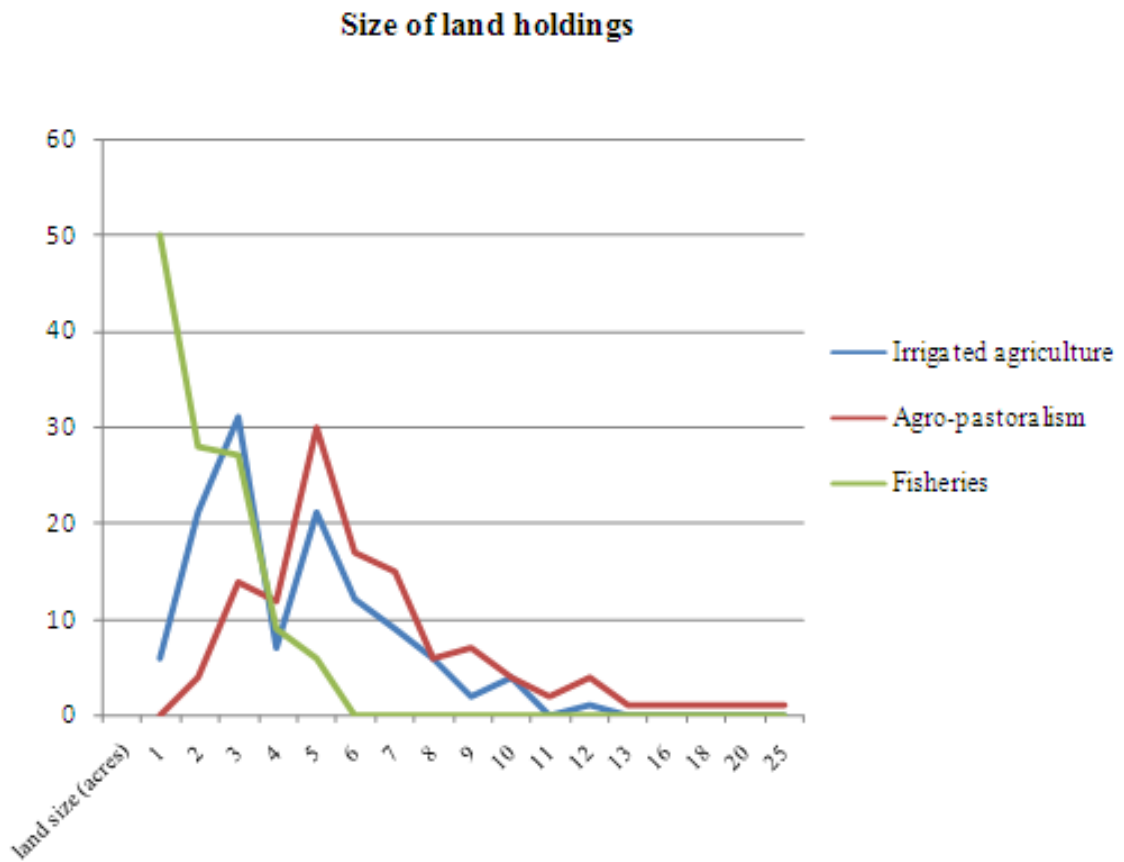
**Figure 4. Size of land holdings, whole sample.**

Land laws favour farmers and pastoralists over fishermen in terms of size of land holdings; farmers and pastoralists therefore enjoy more diversified livelihoods. Most fishermen use common pool resources - CPRs such as NYM dam, which is owned by the Pangani Basin Water Office. According to some scholars (Gordon 1954; Hardin 1968; Ostrom *et al*., 1994; Gardner et *al*., 2000) individuals who depend on CPRs are trapped in a social dilemma that leads to the destruction and degradation of these resources. Illegal overfishing is a common phenomenon at NYM dam, leading to a decline in the fish supply and the degradation of other aquatic resources. The study question on the land laws to have equal consideration to both livelihoods including fisheries where ownership of fishing sites can be owned by groups of individuals of the same locality.

