



**The United Republic of Tanzania
Vice-President's Office
National Environmental Management Council**

**Consulting Services for Preparation of a
Landscape Wide Conservation Plan for the Upstream
Kihansi Catchment
Interim Report**



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ACRONYMS & ABBREVIATIONS

ALAT	Association of Local Authorities of Tanzania
BAMAKA	Baraza la Maendeleo Kata
BAMATA	Baraza la Maendeleo Taifa
CBD	Convention on Biological Diversity
CBOs	Community Based Organization
CEPF	Critical Ecosystem Partnership Fund
CG	Community Grant
CM	Catchment Management
CMP	Catchment Management Programme
DADS	District Agricultural Development Support Programme
DC	District Council
DED	District Executive Director
DoE	Division of Environment
DPLO	District Planning Officer
EAMCEF	Eastern Arc Mountains Conservation Endowment Fund
EARP	Eastern Africa Regional Programme
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ERB	Environmental Regulatory Body
EU	Environmental Units
GEF	Global Environment Facility
ILFEMP	Institutional and Legal Framework for Environmental
ITCZ	Inter-Tropical Convergence Zone
IUCN	International Union for Conservation of Nature and Natural
KRC	Kihansi River Catchment
LKHP	Lower Kiwanis Hydropower Project
LWCP	Landscape Wide Conservation Plan
MNRT	Ministry of Natural Resources and Tourism
MUAJAKI	Participatory Public Health Project
MW	Mugawatt
MWLD	Ministry of Water and Livestock Development
NAWESCO	National Water Wetland Steering Committee
NAWETCO	National Wetland Technical Committee
NBSAP	National Biodiversity Strategy and Action Plan
NCSSD	National Conservation Strategy for Sustainable Development

NEAP	National Environment Action Plan
NEMC	National Environmental Management Council
NEP	National Environmental Policy
NFP	National Forest Policy
NGOs	Non Government Organization
NWP	National Water Policy
PA	Protected Area
PRA	Power Purchases Agreements
PSRC	Parastatal Sector Reform Commission
RWBO	Rufiji Water Basin Office
SACCOS	Saving and Credit Cooperative Society
SADC	Southern African Development Community
SE-MAKI	Socioeconomic Mitigation at Kihansi
TANESCO	Tanzania Electric Supply Company Limited
TBA's	Traditional Birth Attendants
TFCG	Tanzania Forest Conservation Group
TH	Traditional Healer
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
USCFR	Udzungwa Scarp Catchment Forest Reserve
VA	Village Assembly
VEO	Village Executive Officer
VG	Village Government
VPO	Vice-President's Office
WCS	Wildlife Conservation Society
WCST	Wildlife Conservation Society Tanzania
WDC	Ward Development Committee
WPT	Wildlife Policy of Tanzania
WWF	World Wildlife Fund

SECTION 1. INTRODUCTION

1.1 Background

This interim report consolidates progress to date on the tasks toward developing a comprehensive Landscape Wide Conservation Plan for the Kihansi Catchment. The Kihansi Catchment refers to the upper watershed area above the recently constructed Kihansi dam and hydropower station. The LWCP is being developed in harmony with the broader Environmental Management Plan that encompasses all areas directly affected by hydropower project. As part of a region of critical and threatened biologically diverse resources, the LWCP will be developed in a manner consistent with and overall conservation planning and programming in the Eastern Arc Ecoregion, and specifically in the Udzungwa Mountain block.

The Tanzania Electric Supply Company Limited (TANESCO) is currently the sole supplier of electricity in Tanzania. Due to increased demand for electricity in Tanzania, the Lower Kihansi Hydropower Station was constructed by TANESCO and funded by Government of Tanzania, the World Bank, and the European Investment Bank, during 1994-2001. It started power generation in June 2001 after nearly 6 years of construction and is located at the border between Iringa and Morogoro Regions. This installation has a full capacity of 180 MW with an ultimate goal to produce 300 MW (Gerstle, et al. 1997).

The station utilises the falling water of the Kihansi River to generate hydropower for the Tanzanian national power grid. Udzungwa Scarp Forest Reserve which partly lies in the upstream of Kihansi Catchment, constitutes approximately one-third of the entire water catchment for the Kihansi Hydropower Project¹. The Kihansi River flows into the Kilombero River, which is a tributary of the Great Ruaha River. The scheme incorporates a 25m high dam with a 26-hectare reservoir, which diverts water to an underground power generating station, returning water to the river about 6 km downstream.

A number of environmental and conservation problems have been identified across the Kihansi catchment. Attention was first directed to subjects in the lower Kihansi basin, between the dam and a floodplain where the river discharges into a larger drainage system. Later on, surveys were extended to cover most of the catchment, including the upper basin of the Kihansi where human activity, notably poor cultivation practices and forest destruction through swidden practice, were seen as causes of soil erosion, and hence a source of sediment deposition with a potential to reduce storage capacity of the dam.

¹ Gerstle, J.H., S.L. Mhavi, and J. Lindemark. Environmental aspects of the lower Kihansi Hydropower Project, Tanzania. 1997. pages 23-31. In: Hydropower '97. (Proceedings of the 3rd International Conference on Hydropower, Trondheim, Norway, 30 June-2 July 1997). editors: E. Broch, D.K. Lysne, N. Flatabo, and E. Helland-Hansen. A.A. Balkema, Rotterdam, Brookfield

The construction of the LKHP without a comprehensive Environmental Impact Assessment (EIA) resulted in a significant visible impact on the aquatic, riparian and adjacent ecology of the area surrounding the Kihansi Falls. Consequently, the Kihansi Gorge Ecosystem is now one of only 25 Global Biodiversity hotspots as designated by the IUCN. As early as 1997, reports identified a number of processes that threaten the long term sustainability of agriculture within the catchment as well as the maintenance of biodiversity.

Most recently, the National Environmental Management Council (NEMC), through the Lower Kihansi Environmental Management Project, initiated preparation of a Landscape Wide Conservation Plan (LWCP) to prepare a plan that addresses all the pertaining issues with respect to people and environment in the upstream of Kihansi Catchment. The present Interim Report represents an initial consolidation of preparatory studies information, and analysis as well as presenting the major thrusts of the plan, its implementation and monitoring. In, this report, progress and limitations of the work are incorporated into preliminary discussions of findings. The intent is to accommodate for the shortened time period between this report and the final report. Following this report, the Consultant will refine the analysis and presentation, incorporate formal feedback and stakeholder input to develop a Draft Final Report. Subsequently, a Final Report should lead systematically to funding and implementation of the major activities supporting the plan.

1.2 Brief Description of the Planning Area

Kihansi River catchment measures about 614 square kilometers² and lies between 1,200m and 2,200m above sea level, located in the Kilolo³ and Mufindi administrative districts. It supplies the power plant with water from sources and tributaries located in village settlements, farmlands and protected forests. The famous Udzungwa forested mountains cover a significant portion of the catchment, and these forests harbor important biodiversity of the renowned Eastern Arc Mountains in Tanzania. The Udzungwa Scarp forest constitutes approximately one-third of the entire water catchment for the Kihansi Hydropower Project. Population in the upper catchment of Kihansi River estimated in 2002, was about 35,177 people.

The Landscape Wide Conservation Plan focal area includes the entire Kihansi River basin upstream of LKHP and ten subcatchments. More specifically it includes fourteen villages of Igeleke, Ihimbo, Ilogombe, Kibengu, Kipanga, Mapanda, Uhafiwa and Ukami (Mufindi District) and Bomalang'ombe, Masisiwe, Mbawi, Mwatasi, Ng'ingula and Nyawegete (Kilolo District). See Figure 1.1

1.3 Scope of LWCP

LWCP is a catchment management plan with the objective of addressing the problems of water quality, water quantity, soil erosion, vegetation cover and community amenity in the project area in a coordinated manner which as a result the community at large, NGOs, CBOs

² Based on computation from GIS maps produced from satellite imagery 2003 by SMEC

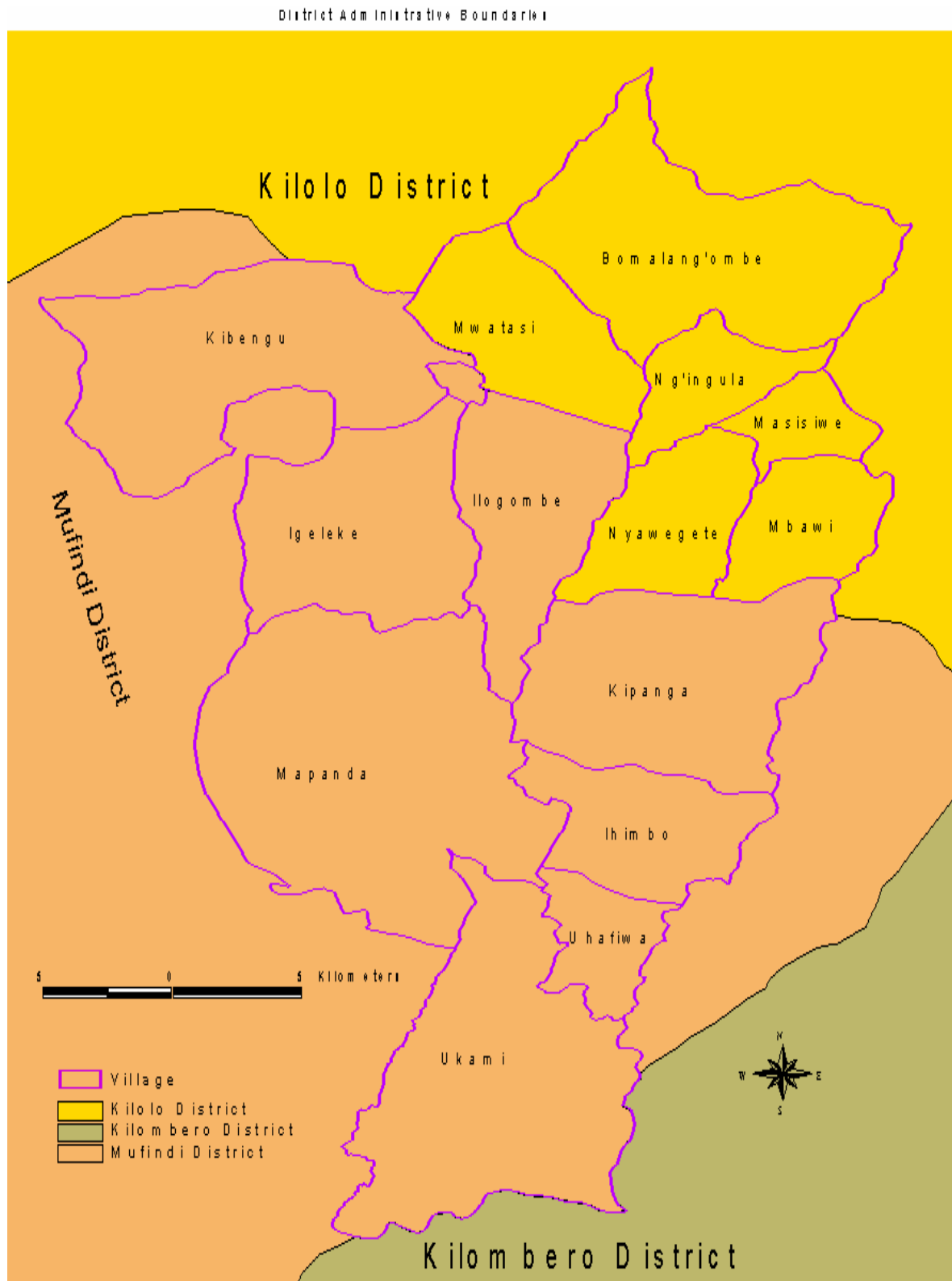
³ Kilolo district was part of Iringa district before

and Government will work together to achieve sustainable use and management of land, water, vegetation and other natural resources.

1.4 Limiting Factors

The Consultant expects that the LWCP will promote and result in a placement of measures that will reduce, halt, or reverse biotic impoverishment of the catchment. However, the capacity to put in place such measures is very much dependent on:

- a. The time available to effect the response;
- b. The availability of funds sufficient to support implementation of activities recommended by the LWCP; and
- c. The quantity and quality of information available during the preparation of the LWCP.



1.5 Structure of the Document

This document consists of eight sections as follows:

1	Introduction	Deals with the introduction whereby the need for the LWCP is stated. Also the brief description of the planning area, LWCP objectives and the structure of the document are provided.
2	Methodology	Describes the methodology and approach in undertaking the study
3	Existing landscape characteristics	Provides the physical and socio-economic environment of the upstream catchment.
4	Policy, legal and administrative framework	Provides the policy, legal and administrative frameworks together with existing plans are discussed
5	Emerging issues	From the second and the third parts which are basically dealing with the existing situation, emerging issues are derived on the catchment's conservation process.
6	Planning goals and objectives	Goals and objectives are arrived at based on previous parts.
7	Planning Proposals	Provides the conservation planning proposal
8	Implementation and Monitoring	The implementation mechanism and monitoring structure which provide ways on how to solve/deal with the emerging issues and therefore conserve the catchment's area for sustainable uses is addressed

This structure will be carried forward and expanded in the Draft Final and Final LWCP reports.

SECTION 2. METHODOLOGY

2.1 Background

The objective of the LWCP is to put in place measures that will reduce, halt or reverse the biotic impoverishment of the catchment. SMEC's methodology was designed for a project area comprising of 10 sub-catchments together with the areas immediately surrounding the catchment to the extent that the areas are of significance to the Catchment Management Plan, and the 14 villages identified above. The key methods that were employed in gathering data included literature review, rapid rural appraisal, participatory mapping, transect walks, interviews, focus group discussions, key informants interview, participatory field observation, and GIS approach in land cover trends assessment. The data collection was divided into five main components of socio-economic, farming systems, hydrology, ecology and land cover trend analysis. For each of these components a comprehensive report was prepared and provided an input in the preparation on this LWCP.

2.2 Literature Review

A thorough review of literature supplied by the Client and acquired by the Consultant was the first step in this study. The list of documents reviewed by the Consultants is presented in Appendix 1.

The technical experts comprising of sociologist, agronomist, land use planner, GIS expert, ecologist and conservation expert reviewed and assessed the documents, data and maps.

This review aimed at gaining a good understanding of the composition of the existing catchment landscape - biological, physical and socio-economic.

The literature review emphasis was on extracting relevant data and identifying where information gaps exist; the conservation issues within the catchment; and the extent of further investigations that will be needed to fill gaps in the project knowledge base.

2.3 Socio-economic

The study started with an extensive literature review of the existing documents. The purpose was twofold. Firstly, to familiarise the consultants with baseline conditions and give direction to the exercise. Secondly, the consultants used existing documentation to establish a baseline against which to assess whether the main issues and conditions have changed.

Based on the results, the Consultant made an empirical estimate as to the trend of living standards into the future— whether these are likely to decline, be static, or improve; and as to which factors are controlling the trend. The communities' points of view, their perception of trends in environmental quality (e.g. village access to resources of wood, animal feed, water, and extent of arable land) was assessed. Impact of these activities on the catchment was assessed.

2.3.1 Methods for Data Collection

i. Participatory tools

Rapid Rural Appraisal was used as the participatory tool. This is a planning tool that makes use of methods that rely on having open-ended discussions and allows the local communities to analyze their problems.

Communities in the catchment area have been involved in PRA process since the Catchment Mangement Plan 1998. Based on this knowledge and recommendations in CMP1999, limited time allocated for completion of the project, it was concluded that there was no need for a full PRA.

ii. Qualitative Rural Appraisal

As part of the Rapid PRA the study team started with consultations in the villages. The number of people participating in the villages' consultative meetings differed from village to village.