## 5.5 Conclusion

Poverty is the driver of using family labour that denies education access to children. This practice is passed from one generation to the next as noted commonly among agro-pastoralists and fishers. The paper concludes by putting in place useful suggestions for sustainable livelihoods options in the wetlands of Pangani. Political leadership from central to local government should endeavour to diffuse politics from governance and promote culture of budget discipline. Budget discipline by central and local government authorities is fundamental factor that facilitate public service efficiency in the sectors of education, health, transport and communication. Public service efficiency will promote welfare of the society and reduce share of household income to finance public services and diversifying livelihoods (livelihood mix) to existing potential economic options. In the long run poverty levels will be reduced leading to decline of family labour dependency and pave way to education access to children.

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**CHAPTER SIX**

**6.0    GENERAL CONCLUSIONS AND RECOMMENDATIONS**

**6.1 Conclusions of major findings**

The following are the summary of the major findings of this study which is the basis for the recommendations made.

**6.1.1 Challenges of institutional decentralisation in wetland management of the**

**Pangani river basin, Tanzania**

The major challenge facing the artificial wetlands of the Pangani river basin is how to link the river basin model to the country's decentralised political structure. Sustainable options for wetland-based livelihoods will greatly depend on how the state bureaucracy is positioned to develop donor policies that will fine tune the adopted agreements and international conventions on wetlands towards promoting domestic sources of revenue. Domestic sources of revenue plays a fundamental role in boosting economic growth in wetland communities and entire ecosystem. Institutional reforms in linking land and water is recommended through co-management in joint budget planning, revenue collection and cost-benefit sharing. Further the co-management should include both the state and non-state actors to engage all land holders, associated livelihoods and economic activities in the wetlands to facilitate joint revenue collection. Sharing power and benefits through consensus building by stakeholders is essential to promote sustainable livelihoods as well as wetland conservation.

**6.1.2 Critique of decentralised political structure in the management of wetland resources' stakeholders**

Decentralisation system within the political structure should target on setting grounds for mobilizing domestic sources of revenue particularly to water sector which faces serious challenges regarding financial dimension of governance. Water resource is a key controlling factor in wetlands, however the water sector is not a driver of economic development, drivers are from the non-water sectors such as agriculture, energy, tourism and fisheries. The study found out what is generated from non-water sectors is not ploughed back to maintain the wetland resource base where water is the key resource. Benefit sharing mechanism between water and non-water sectors is recommended. Additionally, protected area model is proposed to core wetlands such as "water sources and catchment areas" to ensure environmental flows are maintained as key to sustain livelihood production systems. Diversification of livelihoods within a protected area model such as tourism development will add value to sustain livelihoods, generate income and maintaining ecological integrity of wetlands.

**6.1.3 Engendering wetland-based livelihoods through decentralisation in Tanzania.**

The poor link between political and sectoral decentralisation is the major driver of gender inequalities. And further the poor linkage limits the capacity of promoting economic growth due to uncoordinated planning, revenue collection and law enforcement. Economic growth is key to addressing gender inequalities and associated discriminatory practices against women, which are to a greater extent, due to increased levels of poverty. Strengthening domestic sources of revenue is the only sustainable measure to ensure sufficient budgets across sectors. With sufficient budgets, inequality across livelihood

niches will be addressed more adequately and ultimately address the needs and aspirations of men and women.

## 6.1.4 Assessment of the socio-economic factors influencing livelihood choices in the decentralised systems of Pangani river basin, Tanzania

Political leadership from central to local government should endeavour to diffuse politics from governance and promote culture of budget discipline. Budget discipline by central and local government authorities is fundamental factor that facilitate public service efficiency in the sectors of education, health, transport and communication. Further will promote capital formation (tax and credits), growth in labour through investments in technology and human capital. Investment in human capital will enhance education, skills and knowledge to the public and will pave a way to diversification of livelihoods. Livelihood mix is a result of livelihood diversification to explore in other economic potentials apart from wetlands resources. Limiting size of the government is also proposed as a mechanism for budget discipline to facilitate resource efficiency.