The Qualitative survey included a general meeting of the whole village where a guided discussion on general and conservation matters was conducted. This was followed by focused group discussion. Three groups of women, youths and leaders/men were formed. Each group had key informant individuals among them. In these groups discussion a standard checklist was used. This contained issues that were also covered in the Quantitative Rural Appraisal Survey to ensure that the information collected can be complimentary and comparable. Data was collected with the aid of three research assistants. A checklist was used by the field staff.

iii. Participatory Mapping

The consultant involved the people in drawing a village map. In this exercise, the process is as important as the product. In participating, people were able to place useful information related to farming practices, types of crops, valley bottom farming, and spatial relationship. People debated on various issues before it was accepted for it to be put in the map. In this sense this helped the consultants to gain insights into the way people perceive issues, their priorities and reasons behind their inclinations.

iv. Transect Walks

Transect walks were conducted in each village to ensure that the study team explored and gained a full understanding of the spatial differences in a given area. The study team chose the path or transect line after having done the participatory mapping both to validate the information provided and to add new things as the team walked through the village. The Team was accompanied by a group of villagers in order to collectively observe and further discuss land use practices, vegetation, infrastructure, forests, trees, economic activities and social activities. A diagram showing activities, natural resource, social amenities found in and along the walk was prepared.

v. Quantitative Rural Appraisal

The study also used a semi-structured questionnaire to collect quantitative data. The questionnaire sought information on social and economic aspects, environmental issues, social and extension services available, available resources use and their use, technologies available, community priorities and problems, community knowledge and attitudes and practices, community perception of the project and evaluation on social and environmental trends, constraints facing the community and their leaders.

2.4 Farming Systems

2.4.1 Objectives

The main objective of the study was to assess the current farming systems in the Kihansi River Catchment (KRC) area, based on the review of the previous socio-economic surveys and assessment of current situation in the catchment area. This is geared towards establishing whether there are changes in land use practices aimed at sustainable conservation of KRC after the intervention period and the needs for improving the conservation status of the landscape of the sub-catchment. The study also aimed at documenting current adverse environmental impact on the physical and biological landscape and the cause of such impacts. Study results provide a basis to propose appropriate mitigation measures. Moreover, the study guided the Consultant toward recommendations of the best and appropriate land use practices. When finalized, this set of recommendations and best practices should be implemented by communities in the sub catchment to minimise soil erosion and water sediments in the downstream while at the same time conserving the environment and improving their livelihood.

2.4.2 Methods for Data Collection

The study was undertaken in 14 villages located within the KRC area (Figure 1.1). These are the main villages in KRC area in which socio-economic activities have impact on the sustainability of the KRC and consequently on the water quality and quantity downstream.

Multiple research methods/techniques were used to collect data from secondary and primary data sources. The main techniques used include secondary data review, Rapid Participatory Rural Appraisal techniques such as group discussion, key informant interview and Participatory Field Observation.

Secondary data on socio-economic and physical aspects relevant to the study were obtained from review of previous records both published and unpublished literature, including reports obtained within and outside the KRC area. Such areas include offices of the catchment villages, TANESCO - Dar es Salaam, LKEMP, ASPS/DADS Kibengu Ward and Institutions such as IRA and SUA. Some of the reviewed reports include, Farming System Study for the Lower Kihansi Hydropower Project (providing background information on the farming systems in the KRC), Participatory Rural Appraisal Reports on some of the Kihansi Sub catchments, Kihansi Catchment Management Plan Report 1999 and Kihansi area Conservation Plan Report. The Kihansi Conservation Plan provides information on measures to ensure sustainable management and conservation of biodiversity, land and water resources in the Kihansi Gorge. Additional source materials/literature pertaining to agriculture,

livestock production and environmental conservation were also taken into consideration in undertaking this study. The secondary data/information were useful in providing a background and further understanding of current farming systems, their impact on environmental conservation in the KRC area and on appropriate environmental mitigation measures.

i. Participatory Rural Appraisal Techniques

Participatory Rural Appraisal techniques were used to collect primary data as well as to complement the data from the secondary sources. Before undertaking the PRA a pre-appraisal dialogue was conducted in all the 14 villages in the KRC area. This ensured that all the responsible key person/Village authorities were aware of our visit, and it enabled the team to make some pre-arrangement for administering our field data collection exercise.

Participatory approaches, such as participatory rural appraisal (PRA) methods have been developed in late 1980s and 1990's (Chambers 1994). Their emphasis is on participation, focusing on in-depth knowledge of local people who are perceived as agents rather than object of research. PRA methods involve a range of techniques, which include focus group discussion, key informants interview, seasonal calendar and participatory field observation, (Chambers 1992,). Such techniques have the advantage of soliciting more information from local people, since they encourage participation and dialogue between local people and outsiders (researchers) as well as among local people themselves. One of the justifications for giving more emphasis to local peoples' participation in research is the argument that local people have experience, knowledge and ability to conduct their own analysis that have been foregone by conventional agricultural research (Chambers and Jiggins 1986).

The PRA methods have been applied over the past decades to investigate a wide range of issues in the community including farming systems, land resource management, agro-ecosystems analysis and have been very useful (see for example, Mettrick 1993; Chambers 1994; Mikkelsen 1995). It provides more reliable information since it allows discussion and free dialogues among the local people on their issues and cross-check each other's knowledge. By its participatory nature, it empowers villagers to realise the vast knowledge they have on their local environment. The PRA techniques used in this study, focused on group discussions, key informants interview and participatory field observation which were conducted in each village in the KRC area.

ii. Group Discussion

As part of PRA methods, with assistance of village authorities, a Village Assembly was held, where an introduction was made and the purpose of the exercise was fully explained to the participants. This was also an important opportunity for the researcher to familiarise himself with the villagers. From the village assembly 15 to 20 villagers aged 18 years and above from each village were selected for participation in group discussion. Members for group discussion in each village drew representation from men, women, including youth and old people, livestock keepers, village authority, extension agents working in the village, and farmers. Such group also included people locally knowledgeable of various issues being discussed including villages background information. Such exercise was done in each of the

survey villages in the catchment. The group discussion was guided by checklists of open ended questions. The checklist was initially prepared in English and later translated to Swahili to facilitate the communication between researchers and the villagers. Among the issues discussed include types of crops grown and productivity trend, existing field cultivation practices, fertiliser and pesticides use in the villages, agricultural crop marketing system and its associated constraints, major sources of on-farm and off-farm income, types and status of agricultural extension services currently offered in the villages. Environmental issues were discussed including, environmental related problems in the villages and possible solution, on-going programmes on environmental conservation including tree planting in the villages, constraints limiting wide adoption of environmental related conservation efforts. The discussion also focused on livestock keeping including types of animal kept and methods of rearing such animals, potentials on the integration of livestock and crop production, constraints and opportunities in relation to current livestock keeping system. In the group discussion the villagers also discuss land tenure issues in relation to environmental conservation and villagers concern including environmental conservation measures introduced in their villages.

iii. Key Informants Discussion

This process involves an inquiry from a person who is expert on a particular issue of interest to the study. In this study key informant were used to provide information, which could not be well captured by group discussion. The key informants contacted include Agricultural extension officer in Mapanda Ward, who provided detail information on extension services and associated constraints in Mapanda Ward including Ukami, Uhafiwa, Mapanda and Ihimbo Villages, Co-ordinator District Agricultural Development Service (DADS) Kibengu who provided details information on DADS activities in Kibengu Ward including Ilogombe, Kibengu and Igeleke Villages. Discussions were also held with Coordinator LKEMP Kihansi Office, who provided information on major activities undertaken in KRC area and logistical aspects in the sub catchments.

iv. Participatory Field Observation

Joint site visits and observation between researchers and few villagers were done in different areas in the villages including valley bottom areas where there is cultivation of Vinyungu⁴, and water sources. The visits involved field observation as well as *in situ* discussion with the villagers on various issues pertaining to environmental conservation including extent of using ridges, flat cultivation, use of contours in farming, cultivation on water sources, tree planting and deforestation in the villages. The site visits and physical observation provided an opportunity to counter check and verify some of the issues raised during group discussion as well as from other sources. Moreover, it provided a chance to familiarise with the village's physical environment. During the field visit photographs were taken covering different sites of interests including Vinyungu cultivation in valley bottoms, flat cultivation on steep slopes and agroforestry. Such photographs were used to provide illustrations of various issues presented in the subsequent sections of the report.

⁴ Vinyungu is a local name used to illustrate dry season cultivation in valley bottom

2.5 Land Cover

2.5.1 Determination of the Main Landscape Units

Landscape units or land units are areas that have specific or homogenous characteristics in terms of climate, geology, soils, relief (elevation and slope aspects), hydrology and landcover. The landscape units were determined based on elevation, slope, geology and landcover. Climate and soils were not used because of inadequacy of data required for mapping. The land units in the catchment were determined by initially producing a number of maps including elevation (Figure 2.1), slope (Figure 2.2), geological (Figure 2.3) and landcover maps 1999 and 2005 (Figures 2.4 and 2.5). Delineating the catchment area in four main elevation units as follows produced the elevation map:

Low land, < 500 m asl,

Low Hills 500 1400

Hills 1400 -1700

Highlands 1700m asl.

The slope map was produced by delineating the digital terrain model into three main slope types and is as follows:

Flat to gently sloping -0 % to 7%,

Sloping -8% to 13%

Moderately steep to very steep >14%

The geological map was produced by digitizing the 1971 geological map Tanzania at scale 1: 125,000. The catchment area is composed of geological rocks formed during the Quaternary and Neogene period. The landscape unit map was produced by combining the elevation, slope and geology maps.

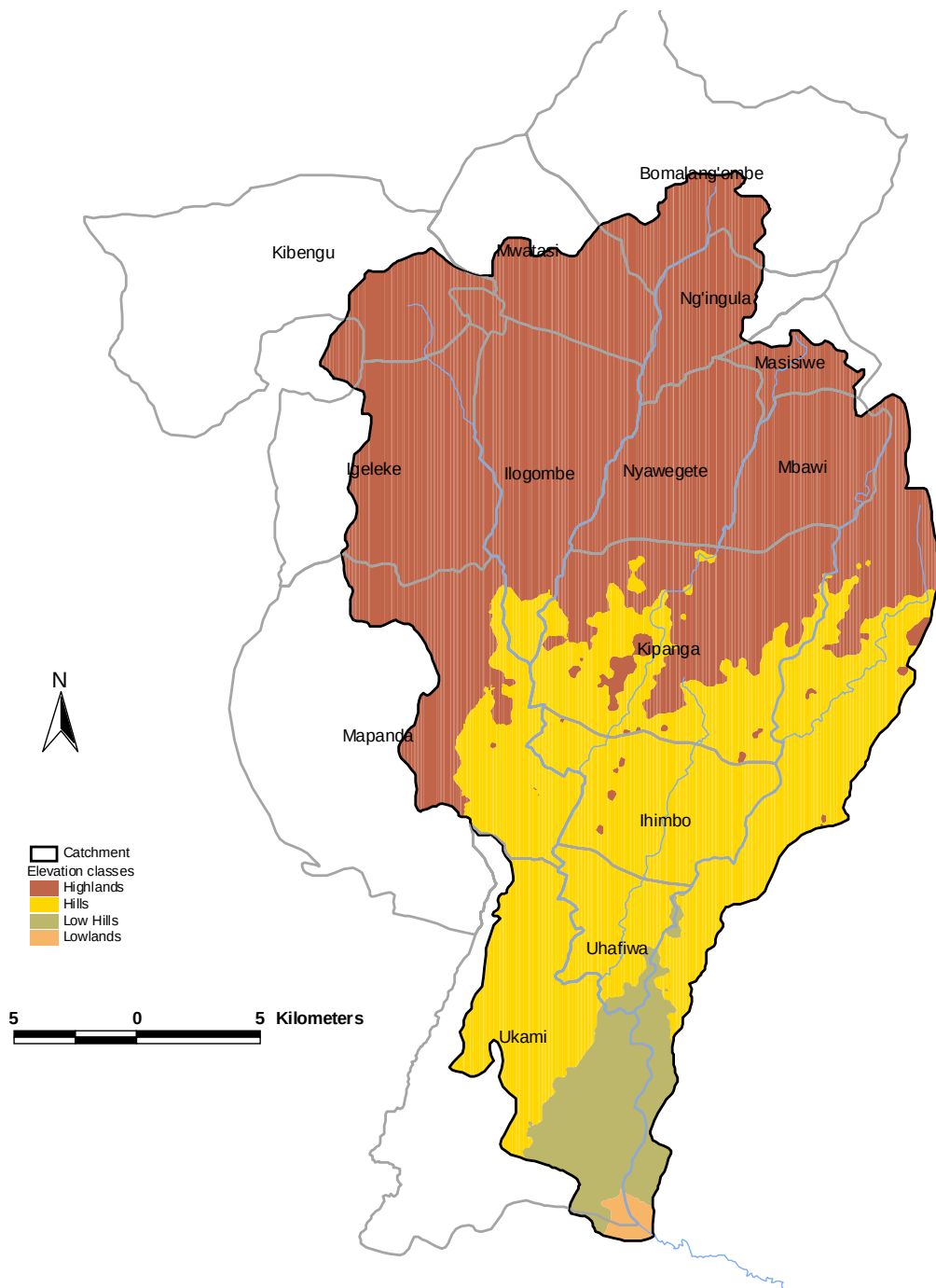


Figure 2.1 Elevation Map

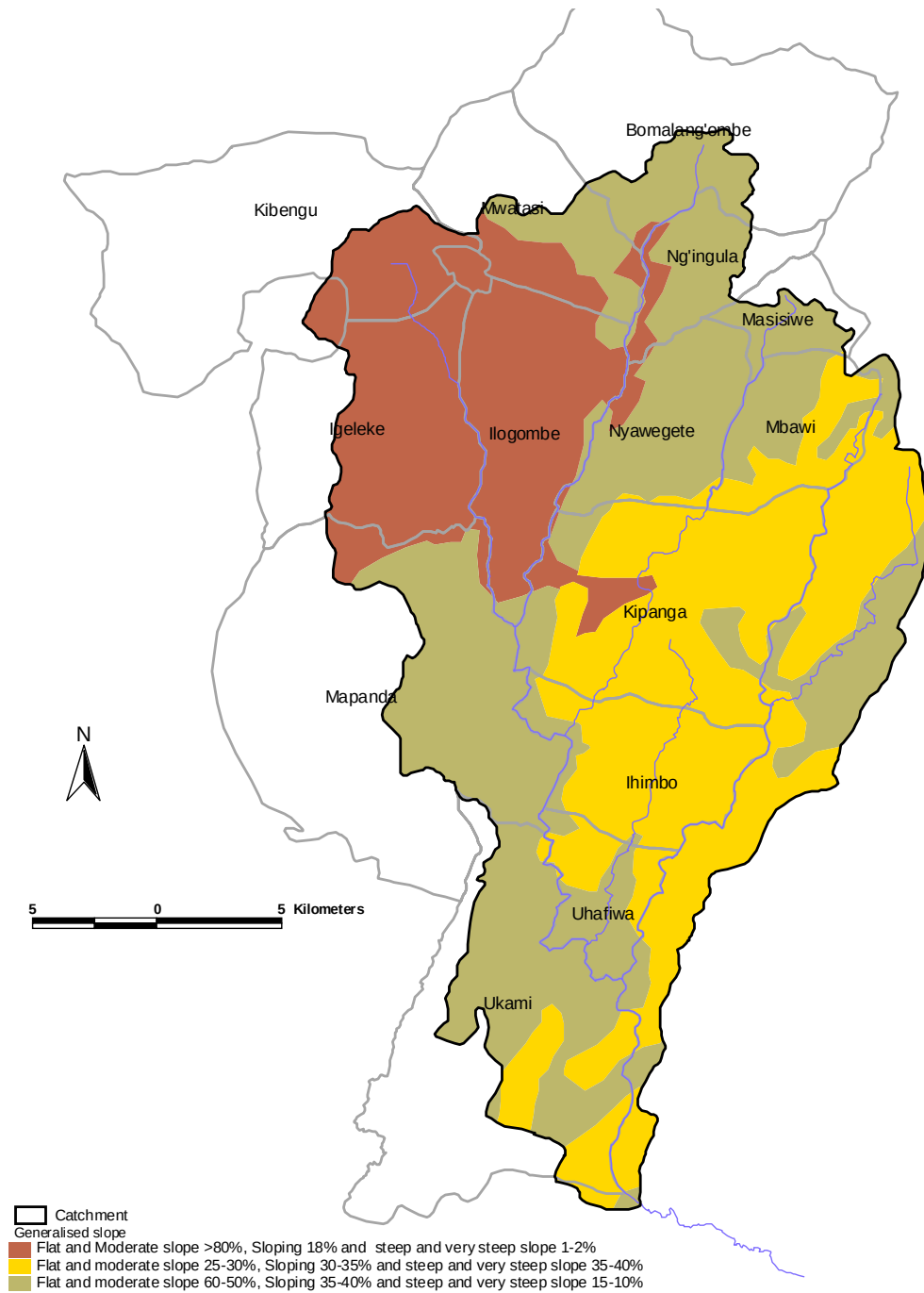


Figure 2.2 Slope Map

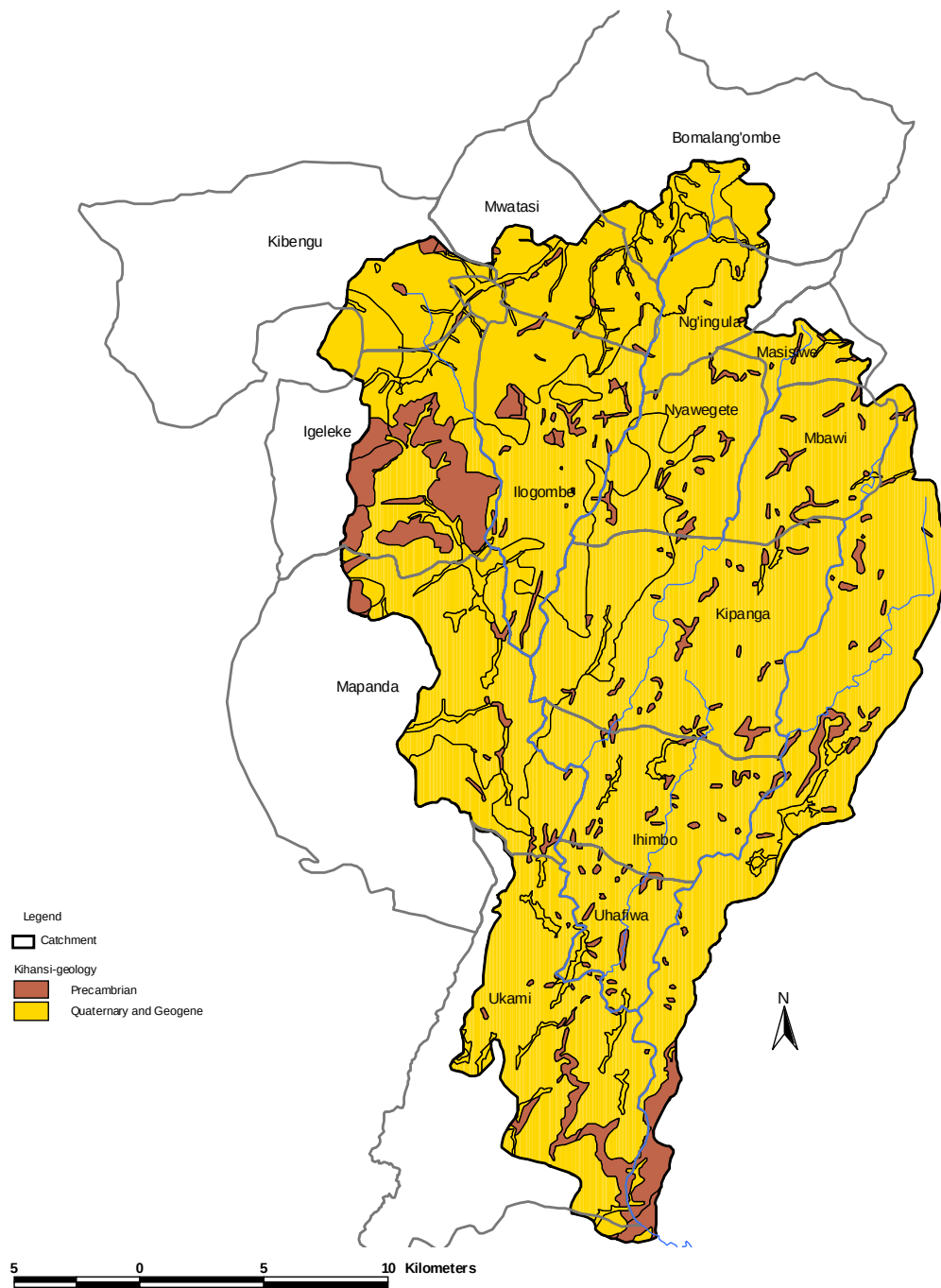


Figure 2.3 Geology Map

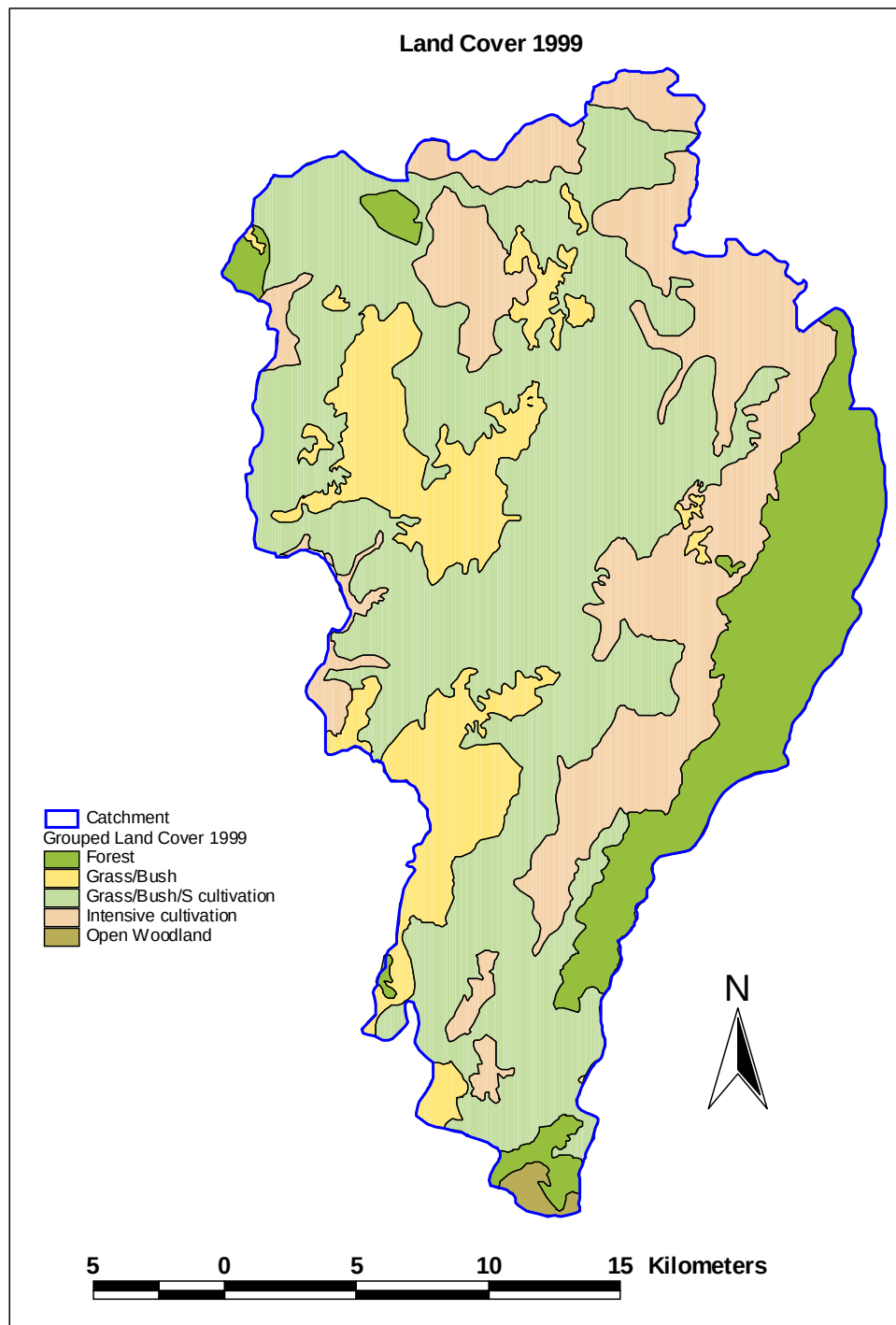


Figure 2.4 Land Cover 1999

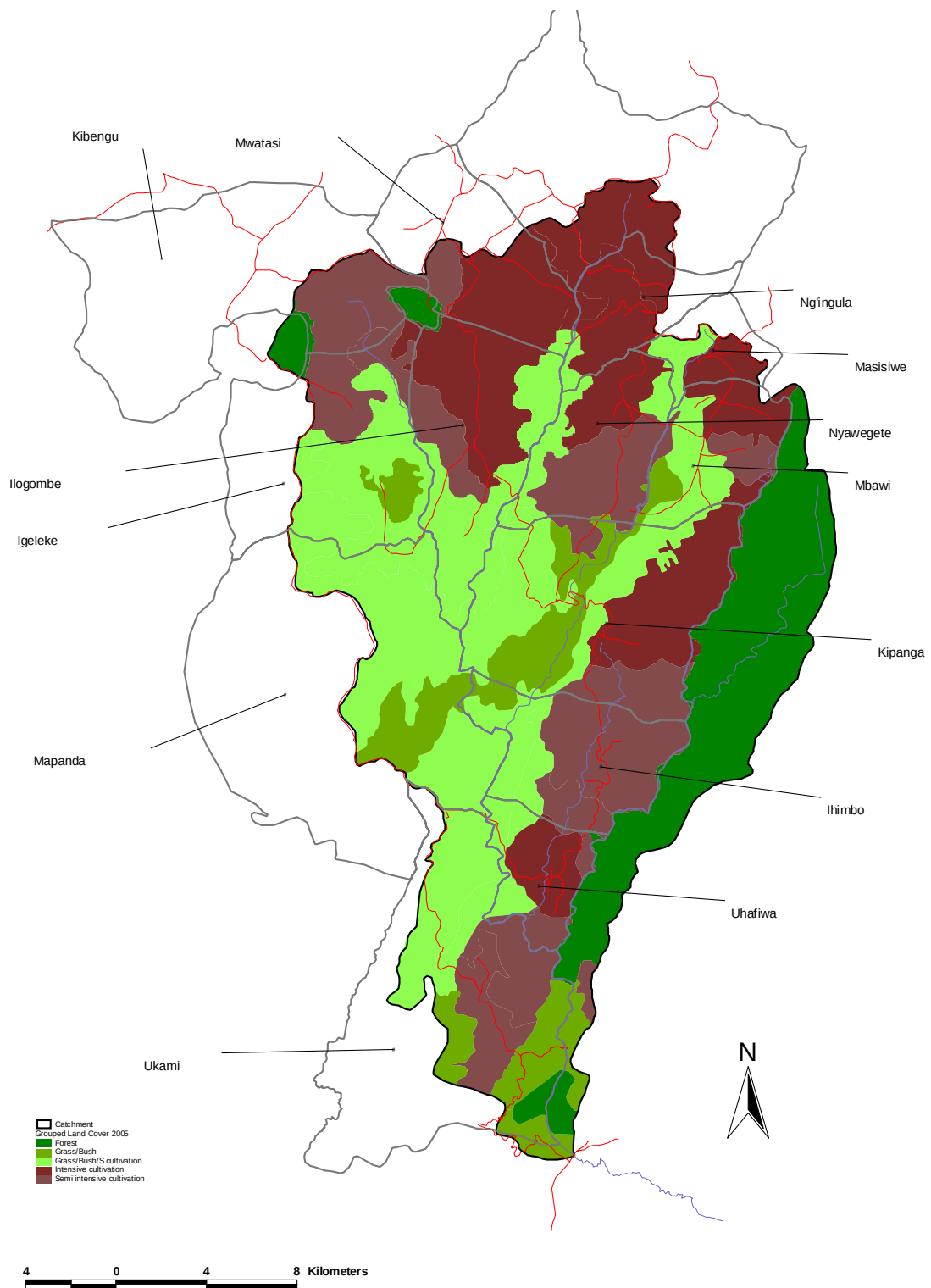


Figure 2.5 Generalized Landcover/use types in the Kihansi catchment for the year 2005

2.5.2 Determination of Landcover/Use

The landcover and landuse of the Kihansi catchment for the year 2005 was determined by using a dry season false SPOT image of 2003. The SPOT image of 2003 was used due to the fact that it was not possible to get a cloud free satellite image for the year 2004. The interpretation of the satellite image was based on a number of elements including color, shape, tone, pattern and context. The classification system used to delineate the landcover/use types for 2005 was formulated by partially taking into account the 1999 NORPLAN landcover/use classification system. This was done on purpose so that it could be possible to compare the 1999 cover types and the 2005. Field verification for the identified landcover/use was done in March 2005 in which the different types of landcover/uses in each main terrain units were identified and recorded through digital photography.

2.5.3 Determination of Landcover/use Changes

The catchment landcover/use changes in were established by comparing the 1999 and 2005 landcover maps by means of a GIS. The 1999 report has two landcover/use maps, a detailed and generalized map. The detailed map had a total of 9 cover types including, Forest, Wooded grassland, Dense bushland, Bushland, Open woodland, Wooded grassland, Bushes with scattered cultivation, Cultivation with scattered bushes and Cultivation with tree crops. The generalized map had four cover types of forest, bush/grass, intensive and semi intensive cultivation. However, the closer look at the generalized map of 1999 showed that all land units that had complexes of vegetation and scattered cultivation were classified as of semi intensive cultivation. This meant that cultivation activities in these areas were between 25 to 75%. This is certainly not scattered cultivation. Therefore the 1999 generalized map was reclassified with the complexes of grass/bush and scattered cultivation remaining the same. The reclassified generalized map of 1999 had five landcover/use of forest, complex of bush/grass and scattered cultivation, intensive cultivation, grass/bush complexes and open woodland. In order to compare the cover changes for the two epochs it was found necessary to reclassify the 2005 cover types into the similar landcover types of the newly reclassified general map of 1999. The cover types for generalized map of 2005 were forest, grass/bush, intensive cultivation, semi intensive cultivation, complexes of grass/bush and scattered cultivation and open woodland.

2.6 Hydrology

The main objectives for hydrological data collection and analysis under the Landscape Wide Conservation Plan for the Kihansi Catchment was to establish the relationship between hydrology and various land uses including human activities, and to contribute in monitoring of the hydrological changes in the catchment hydrological regime.

i. Existing data

The data collection system was established by CMP (1999) projects and later on TANESCO continued, although river sediment load transport was no longer gauged.

The following activities were undertaken in this undertaking:

- ♦ Review of existing reports and data
- ♦ Data collection on hydrology and sedimentation from TANESCO.
- ♦ Hydrological data analysis.
- ♦ Reporting and recommendations

These reports and documents reviewed, detailed previous studies on the Kihansi Catchment Management, including hydrological data collection, analysis, modelling and their relationship with the land use. In these reports annual rainfall, annual run off, ground water level climatic variations and hydrological modelling have been carried out since 1930 to 2003.

ii. River Flow

The gauging stations Kihansi NC3, was installed in 1986 and NC1 in 1983 by Norconsult. The station 1KB28 water level recording installed in 1974 and continued until 1987. The major task of installation of river gauging stations, data collection and data analysis started in 1996/1997 in phase 1 of CMP(1997-1998) and up to February 2000 (phase 2) there were 10 river gauging stations. After completion of CMP project TANESCO has continued to monitor river flow data on the station however sediment transport gauging did continue.

iii. Meteorology stations

Older rain gauge at Uhafiwa Primary School had data from March 1984-May 1989 with many missing data. Four rain gauges were installed during phase 1 of CMP(1997-98) and up to 2000 there a total of ten rain gauge stations with three meteorological stations.

After completion of CMP project TANESCO continued monitoring the meteorological data.

iv. Meteorological Data

Meteorological data were obtained from TANESCO includes:

Rainfall for the stations: Mwatasi Primary School Masisiwe Primary School, Igeleke Primary School Mbawi Disp. Ilogombe Primary School Primary School, Udzungwa forest, Kipanga Primary School Mapanda Primary School and Uhafiwa from November 1998 to December 2003. Data on temperature, wind speed, radiation, pressure and humidity was collected from Udzungwa forest, Mapanda Primary School and Uhafiwa from February 2000 to May 2002. Run off data was gathered from Kihansi river NC3, Lutaki Kihansi NC1, Ruaha at Uhafiwa foot bridge, Ruaha at Kipanga, Luvala at Kipanga(u/s confl.), Mkalasi at Kipanga, Muhu at Ilogombe, Kihansi at Ilogombe, Kihansi at Lugendepalasi, Muhu at Lugendepalasi from November 1998 to October 2003.

v. Hydrological data analysis

Isohyets curves (showing constant rainfall along each curve) were drawn for the hydrologic year 1999-2003 by utilizing the GIS Arc-View software. The Isohyets are based on point rainfall. Monthly average runoff for (November 98-September 2003) is computed for the three major gauging stations NC3, NC1 and Uhafiwa (See Figure 3.8).