## 6.2 Area for further research

**(i) Linking land and water use investments**

The linking of land use investments and water resources within the decentralisation systems in the river basin context should be investigated for further research, as well as the inventory and socio-economic assessment of artificial wetlands.

**(ii) Political and sectoral decentralisation**

The link between political and sectoral decentralisation should be investigated for further research as fundamental for mobilising domestic sources of revenue. Revenue from water, fisheries and other sources of informal sector across livelihoods should be explored for a proper record on revenue generation.

# APPENDICES

## Appendix 1: Study area population

| Region | District | Area within Pangani river basin (km$^2$) | % contribution of each district to basin area | Population 2002 | Population in Pangani river basin | No of households |
|--------|----------|------------------------------------------|----------------------------------------------|-----------------|-----------------------------------|------------------|
| Arusha | Arusha | 103.51 | 0.24% | 282,712 | 282,712 | 72,490 |
|  | Monduli/Arumeru | 2266.25 | 5.25% | 516,814 | 516,814 | 112,351 |
| Kilimanjaro | Hai | 1224.62 | 2.84% | 259,958 | 129,979 | 28,884 |
|  | Moshi urban | 1527.53 | 3.54% | 144,336 | 144,336 | 35,204 |
|  | Moshi rural |  |  | 402,431 | 402,431 | 85,624 |
|  | Mwanga | 2003.96 | 4.64% | 115,620 | 115,620 | 24,088 |
|  | Rombo | 619.93 | 1.44% | 246,479 | 61,620 | 12,575 |
|  | Same | 4970.72 | 11.51% | 212,325 | 191,093 | 39,811 |
| Manyara | Simanjiro | 16620.51 | 38.48% | 141,676 | 127,508 | 29,653 |
|  | Kiteto | 1290.84 | 2.99% | 152,757 | 15,276 | 3,182 |
| Tanga | Lushoto | 1387.88 | 3.21% | 419,970 | 167,988 | 35,742 |
|  | Korogwe | 2974.05 | 6.89% | 261,004 | 261,004 | 58,001 |
|  | Muheza | 410..74 | 0.95% | 279,423 | 55,885 | 12,419 |
|  | Pangani | 462.86 | 1.07% | 44,107 | 13,232 | 3,393 |
|  | Handeni | 4987.64 | 11.55% | 249,572 | 74,872 | 15,598 |
|  | Kilindi |  |  | 144,359 | 28,872 | 5,892 |
| Ocean |  | 7.59 | 0.02% |  |  |  |
| Kenya |  | 2333.90 | 5.40% |  |  |  |
|  | **Total Area** | **43192.54** | **100.0** |  | **2,589,240** | **574,907** |

Source: Turpie et al (2005).

**Appendix 2: River basin model versus decentralised political structure**

| River basin / Political Structure | Global | Market | Community |
|---|---|---|---|
| Central Government | | Internationalisation | |
| Regional Authority | | **DEMOCRATIC ADMINISTRATION SYSTEM** | |
| District Authority | Neo-liberalisation | | Democratic participation |
| Wards | | Decentralisation | |
| Villages/ sub-villages | | | |

# Appendix 3: Multinomial Logistic Regression – Parameter estimates

## Case Processing Summary

| | | N | Marginal Percentage |
|---|---|---|---|
| Livelihood | Irrigated agriculture | 120 | 33.3% |
| | Fisheries | 120 | 33.3% |
| | Agro-pastoralism | 120 | 33.3% |
| Education level: primary/secondary/colege | primary school | 237 | 65.8% |
| | secondary school/colleges | 42 | 11.7% |
| | never gone to school | 81 | 22.5% |
| family labour – father/mother/children | family dependent | 254 | 70.6% |
| | not family dependent | 106 | 29.4% |
| The size of land holding (in acres) | 1 - 5 | 270 | 75.0% |
| | 6 - 10 | 78 | 21.7% |
| | 11 and above | 12 | 3.3% |
| Valid | | 360 | 100.0% |
| Missing | | 0 | |
| Total | | 360 | |
| Subpopulation | | 16[a] | |

a. The dependent variable has only one value observed in 8 (50.0%) subpopulations.