Specific runoff is calculated from daily discharge by dividing sub catchment areas. These are accumulated in order to obtain an overview of the catchment and compare subcatchments. Monthly average temperature, humidity and wind speed are plotted for the three stations Udzungwa forest, Mapanda Primary School and Uhafiwa.

vi. Reporting and recommendations

Based on the hydrological data analysis report and recommendations are prepared

2.7 Biological Environment

The objective under this component was to assess the extent of impoverishment of plant and animal species within the upstream catchment and address their conservation in the LWCP.

Methodology adopted for this purpose was review of data base from various organizations. The only source of information on species and habitats was from Burgess et al in press (Biological Conservation), on species in Udzungwa Mountains.

2.8 Institutional Aspects

The Consultant determined that Tanzania had a strong and largely enabling policy and administrative framework for delivering resource management in place. The team's method thus attempted to review appropriate policy documents to assess their relevance for the Upper Kihansi catchment and its peoples. This included reviewing local administrative structures to determine potential mechanisms to improve local implementation of the generally favorable national policy and legal framework.

It is also planned that LWCP will be discussed by key stakeholders drawing participants from village representatives, officials from central government, district councils of Kilolo and Mufindi, government agencies such as NEMC, LKEMP, Non-governmental organizations, TANESCO, RBWO, WWF and donor agencies.

SECTION 3. EXISTING LANDSCAPE CHARACTERISTICS

3.1 The Physical Environment

3.1.1 Physiography

Kihansi upper catchment contains the western section of Udzungwa mountain block, which is part of the Eastern Arc Mountains. Eastern Arc Mountain comprises a chain of ancient crystalline Precambrian basement mountains that were uplifted millions of years ago and which are under the direct climatic influence of the Indian Ocean (Lovett, 1990; Lovett et al., 2004). There are 13 separate mountain blocks, from north to south: Taita (in Kenya), North Pare, South Pare, West Usambara, East Usambara, Nguu, Nguru, Uluguru, Ukaguru, Rubeho, Malundwe, Udzungwa, Mahenge (in Tanzania). Studies carried out to find out the priorities among the 13 separate mountain blocks within the Eastern Arc (6) (Burgess et al., 1998b; Baker and Baker, 2002; CEPF, 2003), has concluded that Udzungwas block is among the three more important block. The other two are the East Usambaras, Ulugurus.

The Kihansi River Catchment is located in Kilolo and Mufindi Districts in Iringa region. Between 35°44'22" and 35°57'45"longitudes East and 8° 13' 08" to 8° 37' 12" Latitudes south (see Figure 1.1 Location map). The major part of the catchment is within the Eastern highlands (Udzungwa Platteau) with undulating and deeply dissected hills of averge slopes above 30% . See Figure 3.1 – Contour map. A small portion of the upper part of the catchment falls within the Mufindi Plateau which is characterised by gentle slopes of less than 18%⁵. The geology of the catchment area is Quaternary and Neogene rocks with red clay soils of dark or humic topsoils. The soil has carbon content ranging from 2-55 with high nitrogen content and CEC of 10-20 meq.

⁵ Review of Soils and other Related information on Kihansi River Catchment – Norplan 1998

Kihansi Catchment Contours

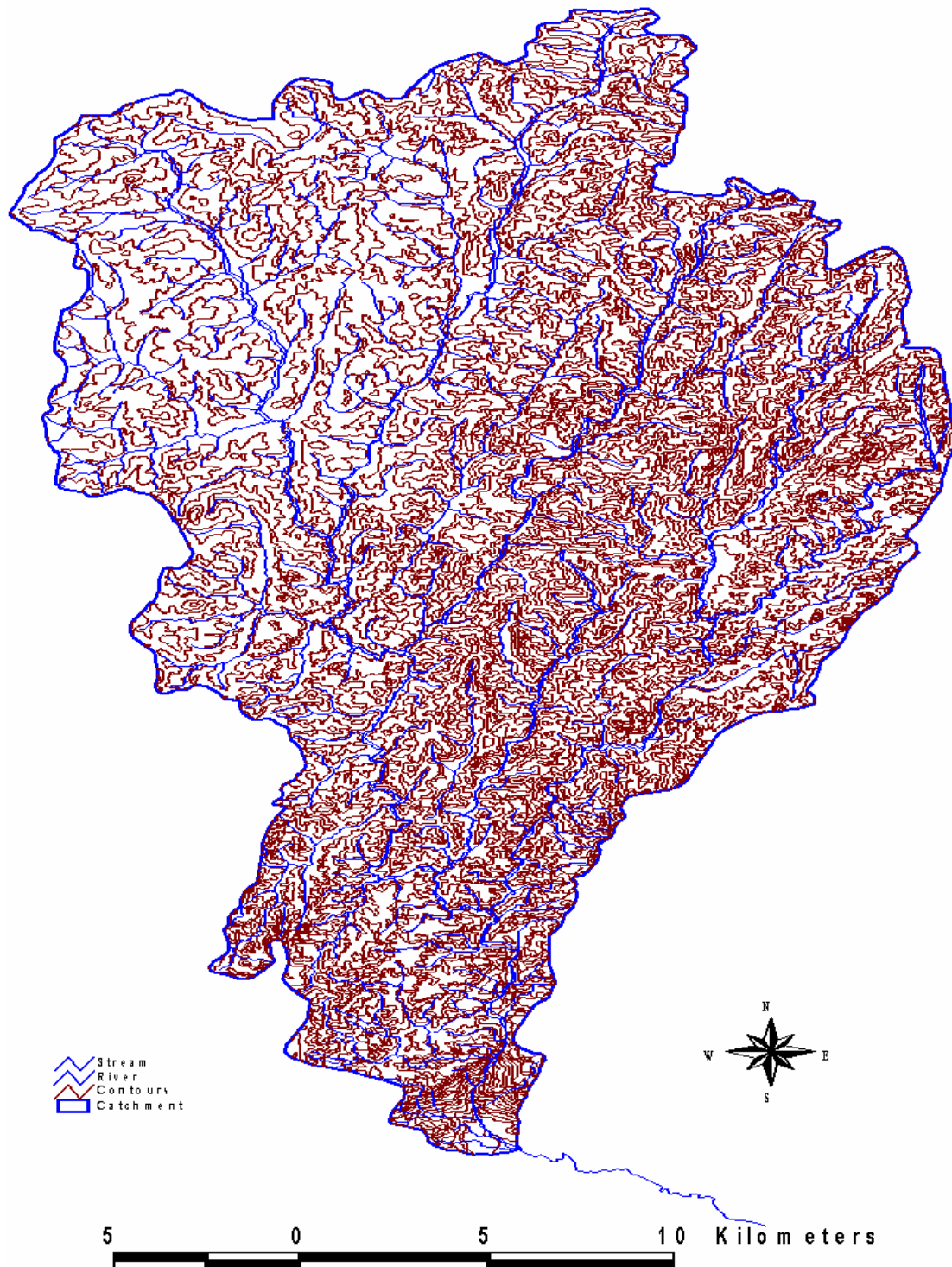


Figure 3.1 – Contour Map

The landscape characteristic of the Kihansi catchment is mainly characterized with six major units, comprising of highlands with complex of flat to sloping terrain; highlands with complex of flat and gently sloping terrain, sloping and moderate to very steep terrain; hills with complex of flat and gently sloping terrain; hills with complex of flat and gently sloping terrain sloping and moderate to very steep terrain; low hills with complex of sloping and moderate to very steep terrain and lowlands with complex of sloping and moderate to very steep terrain. See Figure 3.2.

a. Highlands with Complex of Flat to Sloping Terrain

The highlands with the complex of flat to gently sloping terrain are located in the north west of the catchment and have a total of 14,230ha at an altitude of more than 1,700m above sea level. 80% of the highland's area have complexes of flat and sloping terrain i.e. 0% - 2% and 3 -7%. The dominant cover types in this land unit are the bushland, grassland and farms. Two of the district-protected forest reserves are located in this landscape unit. The villages that are partly or wholly in this unit include Kibengu village, Ilogombe, Igeleke and Mwatasi (Figure no 3.2).

b. Highlands with complex of flat and gently sloping terrain, sloping and moderate to very steep terrain

This is the largest unit found in the north and partly the north east part of the catchment and it covers a of total of 21,542ha. Again just like the first landscape unit it is found at an altitude of more than 1,700m above sea level but with steeper slopes. The unit has a complex of flat, sloping terrain and moderate to very steep slopes. In this land unit 25% to 50% of the area has a flat and gently sloping terrain, 35% to 40% of the area has a sloping terrain i.e. 8% to 13% and 25% to 50% of the area is composed of moderately steep to very steep slopes i.e. >14%. The main cover types found in this landscape unit are part of the protected Udzungwa forest, grassland, bushland, farms and settlements. The settlements located in this unit include part of the Bomalang'ombe, part of Mbawi, part of Kipanga, Nyawegete and part of Ilogombe (Figure no 3.2).

c. Hills with complex of flat and gently sloping terrain

Hills with complex of flat and gently sloping are located in the central part of the catchment, it is a small unit about 800ha. The unit lies between 1,400m and 1,700m above sea level and 80% of its area comprises of flat and gently sloping terrain. The main landcover in this unit are grassland, bushland and farms. Ilogombe and Kipanga villages are partly located in this unit (Figure no 3.1).

d. Hills with complex of flat and gently sloping terrain sloping and moderate to very steep terrain

This is the second largest landscape unit of about 20,969ha cutting across the catchment from the southwest to northeast. The unit is found in the altitude of between 1,400m and 1,700m above sea level. In this land unit 25% to 50% of the area has a flat to gently sloping terrain, 35% to 40% of the area has a sloping terrain i.e. 8% to 13% and 10% to 15% of the area is composed of moderately steep to very steep slopes i.e. >14%. The main landcover

found in this unit include part of Udzungwa forest, grasslands, farms and settlements. Villages located in this landscape unit include part of Mapanda, Uhafiwa and large part of Kipanga (Figure no 3.2).

e. Low hills with complex of sloping and moderate to very steep terrain

This unit is located in the southern part of the catchment between the altitude of 500m and 1,400m above sea level. It is a relatively small unit with total area of about 3,785ha. 25% to 50% of the landscape unit area has a flat to gently sloping terrain, 35% to 40% sloping terrain and 10% to 15% of the area is composed of moderately steep to very steep slopes. The majority of this unit belongs to TANESCO but also part of the Ukami village is within this area (Figure no 3.2).

f. Lowlands with complex of sloping and moderate to very steep terrain

Lowlands with complex of flat and gently sloping terrain, sloping and moderate to very steep terrain with an area of about 314ha. This is the smallest land unit found in the southern part of the catchment. It belongs to TANESCO and the TANESCO camp is located within this unit. It is located within the altitude of less than 500m above sea level. 25% to 50% of the landscape unit area has a flat to gently sloping terrain, 35% to 40% sloping terrain and 10% to 15% of the area is composed of moderately steep to very steep slopes.

For more detailed summary on the geomorphology, geology, soils types, land covers and land uses of the above landscape units refer the Table 3.1

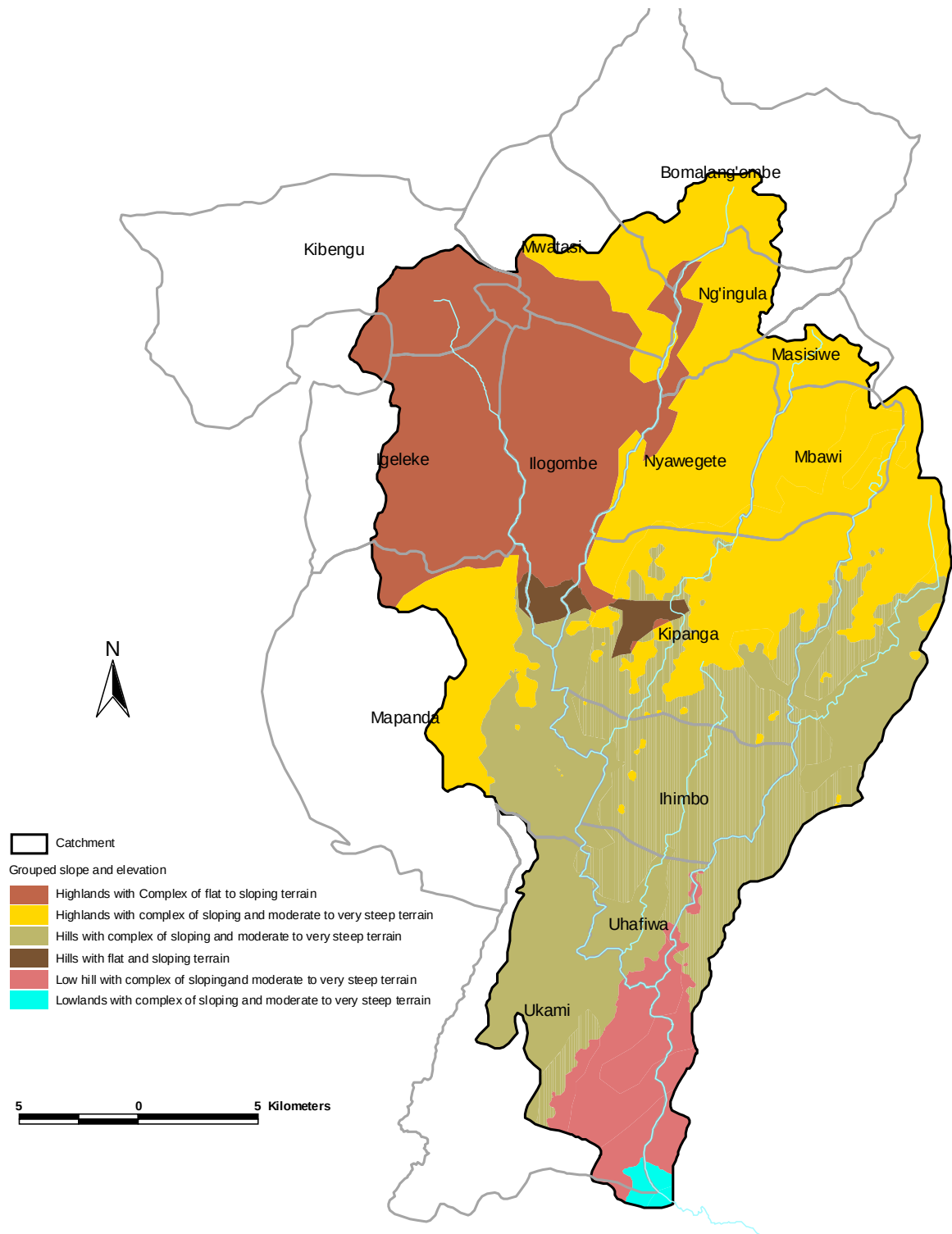


Figure 3.2 Landscape Units

Table 3.1 Land Units

S/N	Landscape unit type	Geomorphology	Landcover	Landuse
1	Highlands with flat to sloping terrain. (Area of 14230 ha)	Highest areas in the catchment with of flat to sloping terrain i.e. 0 – 7% at the of altitude of about 1700m a. s. l.	Forest, Grassland and bushland, farms, settlements	Protected district forest areas, agricultural activities under different farming systems (scattered to intensive cultivation) and residential areas
2	Highlands with complex of flat and gently terrain, sloping and moderately steep to very steep terrain. (Area 21542 ha)	Highest areas in the catchment with complex of falt to gently sloping terrain, sloping (8 to 13%) to very steep terrain(> 14%) at an altitude of about 1700m a.s.l.	Forest, Grassland and bushland, farms, settlements	Protected National forest areas, agricultural activities under different farming systems (scattered to intensive cultivation) and residential areas
3	Hills with flat and sloping terrain (800 ha)	Hilly areas of the catchment with 0% -7% slopes at an altitude of 1400 to 1700 m a. s. l.	Grassland, bushland and farms	Scattered agricultural activities.
4	Hills with complex of flat and gently sloping terrain, sloping and moderate to very steep terrain (Area 20969 ha)	Hilly areas of the catchment with complex of flat and gently sloping terrain, sloping terrain 8% - 13% and moderate to very steep terrain of more that 14% at an altitude of 1400 to 1700 m a. s. l.	Forest, Grassland and bushland, farms, settlements	Protected National forest areas, agricultural activities under different farming systems (scattered to intensive cultivation) and residential areas
5	Low hill with complex of flat and gently sloping terrain, sloping and moderate to very steep terrain (Area 3785)	Hilly areas of the catchment with complex of flat and gently soloping terrain, sloping terrain 8% - 13% and moderate to very steep terrain of more that 14% at an altitude of 500 to 1400 m a. s. l.	Grassland and bushland, farms, settlements	Agricultural activities under different farming systems (scattered to intensive cultivation) and residential areas
6	Lowlands with complex of flat and gently sloping terrain, sloping and moderate to very steep terrain (Area 314)	Lowland areas of the catchment with complex of flat and gently sloping terrain, sloping terrain 8% - 13% and moderate to very steep terrain of more that 14% at an altitude of less than 500m a. s. l	Forest, Grassland and bushland	Mainly TANESCO area

3.1.2 Landcover/Use

The catchment area has a total of 12 types of landcover/use, as shown in Figure 3.3. Table 3.2 shows the area occupied by each land cover and also the percentage of the each landcover/use. The landcover/use in the area can be put into four main groups. The first group is the forest/use that is still dominated by natural or semi-natural vegetation; the second is grass/bushland. The third coverage is grass/bush/scattered cultivation. The fourth group is cultivation which include intensive and semi-intensive. The semi-intensive cultivation means 50 to 75% of the land is under cultivation. When cultivation is more than 75% the area is considered as intensive cultivation. Overall the catchment is still dominated by natural or semi-natural vegetation which accounts for 52% of the cover types while the landcover used for agricultural activities at different intensities accounts for 48% of the total land.

From the fieldwork information obtained, the generalized cover changes were analyzed to determine in which landscape units took place most. The analyzed data indicates that increase in cultivation occurred predominantly in highlands with complexes of flat and sloping terrain in which there was an increase of 8,889ha or 14.5% of agricultural lands that increase between 1999 and 2005.

In the case of highlands and hills with complex terrain of flat, sloping and moderately steep to very steep, there was an increase of cultivated lands by 9.4% and 10% respectively. Increase of vegetation occurred predominantly in hills with complex sloping and moderate to very steep terrain in which 4,513ha or 7.3% of the increase in vegetation occurred in this unit. This is followed by highlands with complex sloping and moderate to very steep terrain in which 3,455ha or 5.6% of the changes in vegetation took place in this unit. No change in intensive cultivation took place in the highlands of complex terrain of sloping, moderate and very steep lands. No change in forest took place mostly in hills with complex slopes of flat to gently sloping, and moderate to very steep. Likewise, no changes occurred in complex grassland, bushland and scattered cultivation which took place mostly in the highlands. Table 3.2 and figure 3.3 showing land cover change 1999-2005 shows the details of the changes per landscape.

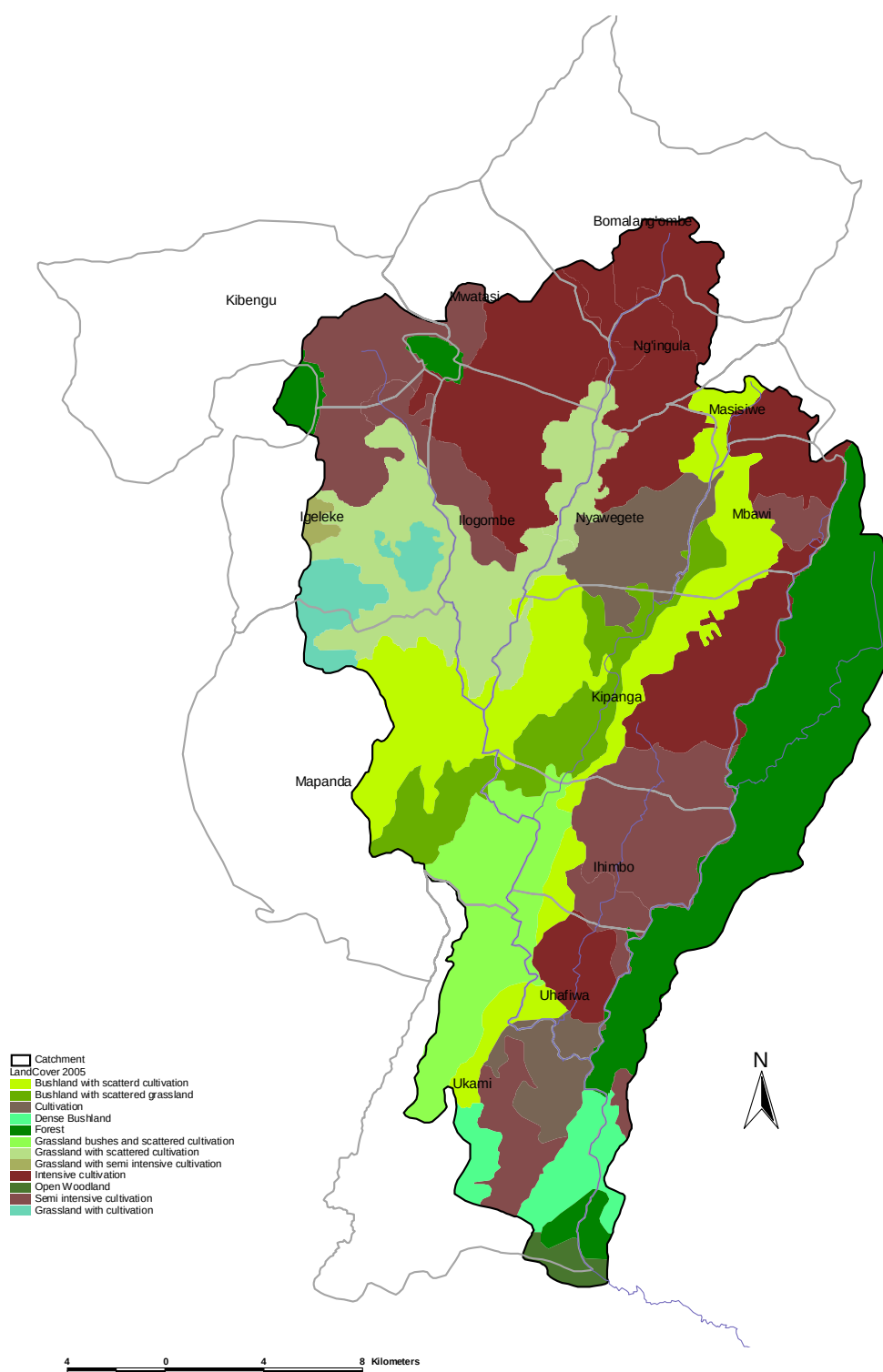


Figure 3.3 Detailed Landcover/use Types in the Kihansi Catchment for the Year 2005

Table 3.2 Landcover changes per landscape unit

S/N	Landcover/use type	Area (ha)	Percentage of the total area	
I	Natural and semi natural vegetation			Percentage of semi-natural vegetation
1	Forest	9080	15	28
2	Bushland with scattered cultivation	8234	13	25
3	Grassland with scattered cultivation	6476	10	20
4	Complex of grassland, bushland and scattered cultivation	4071	7	13
5	Bushland with scattered grassland	3240	5	10
6	Dense Bushland	1233	2	4
	Sub total	32,334	52	100
II	Agricultural lands			Percentage of agricultural lands
7	Intensive cultivation	14084	23	49
8	Semi intensive cultivation	9881	16	34
9	Cultivation	4869	8	17
	Sub Total	28833	47	100
	Total	61167	100	

Included also in the above categories are grass land with semi intensive cultivation, open woodland and grassland with cultivation. (Figure 3.4 detailed landcover/use map). Changes in subcatchments are presented in Figure 3.5

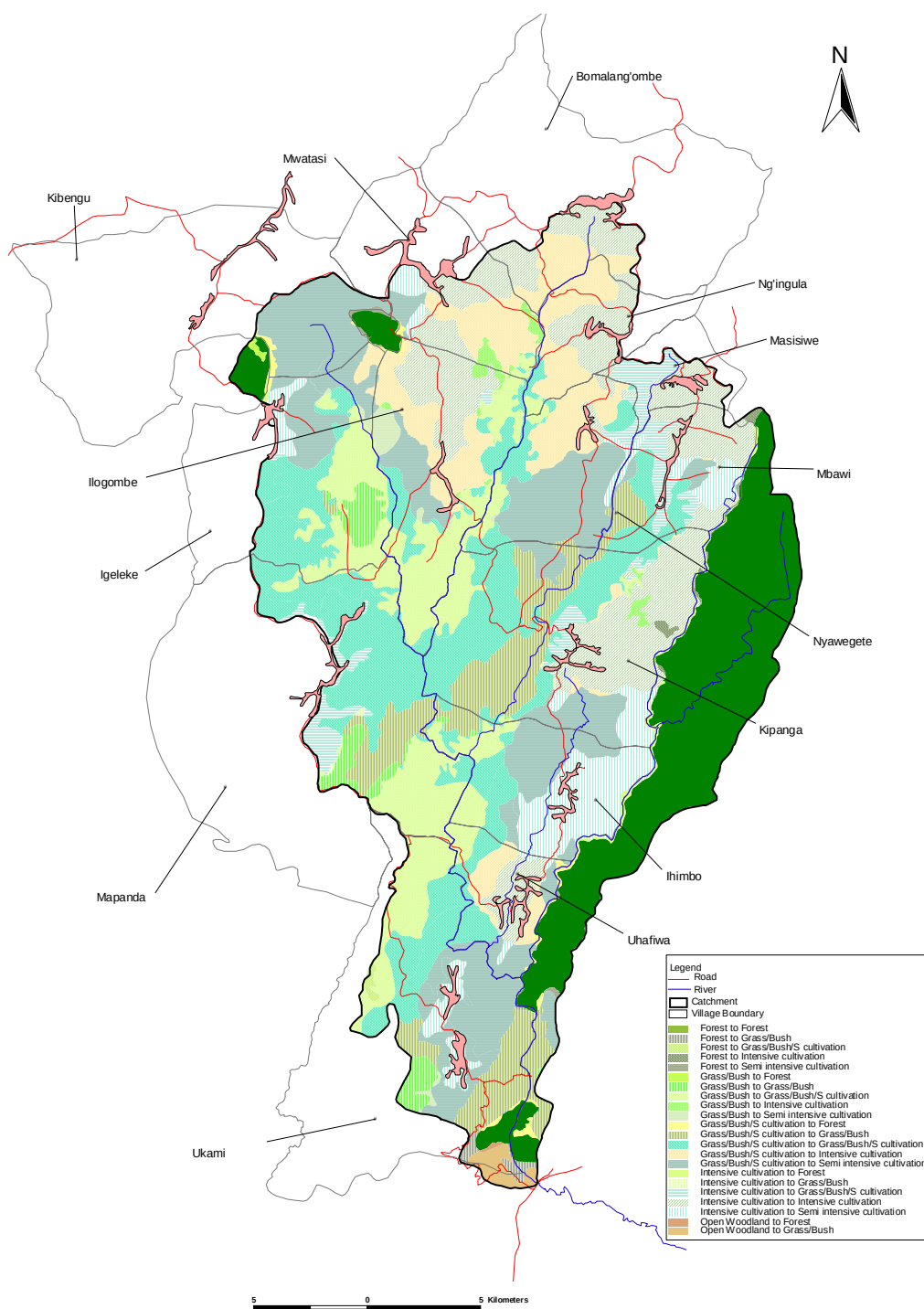


Figure 3.4 Detailed landcover/use Changes 1999/2005

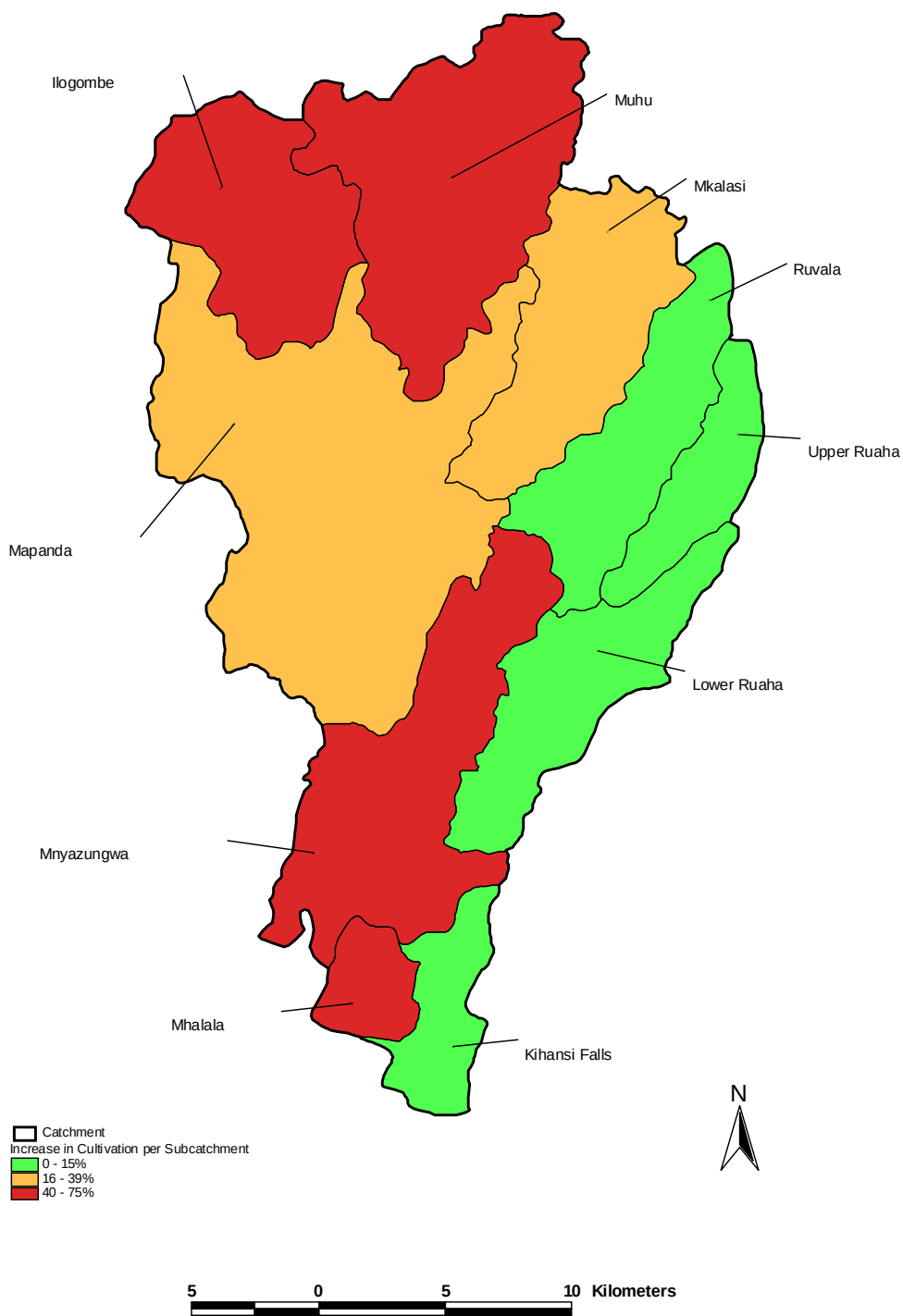


Figure 3.5 Landcover/Use Changes per Sub-Catchment

3.2 Hydrology

3.2.1 Climate

Kihansi catchment's hydrology includes surface water, ground water and drainage.

There are three main rivers and streams in the Kihansi catchment. These are Kihansi, Udagaji and Mhalala (See Figure 3.6). The Kihansi River is unusual in that it rises on the Udzungwa plateau near Bomalangómbe and flows south before turning eastwards over the escarpment. The catchment of all other rivers which flow down the Udzungwa escarpment are predominantly on the forested escarpment slope. In contrast the Kihansi has a large and hydrologically important catchment of 614 square Kilometer in the undulating hills of the plateau, where the land use is mainly rough grazing and small-holder agriculture, and with a rainfall of 1,000-1,800mm/year⁶.

Kihansi catchment climate is dominated by the Indian Ocean monsoon. Air mass movement within the Inter-Tropical Convergence Zone (ITCZ) brings rain to southeastern Tanzania during the months of November to May, peaking in April. It receives about 1,500 millimeters of rain annually. Topographic variation translates into local variation in rainfall and humidity. The lower part of the project area is hotter and drier than the cooler upper parts.