## Model Fitting Information

| Model | Model Fitting Criteria | Likelihood Ratio Tests | | |
|---|---|---|---|---|
| | -2 Log Likelihood | Chi-Square | df | Sig. |
| Intercept Only | 314.495 | | | |
| Final | 65.561 | 248.935 | 10 | .000 |

## Pseudo R-Square

| | |
|---|---|
| Cox and Snell | .499 |
| Nagelkerke | .562 |
| McFadden | .315 |

**Likelihood Ratio Tests**

| Effect | Model Fitting Criteria | Likelihood Ratio Tests | | |
|---|---|---|---|---|
| | -2 Log Likelihood of Reduced Model | Chi-Square | df | Sig. |
| Intercept | 65.561[a] | .000 | 0 | . |
| education | 167.646 | 102.085 | 4 | .000 |
| labour | 79.650 | 14.089 | 2 | .001 |
| landholding | 142.265 | 76.705 | 4 | .000 |

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

**Parameter Estimates**

| Livelihood[a] | | B | Std. Error | Wald | df | Sig. | Exp(B) | 95% Confidence Interval for Exp (B) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Lower Bound | Upper Bound |
| Irrigated agriculture | Intercept | -17.739 | 1792.278 | .000 | 1 | .992 | | | |
| | [education=1] | 1.878 | .392 | 22.924 | 1 | .000 | 6.544 | 3.033 | 14.118 |
| | [education=2] | 33.161 | 2863.507 | .000 | 1 | .991 | 2.522E14 | .000 | [b] |
| | [education=3] | 0[c] | . | | 0 | . | . | . | . |
| | [labour=1] | -1.267 | .390 | 10.545 | 1 | .001 | .282 | .131 | .605 |
| | [labour=2] | 0[c] | . | | 0 | . | . | . | . |
| | [landholding=1] | 17.513 | 1792.278 | .000 | 1 | .992 | 4.036E7 | .000 | [b] |
| | [landholding=2] | 16.412 | 1792.278 | .000 | 1 | .993 | 1.342E7 | .000 | [b] |
| | [landholding=3] | 0[c] | . | | 0 | . | . | . | . |
| Fisheries | Intercept | -36.241 | .829 | 1911.283 | 1 | .000 | | | |
| | [education=1] | 3.973 | .755 | 27.697 | 1 | .000 | 53.168 | 12.105 | 233.517 |
| | [education=2] | 34.856 | 2863.508 | .000 | 1 | .990 | 1.373E15 | .000 | [b] |
| | [education=3] | 0[c] | . | | 0 | . | . | . | . |
| | [labour=1] | -.480 | .432 | 1.237 | 1 | .266 | .619 | .265 | 1.442 |
| | [labour=2] | 0[c] | . | | 0 | . | . | . | . |
| | [landholding=1] | 33.871 | .000 | . | 1 | . | 5.126E14 | 5.126E14 | 5.126E14 |
| | [landholding=2] | 14.287 | 1821.495 | .000 | 1 | .994 | 1602221.081 | .000 | [b] |
| | [landholding=3] | 0[c] | . | . | 0 | . | . | . | . |

a. The reference category is: Agro-pastoralism.

b. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

c. This parameter is set to zero because it is redundant.

## Appendix 4: Household questionnaire

Name of the Interviewer .................... Name of the Interviewee ...............................

District ................. Ward ................ Village ........... Sub-village ...........................

A" SOCIO-ECONOMIC ISSUES

1. Marriage 1 = Married 2 = Not married 3 = Widow/Widower 4 = Divorced

2. Gender 1 = Male 2 = Female

3. Total number of people living in our household 1 = Adults 2 = Children

4. Level of education I = I – VII 2= I – V 3 = IV-VI 4 = College/University

   5= Not educated

5. Age ................................................ years Tribe ........................................................................

6. What are your main economic activities? Mention the most important one;

   1=agriculture 2=fisheries 3=agro-pastoralism 4=Small scale business 5=charcoal burning

   6=tourism

   7=timber harvesting 8=carpenter 9=government employee

7. What is the major source of your income? Mention the most important source

   1=agriculture 2=fisheries 3=agro-pastoralism 4=Small scale business 5=charcoal burning

   6=tourism

   7=timber harvesting 8=carpenter 9=government employee

8. How long have you stayed in this village? ........................... years

9. How do you compare this village welfare in generating livelihood?

   1=Very good 2=good 3=average 4=bad 5=very bad

10. Why are you living in this village

    1=born here 2=marriage 3=economic potential 4=political reasons 5=others

    (mention)...........................

11. Which one of the following options ranks the most top five in generating employment? Prioritise the

    most important one:

    a. Agriculture (rainfed) b. Agriculture wetlands) c. Fisheries (wetlands)

    d. Agro-pastoralism (wetlands) e. Tourism (wetlands) f. Timber harvesting

    g. Charcoal burning h. Government employment i. Business – small scale

## B. WETLAND RESOURCES AND BENEFITS

12. Do you benefit from wetland resources? 1 = yes  2 = no

If yes, what do you consider as the most benefit derived from wetlands?

1=irrigated agriculture   2=fisheries   3=pastoralism   4=conservation      5=tourism   6=handicrafts

7=others(mention)

13. What percentage of your total household income (last year) was generated from wetland

resource......................

14. If     no     income     was     generated     what     were     the     possible     reasons?

Mention......................................................

15. Do you experience environmental degradation? 1=yes   2=no

16. If yes, what are the factors contributing reasons to degradation

1=unsustainable agriculture practices harvesting  2=illegal fishing  3=environmental pollution

4=illegal hunting  5=unsustainable cattle grazing  6=others mention)

## C. LIVELIHOOD STRATEGIES AND OPTIONS

Irrigated agriculture

17. Natural capital – land ownership and mode of production

| Far m no. | Plo t no. | Distance from home (km) | Farming duration (years) | Certificate of land registration | Acces s to land | Land ownershi p | Means of production | Irrigatio n scheme | Farm / plot size | Soil qualit y |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | | | | | | | | | |
| | 2 | | | | | | | | | |
| | 3 | | | | | | | | | |
| | 4 | | | | | | | | | |
| 2 | 1 | | | | | | | | | |
| | 2 | | | | | | | | | |
| | 3 | | | | | | | | | |
| | 4 | | | | | | | | | |
| 3 | 1 | | | | | | | | | |
| | 2 | | | | | | | | | |
| | 3 | | | | | | | | | |
| | 4 | | | | | | | | | |

Certificate of land registration:     1=registered  2=not registered  3=public/common land
Access to land:                       1=inheritance 2=purchased 3=rented 4=others
Land ownership:                       1=Father  2=Mother  3=Both
Means of production:                  1=rainfed  2=Irrigation (human-made wetlands)
Irrigation schemes:                   1=LMIS  2=MIS  3=none
Size of land (acres):                 1=1-5  2=6-1=  3=11-20  4=21 and above
Soil quality:                         1=very good  2=good  3=average  4=bad  5=very bad

18. Types of cultivated crops

| Farm no. | Plot no. | TYPES OF CROPS CULTIVATED | | | | | | | | | | Mode | Irrigation schemes | Mans of production | | Size of farm/ plot |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2009 | | | 2008 | | | 2007 | | | | | | | | |
| 1 | 1 | | | | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | |
| | 4 | | | | | | | | | | | | | | | |
| 2 | 1 | | | | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | |
| | 4 | | | | | | | | | | | | | | | |
| 3 | 1 | | | | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | |
| | 4 | | | | | | | | | | | | | | | |

Cultivated crops: 1=rice/paddy 2=maize 3=beans 4=vegetables (tomatoes, onions, cabbage, eg plant, okra)

Potatoes) 5=Banana plants 6=Fruits mangoes, oranges) 7=others.....................................