Monthly average temperature of the three stations for 2000-2002 are shown in Figure 3.7. The variation of humidity through the year have different pattern for the three stations, with Mapanda having highest peak value of 97.9% in May and lowest minimum value of 84.99 %. Huafiwa and Udzungwa have their maximum humidity during the month of April with the values of 97.66% and 97.24% respectively.

The minimum humidity for the two stations, namely Uhafiwa and Udzungwa is in October with the values of 87.05 % and 90.14 % respectively.

Variation of the monthly average humidity of the three stations for the year 2000-2002 is presented in Figure 3.8.

The wind speed have similar pattern for both the three stations with higher monthly values observed at Uhafiwa, followed by Mapanda and Udzungwa the least values.

In both the stations the maximum wind speed is in October with Uhafiwa having the highest value of 3.56 m/s, Mapanda 2.21 m/s and Udzungwa the lowest of 1.01 m/s.

The minimum wind speed is in June for Uhafiwa station with a value of 1.48 m/s while in February for Mapanda and Udzungwa stations with values of 0.99m/s and 0.42m/s respectively.

Monthly average wind speed of the three stations for the year 2000-2002 are provided in Figure 3.9.

⁶ EMP Updated – 2004 page 19.

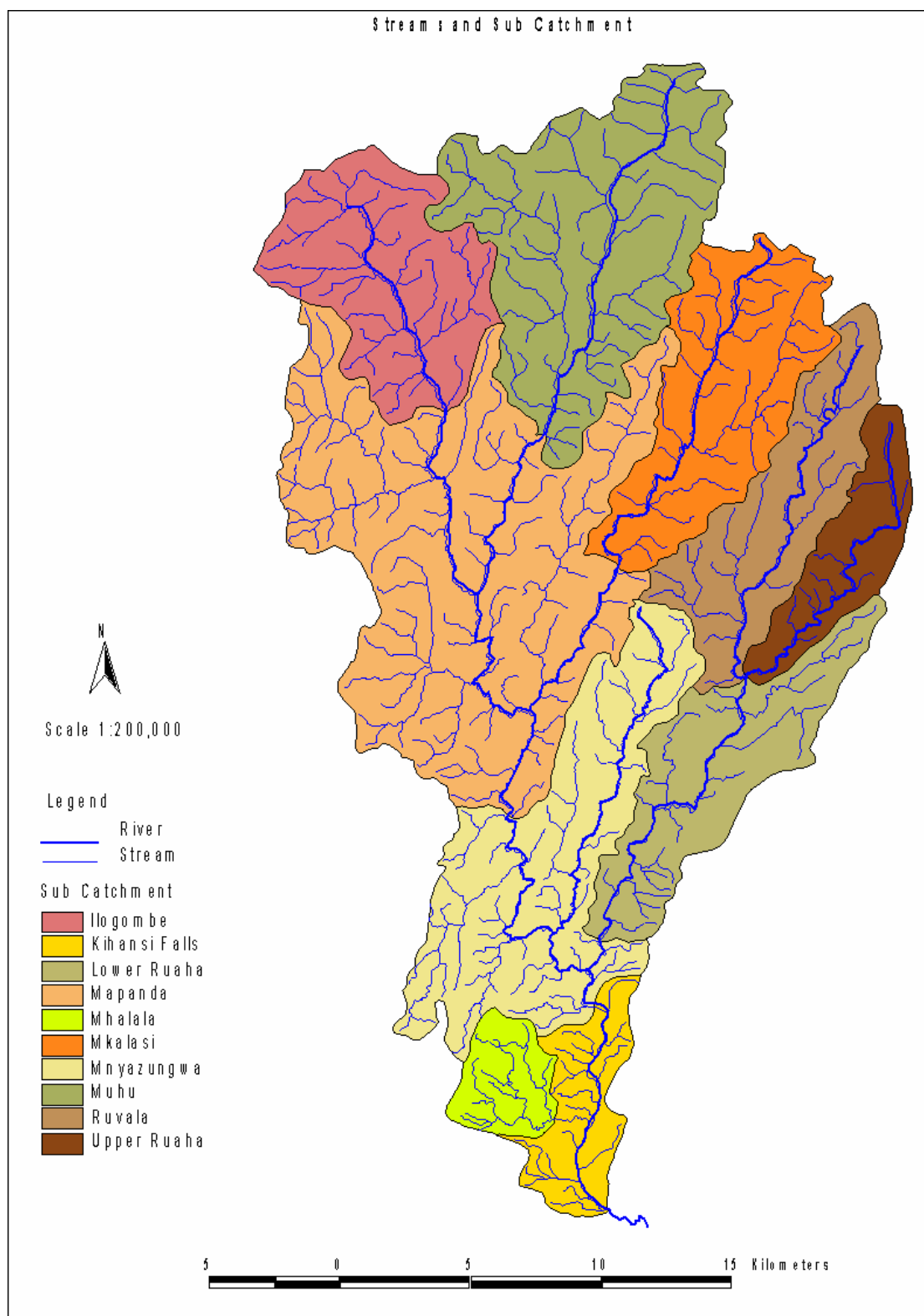


Figure 3.6 Rivers and Sub-catchments

The general climatic trend indicates that Udzungwa forest on Eastern part of the Catchment area has the lowest temperature value and Mapanda station has the highest value of humidity. The Udzungwa forest differs slightly in its maximum value of humidity compared to Mapanda and Uhafiwa although Udzungwa has a minimum fluctuation from its maximum to minimum values of humidity. The wind speed in Udzungwa forest is very low throughout the year compared to the other two stations.

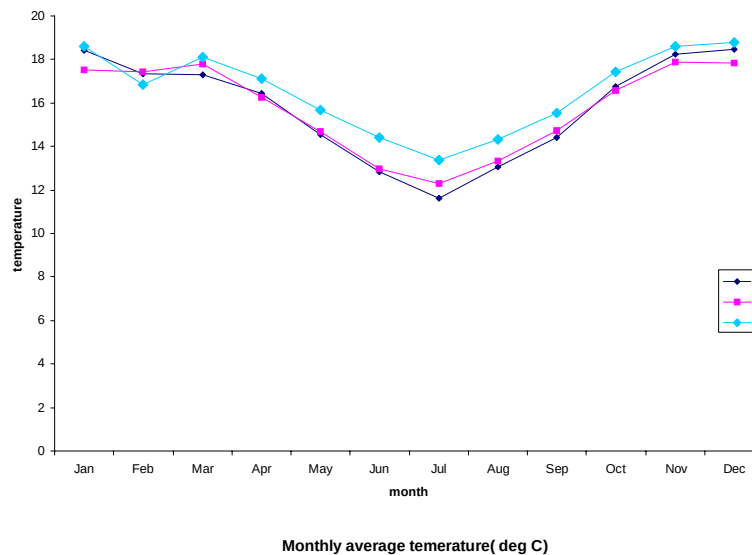


Figure 3.7 Monthly Average Temperatures for Three Stations 2000-2002

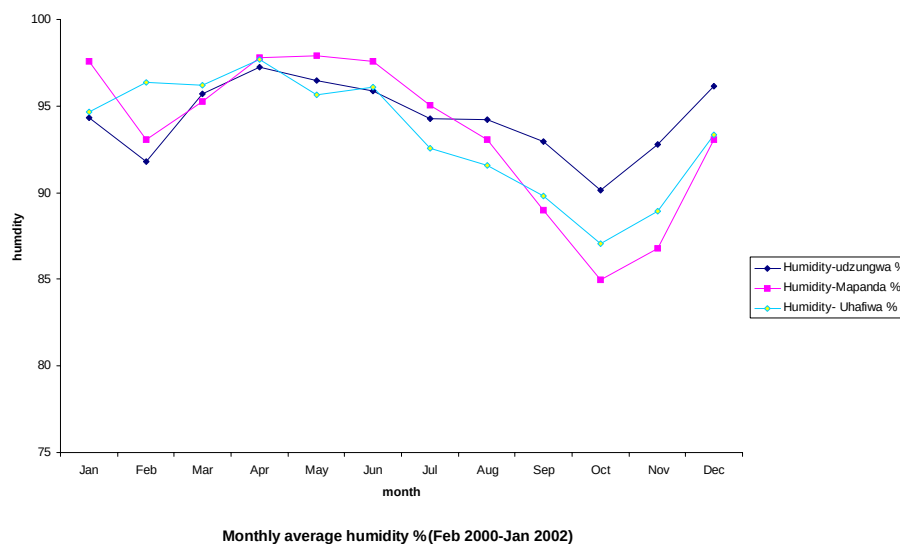


Figure 3.8 Variation of Monthly Average Humidity for Three Stations 2000-2002

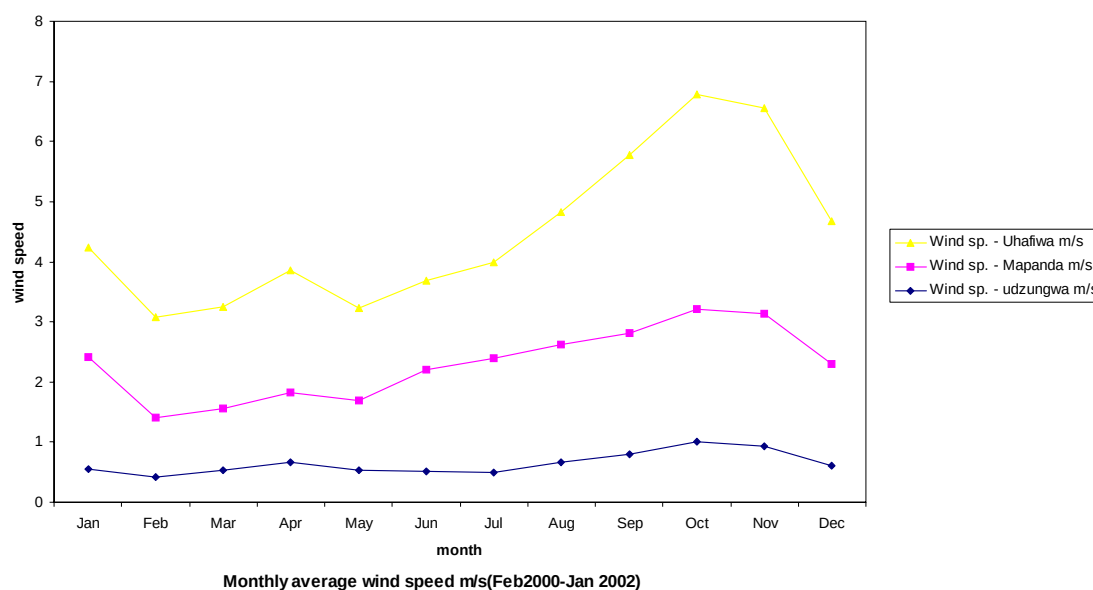


Figure 3.9 Monthly Average Wind Speed for Three Stations 2000-2002

3.2.2 Rainfall

Isohyets for the annual Average Rainfall for hydrologic year 1999-2003 are presented in Figure 3.10 which shows that the rainfall amount range from 900mm on the western and northern part of the project area to 3,000mm which are mostly found on the eastern part characterized by the Udzungwa forest reserves as its land cover. In the north-eastern part of the project area where most of the agriculture practices are taking place the average rainfall is 1,200mm per year which is enough for cultivation unless there is a big variation between dry and wet seasons. In such cases irrigation practices are usually required.

According to EMP Updated 2004, the area experience hottest temperatures during January and February and coolest temperatures in June and July. With a lapse rate of 6°C/1000 meters, night time temperatures can fall to -7°C in the upper parts of the project area during the cold season.

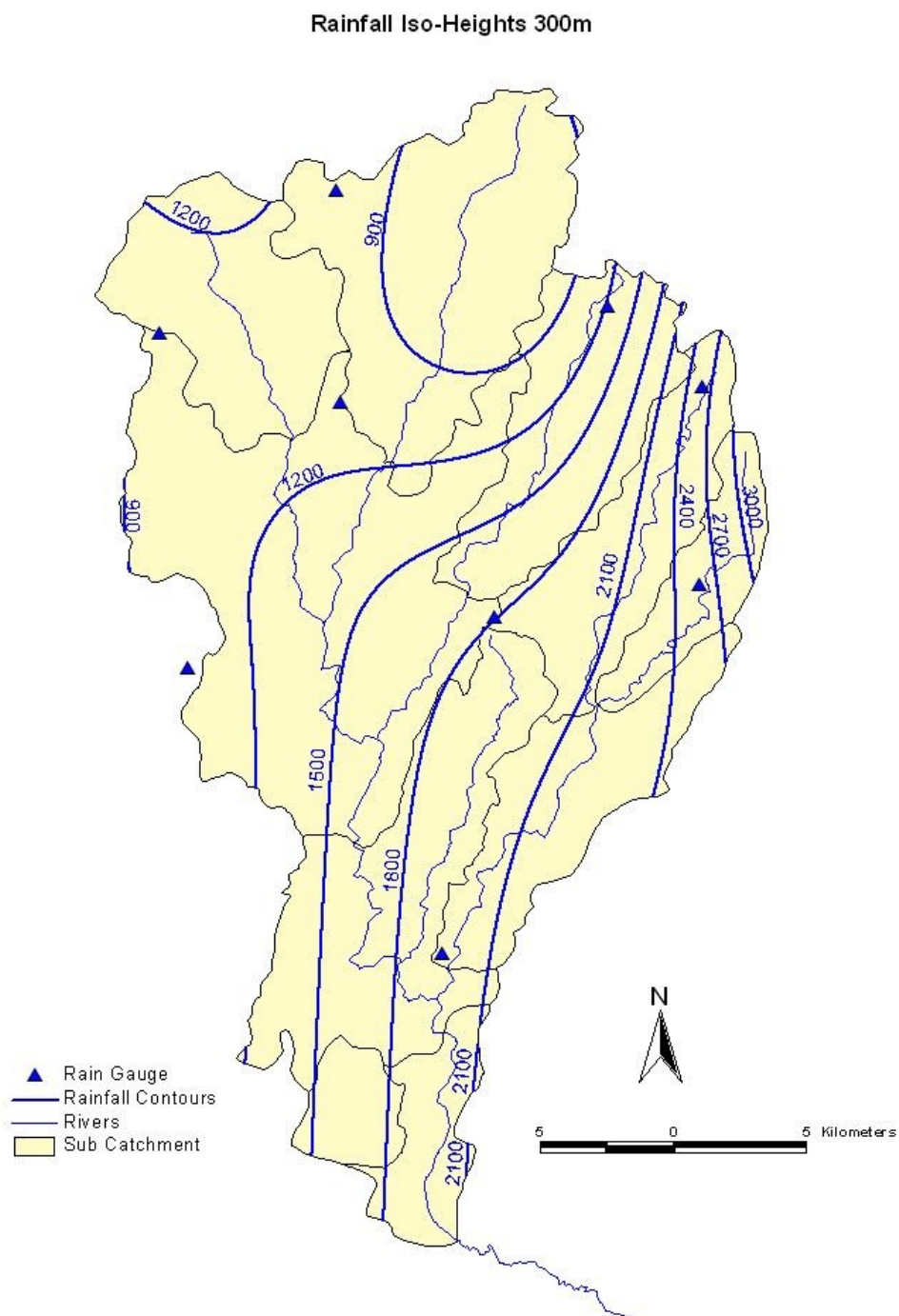


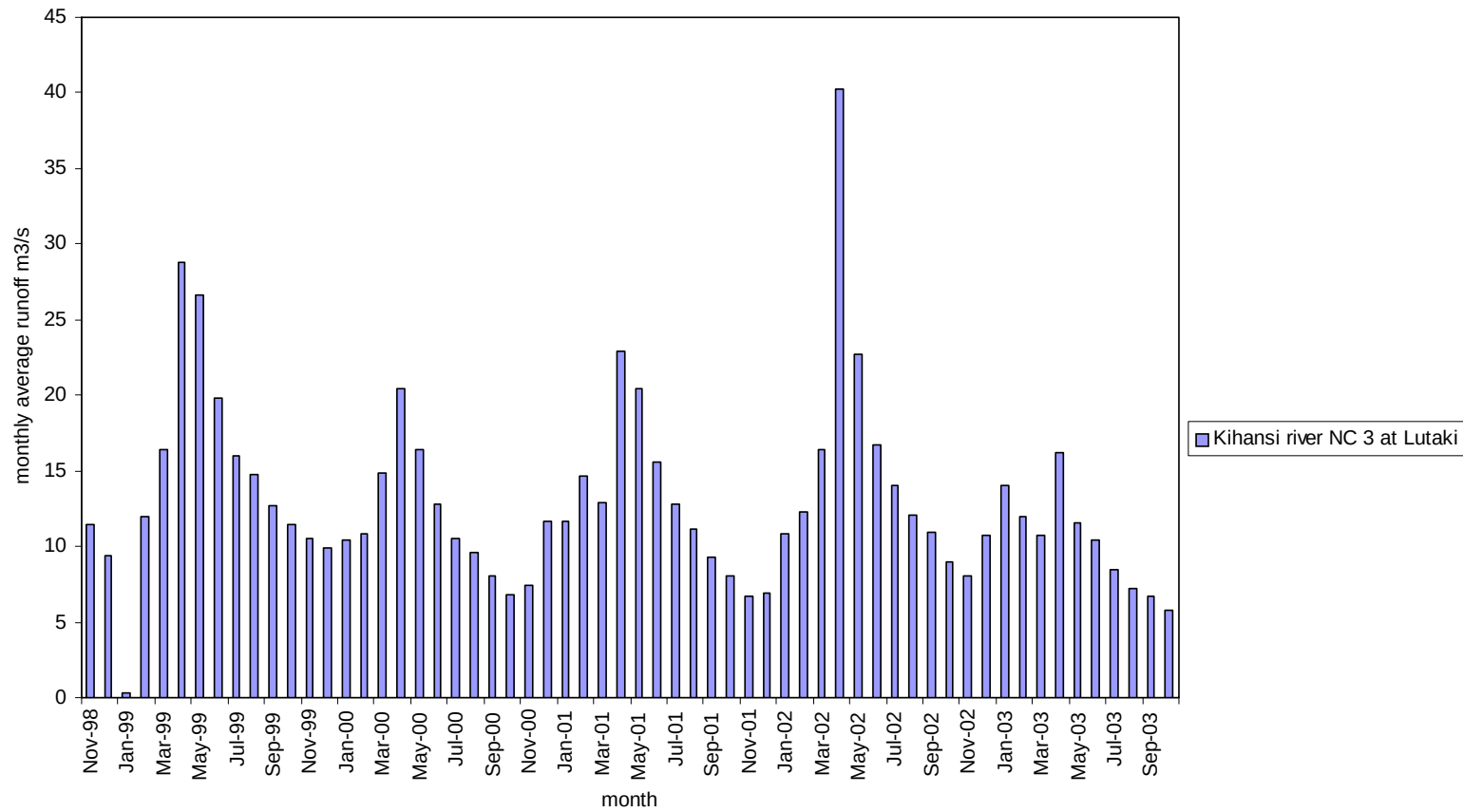
Figure 3.10 Isohyets for the Annual Average Rainfall (hydrologic year 1999-2003)

3.2.3 Surface Runoff

Since 1927, extensive flow measurements have been done at the river gauging station NC 3 at Lutaki (dam site) and the average flow at the station during the period 1927 to 1956 was estimated to be 13.4 m³/s increasing to 18.3m³/s between 1957 and 1987⁷. The increase in flow could be due to increased rainfall, or possibly a change in land use with a shift from woody vegetation to grassland and agriculture on which grasslands and agriculture lands allow water to evaporate or percolate in the ground quicker than in the woody vegetations. Reducing cover tends to make flow more episodic and less even. The highest average monthly flows are at the time of highest rainfall which is usually experienced in April with an average of 30.7m³/s. The lowest average flow is of 10m³/s occurs during dry seasons which are September and October. The driest year on record is 1956 when the lowest flow was 6.69m³/s. Refer Table no 3.3 and Figure 3.11 on Monthly average runoff-Kihansi river NC 3 at Lutaki. and Annual average run off for Sub catchment and Whole Catchment, mm/year (1999-2003)

With reference to the graph above, it has been indicated that the highest surface runoff was recorded to be 30m³/s in May 1999 and the lowest amount was 14m³/s in May 2003. Considering that the month of May is the peak season for rainfall the trend shows that the amount of surface runoff is decreasing. Based on the information obtained from TANESCO the maximum design flow for the existing turbines at the hydro-electric plant is 25m³/s i.e. three turbines and the minimum design allowable flow is 4m³/s which allows only one turbine to run. In that case even though there is a decrease to surface runoff its not yet a threat to the hydro-electric production.

⁷ CMP Norplan 1999



Monthly average runoff -Kihansi river NC 3 at Lutaki

Figure 3.11 on Monthly average runoff-Kihansi river NC 3 at Lutaki

Sub catchment	Area(Km2)	Annual run off (m3/s)	Annual run off(mm/year)
Mnyazungwa	84	2.8	1014.34
Mapanda	161	2.65	500.87
Lower Ruaha	49	1.4	869.43
Upper Ruaha	25	1.43	1740.6
Ruvala	48	1.9	1204.52
Mkalasi	60	1.41	715.11
Muhu	95	1.22	390.79
Ilogombe	58	0.51	267.57
Kihansi total	580	13.32	698.84

Table 3.3 Annual averages run off for Sub catchment and Whole Catchment, mm/year (1999-2003)

3.3 Biological Landscape

3.3.1 Common Landcover Species

The land is covered with pure herbaceous (grass) vegetation or dense short trees not exceeding 6m in height. Pure grasslands are mostly found on ridge tops and hilly slopes underlain with marginal soils probably because of prolong soil erosion or inherent shallow soils. The main grass species are *Themeda triandra* and *Hyperrhenia rufa*. Valley bottom grassland is found in poorly drained valley bottoms at the escarpment composed of *Phragmites mauritanus* (matete). Short trees are the dominant vegetation in these areas but are commonly mixed with grasses or brackens (ferns). The bushes are part of the pioneer vegetation in the 3-4 years fallow cycle after cultivation combined with occasional wild fire effect. The common tree species are *Harungana madagascariensis* and *Maesa lanceolata*⁸.

Plant samples from some of the villages were taken and identified. These included 51 plant species identified on the site from the villages of Ukami, Uhafiwa and Ihimbo. Another 104 plant species were identified for the northern part of the catchment (See Appendix 2).

3.3.2 Forests

There are three main forests partly or fully located within the upstream catchment of the Kihansi River. These forests are: Uzungwa forest, Ihangana and Idewa.

⁸ Catchment Mangement Plan – Norplan 1999

Table 3.4 – Forests in the Upstream Kihansi Catchment

Forest reserve name	Area (ha)	Total Ownership	year established
Uzungwa	20500	CG	1929
Ihangana	1207	LA	1931
Idewa	291	CG	1965

The tree canopy reaches up to 25m and above. The under storey is usually formed of impenetrable shrubs entangled with lianas or climbers. The ground layer is covered with a deep layer of decomposing litter and/ or herbaceous vegetation making it less susceptible to splash erosion. Common species found in the forests are *Newtonia buchananii*, *Kigelia Africana*, *Sorindeia madagascariensis* and *Syzigium guineense* (Mvengi). Others are *Agauria salicifolia* (Mkolongo), *Myrica salicifolia*, *Bersama abyssinica*, *Parinari excelsa* (Msaula) and *Macaranga kilimandscharica* (Mpalala).

3.3.3 Species in Uzungwa Scarp Forest

The available data on the wild life and plant species provides information on Uzungwa forest reserve. Uzungwa Scarp Forest Reserve has a rich wild life and plant species within the catchment. The information on the species found in Udzungwa Mountain is provided hereunder and was extracted from papers by various authors⁹.

The area of closed canopy forest area is estimated at ~100 km². Together with the Mwanihana Forest of the Udzungwa Mountains National Park, USFR is characterised by a great altitudinal range of forest cover that is unique to the continent.

The large mammalian fauna includes the two Udzungwa-endemic primates: Udzungwa red colobus and Sanje mangabey. USFR is of crucial importance to Sanje mangabey because the forest contains one and perhaps the largest of the only two subpopulations known for this taxon, the other being in Mwanihana forest. The IUCN Vulnerable Abbott's duiker is also present (Rovero et al., in press). In a comprehensive herpetological survey conducted by M. Menegon and collaborators, a unique community of Amphibians and Reptiles were noticed which suggests that USFR has been a centre of endemism for cool-dependent and relatively immobile vertebrate species. A census-based study of the primate and antelope community recently initiated by F. Rovero, indicates significant populations of the Udzungwa red colobus and Sanje mangabey. The great altitudinal range of USFR is reflected in the diversity of vegetation types (Shangali et al. 1998), including lowland rain forest (300-800 m a.s.l.), submontane rainforest (700-1,400 m a.s.l.), montane rainforest (1,400-1,800 m a.s.l.), and mountain bamboo forest (above 1,800 m a.s.l.). The forests are of the Eastern Arc type and are rich in species of restricted distribution, for example: *Allanblackia stuhlmannii* and

⁹ The Biological Importance of the Eastern Arc Mountains of Tanzania and Kenya

*Octoknema orientalis*¹⁰ (Lovett and Pocs 1993). USFR is ranked 1st as conservation priorities, together with Mwanihana forest and West Kilombero forests, based on data on birds, primates and duikers (Dinesen et al. 2001). For birds, in particular, this forest is ranked 2nd for importance after West Kilombero forests and before Mwanihana forest by Dinesen (1998). Fifteen restricted-range species have been recorded, including the first record in the Udzungwas of the Usambara Eagle Owl *Bubo vosseleri* (D. Moyer, in litt.)¹¹. Seven of these are categorised as globally threatened, including Rufous-winged Sunbird, which is present at high densities. See Appendix 2

The species assemblage of the Eastern Arc contains both taxa with an ancient history and those of more recent origin. Ancient affinities are with West Africa, Madagascar and even South America and SE Asia. Mountain block prioritisation shows that Ulugurus, East Usambaras and Udzungwas are most important blocks, with other important blocks being the South Ngurus and West Usambaras. Eastern Arc forest is protected within the Udzungwa Mountains National Park and the Amani Nature Reserve in the East Usambara Mountains.

Trees: Udzungwa is home to 37 species, endemic/ near endemic trees found in the Eastern Arc, and is second after East Usambara (40 species). The Udzungwa Mountains have the largest number of single-block endemic (found in no other forest blocks) vertebrate species (14) and 38 of the largest number of vertebrate species in the Eastern Arc. If the near-endemics and strict endemics are combined then the Udzungwas has the largest number of vertebrate species (93).

Udzungwas is most important among the Eastern Arc blocks when the number of red listed species (40 species) is used as the measure of importance. There are 36 species of strict and near endemic trees in Udzungwas.

Millipedes: Hoffman (1993) outlined the state of knowledge of the Eastern Arc millipede fauna, showing that the East Usambara, Udzungwa and Uluguru ranges (the only ones with partly complete inventories), contained at least 26 species and 10 genera strictly confined to one or other of these mountains.

Bryophytes: With respect to bryophytes the Udzungwa Mountains remain practically unexplored. The Eastern Arc Mountains support a diverse assemblage of bryophytes, with around 700 species recorded (Pócs, 1998). The bryoflora of the Usambara and Uluguru Mountains is quite well known.

Butterflies: There are 9 species of endemic butterflies in Udzungwa.

3.4 Socio-economic Environment

The findings of the socio-economic survey are briefly described below and contribute to the description and trend analysis of the socio-economic environment.

¹⁰ Lovett, J.C. & T. Pócs. 1993. Assessment of the condition of the Catchment Forest Reserves, a botanical appraisal. Pp. 300. Catchment- Forestry Report 93.3

¹¹ Moyer D. and Mulungu E. 2004. Report on a fieldtrip to the central part of the Uzungwa Scarp Catchment Forest. Unpublished report, WCS, 9 pp

3.4.1 Administration

a. Village level

The highest village decision-making body, the village assembly (VA), is attended by all adult villagers. Decisions made by the Village Government (VG) are presented at the VA and are thoroughly discussed to reach a consensus. The Village Assembly elects the Village Government. The VA also has the powers to remove any or all of the members of the VG¹².

The village government operates through three committees, namely

1. Planning and finance
2. Education and social welfare and
3. Defence and Security

The number of representatives in each committee depends on the size of the VG. The village governments in Kihansi catchment have between 15-27 members. In some villages, the committees are further subdivided into sub-committees dealing with specific, day-to-day issues and development operations.

Administratively, each village has a chairperson and a village executive officer (VEO) as the main office bearers of the village. The VEO is responsible for day-to-day village activities and vested with administrative powers.

Each village has sub-villages, which have similar organizational structures to the VG. The planning system usually begins at the Sub village level where agreed plans are verified at the sub-village meeting. The plans are then submitted to the respective committees that compile them to form a single plan. See Figure 3.12.

In addition to previous mentioned structures, there are also user level committees at the water source level. Residents in a certain area are mobilized by sub-village leader for clearing, deepening or putting a support structure on water source. Although such informal user level committees are not registered, they are recognized by the VG administrative structures. Voluntary work groups, such as working parties (Migowe), traditional birth attendants (TBA's) and traditional healers (TH's) are similarly recognized by the village administration. Finally, independent volunteers, youth and women groups include people who have special skills who assist the community or villages. All villages can mobilize youth and women for income generating activities. Various environmental conservation groups can also be found in some villages. Some of these groups, but most group's activities are centred on agriculture activities and tree planting.

b. District level

The District Council (DC) is the highest level of the local government and is constituted of elected and nominated councillors, and established by the Act of Parliament under the Local Government Act of 1982. The DC has two district lines of authority; the executive side whereby the District Executive Director (DED) is the overall responsible for day to day activities of the district council and the legislative side which is led by the District chairperson. These two sides are inter-related while performing their duties.

¹² Mufindi District Council-Catchment Management Project, 2003

Each ward elects one council among the registered political parties in the ward. After the election, councillors form a full assembly under a chairperson and a vice-chairperson. The sub-committees under the full assembly are:

1. Finance and Planning Committee
2. Economic Service Committee
3. Social Services Committee
4. Labour Force Development and Environmental Conservation Committee
5. Administration and Culture Committee

The full assembly also includes elected members of the parliament from the same District. Environmental conservation matters are part of the Labour Force Development committee. Most committee and the Full Assembly meet quarterly. The finance and planning committee meets monthly.

The regional commissioner links the district council to the central government. The central government approves the budget of the district council. In addition, District councils and the municipal council have an association known as the Association of Local Authorities of Tanzania (ALAT).