Mode of production: 1=rainfed 2-Irrigation (wetlands)
Irrigation schemes: 1=LMIS 2=MIS 3=none
Means of production: 1=hand hoe 2=cattle plough 3=tractor
4=others..................................................................

Agro-pastoralism
\

| Type | Amount | Years | Land registration | Access to land | Land ownership | Means prodn | Mode prodn | Amount (Kgs/Lts) | Amount sold |
|---|---|---|---|---|---|---|---|---|---|
| Cattle | | | | | | | | | |
| Goat | | | | | | | | | |
| Sheep | | | | | | | | | |
| Chicken | | | | | | | | | |
| Pigs | | | | | | | | | |
| Donkey | | | | | | | | | |

Land rights ownership 1=\registered 2=Not registered/Society 3=Public land – CPRs
Land availability 1=Inheritance 2=Purchased 3=Rent 4=others\
Land owner 1=male 2=Female 3=Male and Female (both)
Means of production 1=seasonal rain 2=migratory (wetlands)
Mode of production: 1=Milk 2=Meat 3=Manure 4=Cattle selling 5=Eggs 6=Others
Size of land (acres): 1=1-5 2=6-10 3=121-20 4=21 and above

19. How many cattle do you possess?.................................................................................
20. Cattle keeping services (vaccination): 1=District 2=Private 3=NGOs projects
21. Do you migrate to other areas for grazing and wate3ring sites? 1=yes 2=no
22. What percentage of the total household income did you generate from agro-pastoralism – last years?......................

Fisheries
23. Is you household engaged with fisheries?1=yes 2=no
24. Who is totally responsible with fishing?
    1=father 2=mother 3=children 4=all 5=casual labourers/others
25. Do you migrate to other areas for fishing sites? 1=yes 2=no
26. If yes, who stays with the family? 1=father 2=mother 3=neighbour 4=relatives
27. Do you have fishing licence? 1=yes 2=no
28. Access to fishing sites: 1=own fish pond 2=wetlands 3=open area
29. Land ownership: 1=inheritance 2=purchased 3=rented 4=others mention..............

30. Average size of land ownership per household: .....................acres/hectares
    Size of land (acres): 1=1-5  2=6-10  3=11-20  4=21 and above
31. How is the trend of fish availability for the last decade? Has it changed? 1=Yes  2=no
    If yes specify: 1=increased supply  2=decreased supply  3=no changes
32. How is the trend of fishers migration to the area for the last decade? 1=increased  2=decreased  3=no changes
33. Is the fishing sector declining?  1=yes      2=no      If yes, for what percentage.............................................................
    If yes, what are the possible reasons: 1=Illegal fishing  2=Illegal fishing gear  3=population pressure 4=others
34. Where do you sell fish and fish products?  1=brokers – village  2=brokers-=town  3=roadside 4=restaurant/hotels  5=other regions please mention................................................
35. How much percentage of our total income – last year was generated from fishing .............................................

Fishers trend – revenue and expenditures

| Revenue per annum | 2008 | | | 2009 | | |
|---|---|---|---|---|---|---|
| | Type 1 | Type 2 | Type 3 | Type 1 | Type 2 | Type 3 |
| Sales – fresh fins | | | | | | |
| (kilogram) | | | | | | |
| Home consumption | | | | | | |
| (kilogram) | | | | | | |
| Expenditures | | | | | | |
| Per annum | | | | | | |
| Taxes | | | | | | |
| Local government | | | | | | |
| Fishing licence | | | | | | |
| Landing fees | | | | | | |
| Purchase of fishing gears | | | | | | |
| Maintenance fishing gears | | | | | | |
| Casual labourers | | | | | | |
| Canoes renting | | | | | | |
| Packing equipments | | | | | | |
| Transport | | | | | | |
| Others | | | | | | |

## D. FINANCIAL CAPITAL

| | Credit availability | Credit provider | Credit amount | Repayment period | Payment schedules 1=monthly 2=farming season | Total repayment | Application credit purpose |
|---|---|---|---|---|---|---|---|
| 2009 | | | | | | | |
| 2008 | | | | | | | |
| 2007 | | | | | | | |
| | Have you ever provided credit? | To whom? | Credit amount | Repayment period | Payment schedule 1=monthly 2=farming season | Total repayment | Application/credit purpose |
| 2009 | | | | | | | |
| 2008 | | | | | | | |
| 2007 | | | | | | | |
| | Do you have savings? | Where do you keep our savings? | | How much? | Do you get interest from your savings? 1=yes 2=no | If yes, how much annually? | Why do you keep our savings the |
| 2009 | | | | | | | |
| 2008 | | | | | | | |
| 2007 | | | | | | | |

Credit provider: 1=credit programs 2=bans 3=projects 4=NGOs 5=Businessmen 6=villagers 7=cooperatives 8=savings and credit society – SACCOS 9=others
Credit application: 1=farm implements 2=fishing gears 3=cattle vaccines 4=school fees 5=food/groceries 6=health expenses 7=ceremonies 8=others
Whom did you provide credit: 1=relatives 2=farmers 3=SACCOs member 4=Cooperative member 5=others
Reasons for credit request: 1=profit 2=social capital 3=solving problems 4=others
Where do you keep your savings: 1=bank 2=home relatives 4=cooperatives 5= SACCOs 6=others
Why do you keep your savings there? 1=no bank services 2=tradition 3=social networking 4=subsidy on farm implements 5=access to credit 6=others

## E. HOUSEHOLD PROPERTIES

| TOOLS | NUMBER |
|---|---|
| Ownership 1=head of the household  2=house rented | |
| If is a rented house, how much do you pay as a monthly rent? | |
| How many members are present in your household? | |
| Type of construction equipment 1=wood  2=cement blocks  3=burnt bricks 4=soil bricks  5=soil | |
| Total number of the rooms in hour house | |
| Type of construction equipment 1=wood  2=cement blocks  3=burnt bricks 4=soil bricks  5=soil bricks covered with cement  6=others (tree branches) | |
| Roof  1=iron sheets  2=tiles  3=cement  4=water taps  4=Dam  5=others | |
| Availability of water 1=river  2=water well  3=water taps  4=others | |
| Availability of electricity  1=kerosene lamp  2=generator  3=solar 4=TANESCO 5=candles 6=firewood  7=others | |
| Energy (cooking)  1=charcoal 2=firewood 3=gas cooker  4= electric cooker 5=others | |
| Type of toilet//bathroom  1=none  2=pit latrine  3=western type (sitting) 4=Indian type  5=others | |

36. Type of house and accessories within the household
37. How many meals do you consume per day? 1=three  2=two   3=one

## F. HOUSEHOLD – FAMILY AND CHILD LABOUR

38. Dependency of the family labour in generating household income from livelihood activities

| Activity | Number of Activity | Number of people | | | Seasons | Income |
|---|---|---|---|---|---|---|
| | | Males | Females | Children | | |
| Agriculture | 1 | | | | | |
| Cattle grazing | 2 | | | | | |
| Cleaning & drying | 3 | | | | | |
| of fish | 4 | | | | | |
| Selling of fish | 5 | | | | | |
| Selling of crops | 6 | | | | | |
| Selling of cattle | 7 | | | | | |
| Selling of milk | 8 | | | | | |
| Tailoring | 9 | | | | | |
| Restaurants/Groceries | 1- | | | | | |
| Brick making | 11 | | | | | |
| House construction | 12 | | | | | |
| Daily housework | 13 | | | | | |
| Casual labour | 14 | | | | | |

## G. HOUSEHOLD – PHYSICAL ASSETS

| Code No | Asset | Number of assets | Total assets | Buying price (Tshs) | Current price (Tshs) | Year purchases |
|---|---|---|---|---|---|---|
| 1 | Radio | | | | | |
| 2 | Bicycle | | | | | |
| 3 | Motorcycle | | | | | |
| 4 | Vehicle | | | | | |
| 5 | Gun/Rifle | | | | | |
| 6 | Television | | | | | |
| 7 | Mattress | | | | | |
| 8 | Beds | | | | | |
| 9 | Carpets | | | | | |
| 10 | Side chairs | | | | | |
| 11 | Chairs | | | | | |
| 12 | Tables | | | | | |
| 13 | Plates | | | | | |
| 14 | Bucket | | | | | |
| 15 | Saucepan | | | | | |
| 16 | Sofaset | | | | | |
| 17 | Cupboard | | | | | |
| 18 | Wardrobe | | | | | |
| 19 | Spoon/knives | | | | | |
| 20 | Bedcovers | | | | | |
| 21 | Refrigerators | | | | | |
| 22 | Mobile phones | | | | | |
| 23 | Gas/electric cooker | | | | | |
| 24 | Others | | | | | |

## H. HOUSEHOLD – INCOME AND EXPENDITURES

| Source of Income | Amounts Tshs | | Responsible person in receiving the money | | |
|---|---|---|---|---|---|
| | 2009 | 2008 | | | |
| 1.  Salary | | | | | |
| 2.  House rent | | | | | |
| 3.  Land rent | | | | | |
| 4.  Charcoal making | | | | | |
| 5.  Burnt bricks | | | | | |
| 6.  Handcrafts | | | | | |
| 7.  Monthly pension | | | | | |
| 8.  Assistance from family members | | | | | |
| 9.  Timber harvesting | | | | | |
| | | | | | |
| Household expenses | 2009 | 2008 | Responsible person in paying the money | | |
| 1.  House rent | | | | | |
| 2.  Electricity bill | | | | | |
| 3.  Water bill | | | | | |
| 4.  School fees | | | | | |
| 5.  Food/groceries | | | | | |
| 6.  Phone vouchers | | | | | |
| 7.  Clothing | | | | | |
| 8.  House construction | | | | | |
| 9.  Fuel energy (cooking) | | | | | |
| 10. Ceremonies | | | | | |
| 11. Group-contributions | | | | | |
| 12. Health expenses | | | | | |
| 13. Transport | | | | | |

The person responsible in paying and receiving money:
1=Head of the family (husband)  2=wife of the head of the family's  3=head of the family (woman)
4=female child (head)  5=male child (head)  6=others (mention)...................................................................

### I. CIVIL SOCIETY ORGANISATION – CSO

39. What type of CSO are you involved with?
1=registered  2=not registered  3=others. Please mention..........................................................

40. What are the conditions attached to joining CSO (mention the most important one)  1=fees  2=member of the village  3=land holding  4=water users  5=fishing site  6=others.........................................................................

41. Are you aware of environmental laws governing wetlands in water, livestock irrigation schemes and fishing sites?  1=yes  2=no
If yes, please mention....................................................................................................

42. Do you pay for water connection/abstraction?  1=yes  2=no

43. Do you need to be member of water users association to access water for irrigation in the schemes?

1=yes  2=no

44. Does the available water supply meet the requirement of water services for irrigation?
1=yes  2=no
If no, what should be done.................................................................................................

45. Does the Pangani Basin Water Office responsible for water fees collection?  1=yes  2=no

46. What other organizations are engaged with community development in your area?
Please mention.......................................................................................................................

### J. OTHERS

47. Have you ever been involved in training in the following areas:
1=wetlands  2=irrigation  3=fishing  4=forestry  5=rain water harvesting  6=others.........................................

48. if yes, which organization was responsible for training provision?
1=government  2=Pangani Basin Water Office  3=NGOs (mention..............) 4=Others

49. which kind of group (livelihoods) was responsible to be trained?
1=irrigators  2=lower Moshi Irrigators  3=Fishers  4=Villagers (mention what village..........)  5=others

50. was the training important? 1=very important  2=important  3=average  4=not important  5=I don't know

51. what kind of training would you like to be exposed in future for promoting your livelihood?

52. General suggestions
.......................................................................................................................................
.......................................................................................................................................
.......................................................................................................................................
.......................................................................................................................................