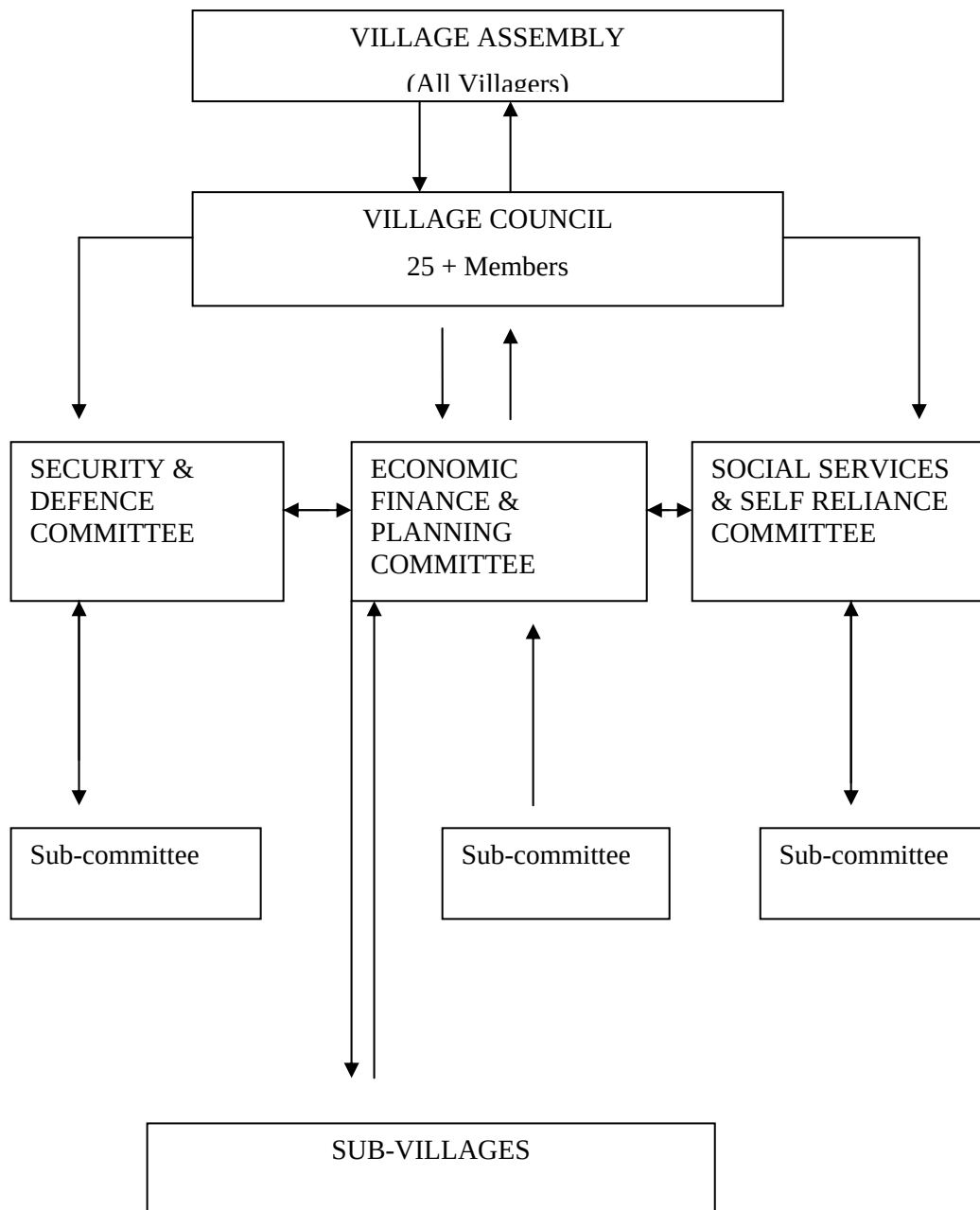


Figure 3.12 Village Organization Structure

3.4.2 Population Projections

A baseline study (Norplan 1996) estimated that the catchment area cover about 588km² and it is inhabited by some 38,000 people distributed in 14 villages. By the year 2002 the total population was recorded to be 35,177, during the inter-census period high growth rates were recorded i.e. above 3.0% were recorded in Ihimbo, (4.8%) Mapanda, (3.8%) Igeleke, (3.7%) Bomalangombe, (3.2%) Mwatasi and (3.1%) Kibengu.. There were also villages where negative growth rates were recorded and these included Ukami, Masisiwe and Ng'ingula villages. These almost certainly result from high out-migration. The situation in Ukami

however changed between 1993 and 1996 when it registered 1,861 and 2,395 people respectively representing a growth rate of 5.4% per annum for this period.

This increase was explained by the in migration resulting from the dam construction and related activities. (Norplan 1999). The current population demographic statistics are shown in the Table 3.5 below.

Table 3.5 Population Projection 1978-2025

Village Name	1978 Actual	1988 Actual	1996 Projections	2000 Projections	2002 Actual	2005 Projections	2015 Projections	2025 Projections
Ukami	2035	1569	2395	2604	2810	3412	4126	4989
Uhafiwa	913	1106	1260	1386	1231	1447	1750	2116
Ihimbo	1269	2031	1790	3565	1605	1800	2177	2632
Kipanga	2194	2372	2569	2610	2372	2305	2787	3370
Mwatasi	2289	3092	3190	4196	3786	3933 ¹³	4756	5751
Nyawegete	-	1308	1455	-	1691	1756	2160	2567
Kibengu	1676	2273	2635	3279	2864	2975	3598	4350
Mbawi	-	-	2186	-	2317	1996	2414	2919
Ilogombe	886	1151	1630	1585	1909	2632	3182	3849
Bomalan gombe	3103	4248	6371	6199	4730	6800	8223	9944
Ng'ingula	2128	1579	2025	1109	2210	2592	3134	3790
Masisiwe	2496	1508	1689	825	1789	2983	3607	4362
Mapanda	2278	3293	3821	5152	3952	4357	5269	6371
Igeleke	1200	1734	2494	2682	1911	1891	2287	2766
Total	22467	27264	35510	35192 ¹⁴	35177	40879	49470	59776

Source: National Population census report 1978-2002 and projections based on 1.9% growth rate

According to the table above there has been steady population increase in some villages. There was a high increase in villages like Ukami, Ilogombe and Masisiwe. There was a modest increase in all other villages except in Mbawi and Kipanga villages where negative growth was experienced. However projections based on average growth rate of 1.9% shows that in ten years time i.e. 2015 population increase will be recorded in all villages. Overall projections show that the population in the catchment will increase to 49,470 in 2015, which will be an increase of 39.3% and 21.0% from 1996 and 2005 respectively. In 20 years time, the population will increase to 59,776 which is 68% increase from 1996, 46.2% from 2005

¹³ For Mwatasi, Nyawegete and Kibengu the population was projected at 1.9% growth rate

¹⁴ This is a projected population and the decrease between 1996 and 2000 is due to lack of population figures for villages of Nyawegete and Mbawi

and 20.2% from 2015. In some villages the increase will be more than 100% in 20 years time. These villages include Ukami, Ilogombe and Masisiwe.

3.4.3 Population Density

Population figure from 2002 indicate that the catchment was inhabited by 35,177 people. Using this figure the population density for the catchment is approximately 57¹⁵ individuals/km². Highest village population densities, of over 45 people/km², are found in the upper part of the catchment. For example, Bomalangómbé, Masisiwe and Ngíngula. Population densities decrease lower down the catchment with the lowest densities recorded in Ukami and Mapanda at less than 27 people/km².

See Figure 3.13 for population density.

¹⁵ These figure is based on catchment area of 614 km²

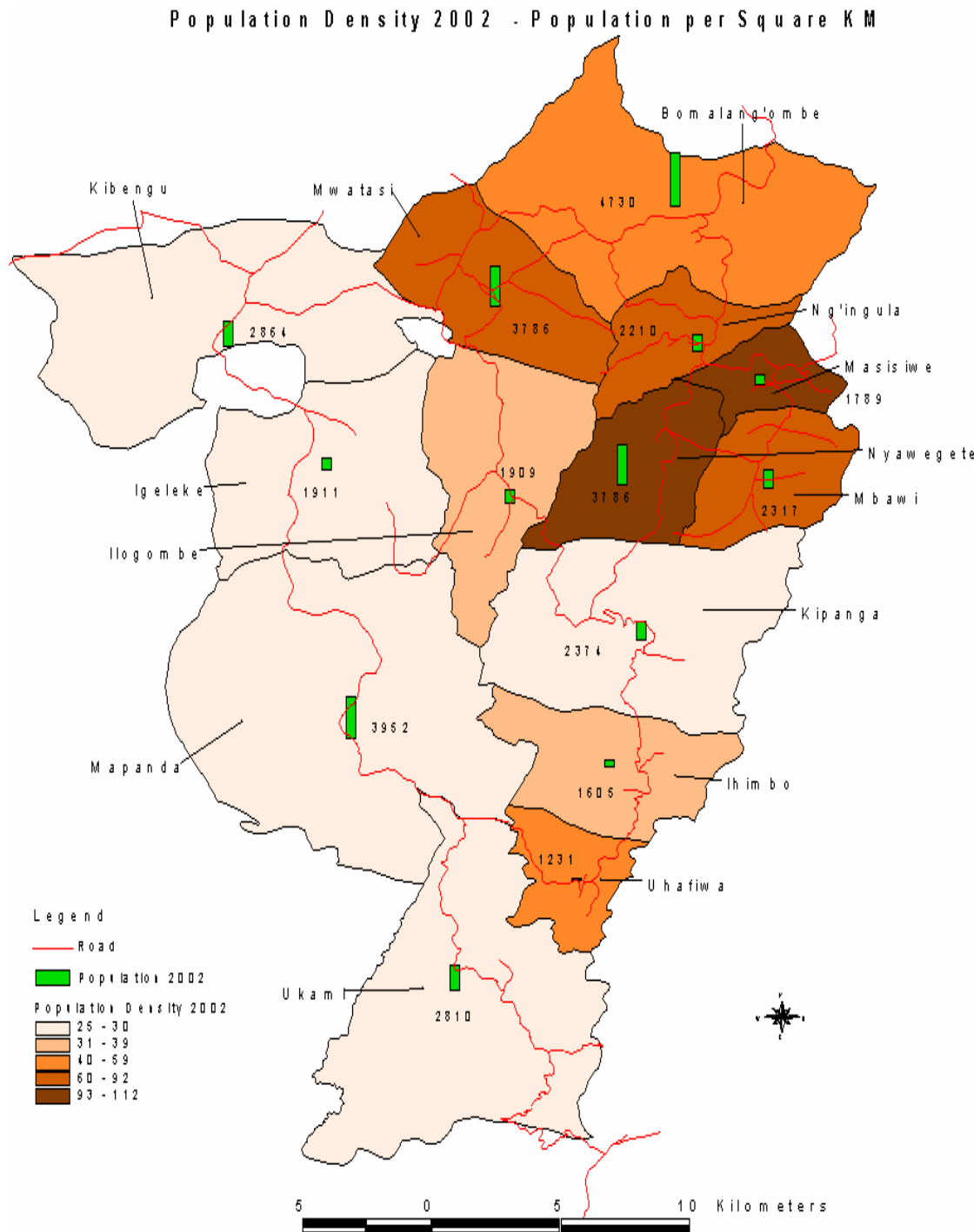


Figure 3.13 Population Density

3.4.4 Population Structure

The population structure for the catchment area based on 2002 national population census indicates an average house hold size of 4.8 for the six villages in Kilolo district and 4.7 for villages in Mufindi. This compares well with the Tanzania mainland average of 4.9. As for male and female population villages in Kilolo district there were a total of 7895 and 8664

and 8412 and 10244 for Mufindi district respectively. This indicates a higher ratio of female to male.

3.4.5 Ethnic Composition

The Hehe are the dominant tribe in the area. Other tribes include Bena, Kinga, Zungwa, Sukuma and Sangu (Kihansi Catchment Management Plan Project, Final Report, April, 1999; pg.2.1-2).

3.4.6 Level of Education

A socio-economic study which was conducted in 1997 reveals that, generally, majority of the people in the catchment have attained basic education. Almost 60% of all the respondents at village level completed primary education. However, illiteracy is still high with almost a quarter of the respondents (24%) having no formal education or just had attended adult education classes. The highest proportion of respondents with no formal education was found in Mbawi and Ihimbo. Few people have education above primary school level (2%) (Norplan A.S, Vol. II, 1997;pg 42).

However the Table below summarizes the level of education in the catchment's villages.

Table 3.6 Level of education

S/No	Villages	Level of Education				
		Primary	Secondary	Short courses	Diploma/degree	Not indicated
1	Kibengu	95%			5%	
2	Mwatasi	82.6%	4%	13%		
3	Nyawegete	91%		9%		
4	Masisiwe	60.9%	1.2%	0.6%		37.35%
5	Ngíngula	82.4%	2.6%	5.2%		9.8%
6	Bomalangómbe	94.2%	3.9%	0.6%		1.3%
7	Ilogombe	100%				
8	Mbawi	96.8%	3.2%			
9	Kipanga	90.7%	7%			
10	Ukami	90.45%	5.5%	1.4%	2.7%	
11	Ihimbo	89%		11%		
12	Uhafiwa	93.3%		6.7%		
13	Mapanda	86%		1.7%	3.3%	9.1%
14	Igeleke	65.1%	0.9%	9.4%		24.5%
15	Average	87%	2%	4.2%	0.9%	5.9%

Source: Norplan CMP 1999, PRA 2005

3.4.7 Economic Activities

The dominant economic activity in all the villages is farming. People depend on this largely subsistence activity both for food and for obtaining income. Current farming practices are confronted by a number of problems which threaten the environmental health in the catchment and indeed the future of the Kihansi dam. Poor farming practices used lead to soil erosion which causes sedimentation and pollution of the rivers. In addition the activity has very low yields making people to depend on slopes and valley bottom farming. Apart from crop production, other activities include livestock keeping, fishing, hunting and trading activities.

To determine the relationship between the catchment communities and resource use it was important to investigate the dominant economic activities conducted by the majority of the villagers. The study asked about the main economic activity that saves as the major means of livelihood. The results are presented in the table below.

Table 3.7 Economic Activities

Village	Farming %	Animal keeping %	Employment %	Other %
Kibengu	80	15	5	
Mwatasi	71.7	21.7	2.2	4.3
Nyawegete	85	10	2	3
Masisiwe	83.4	14.8	0.6	1.2
Ng'ingula	86	9	3	2
Bomalangombe	90.3	4.5	2	3.2
Ilogombe	84.2	10.5		5
Mbawi	64.5	25.8	3.2	6.5
Kipanga	89	6.6		4.4
Ukami	84	6.6	4	5.3
Ihimbo	85	10	5	
Uhafiwa	86.7	5	5	3.3
Mapanda¹⁶	100			

¹⁶ Data was adopted from Participatory Rural Appraisal for Igeleke and Mapanda Villages January 2005 by Environmental Resources Consultancy.

Igeleke	98.1	1.9		
Average	84.9	10.1	2.3	2.7

Source: Socio-economic Survey 2005 by SMEC

The results indicate that most respondent (85%) engage in crop production for their livelihood. In fact agriculture (crop production and animal keeping) is done by 95% of the respondents. The majority of the production is for subsistence although maize and beans are at times sold to get cash for other household needs for example education, health, clothing etc. There is limited production of coffee, pyrethrum and tea although the potential is there. However it was reported in Kipanga and Ihimbo, which grew sunflower and pyrethrum respectively have now stopped production because of lack of markets for the crops. Only 2.3% reported to be employed in the formal sector especially education while 2.7% indicated to be in the other activities category which included small businesses e.g food vending, kiosks, selling local brew and technicians. Even though farming activities constitutes the main source of peoples livelihood, the absence of credit facilities to facilitate farmers access to agricultural inputs has contributed to limited use of for example artificial fertilisers and pesticides and consequently resulted into low crop productivity.

3.4.8 Land Tenure

Agriculture being the major means of livelihood in the catchment makes land a very important asset to the communities living in the catchment villages. It is thus addressed in detail this study.

Similar to other rural setting in Tanzania, land ownership in the catchment is under customary law and the main way of access to land is through inheritance. About 70% of the population in the lower catchment villages acquire land this way. Other means include buying (14.5%), and being allocated by the village government (7.3%). The picture did not change significantly when data for the whole catchment (including the upper catchment villages) was calculated as Table 3.8 below shows.

Table 3.8 Means of obtaining land by villagers

Village	Inherited	Bought	Village government	Others ¹⁷
Kibengu	55	20	20	5
Mwatasi	77.3	22.7		
Nyawegete	69	29	2	
Masisiwe	78.7	12.4	4.1	4.8
Ng'ingula	84	12	2	2
Bomalangombe	65	20	8	7

¹⁷ The others category include those who cleared forests and those who did not indicate how they got land

Ilogombe	57.9	31.6	10.5	
Mbawi	64.5	32.3	3.2	
Kipanga	57.8	11.1	8.9	22.2
Ukami	61.3	25.3	2.7	10.7
Ihimbo	75	10		15
Uhafiwa	71.7	6.7	16.7	5
Mapanda	66.1	9.1	24	0.8
Igeleke	76.4	12.3	11.3	
Average	68.6	18.1	8.1	5.2

Source: Socio-economic Survey 2005 by SMEC

It is observed that 68.6% of the respondents have inherited their farms, while 18.1% have purchased their land. Another 8.1% were allocated land by the village government while 5.2% did not indicate how they acquired their lands. The majority of people indicated that getting land for farming was difficult, which is an indication of pressure on arable land. It was also revealed that pressure on land has cut down the fallow time from between 5 and 10 years to between 3 and 5 years now. This notwithstanding, farm ownership compared to other areas of the country is high. Ownership levels in the catchment are indicated in Table 3.9 below

Table 3.9 Farm ownership

Village	Frequency	Percentage	Total
Kibengu	40	100	40
Mwatasi	44	95.6	46
Nyawegete	98	98	100
Masisiwe	165	97.6	165
Ng'ingula	150	98%	153
Bomalangombe	152	98.1	155
Ilogombe	19	100	19
Mbawi	58	93.5	62
Kipanga	44	97.7	45
Ukami	67	90.6	75
Ihimbo	34	87	39
Uhafiwa	60	100	60
Mapanda	121	100	121
Igeleke	106	100	106
Total	1158	97.6	1186

Source: Socio-economic Survey 2005 by SMEC

The Table 3.9 indicates that the overwhelming majority (97.6%) of the people own farms. In 5 villages (Kibengu, Ilogombe, Uhafiwa, Uhafiwa, Mapanda and Igeleke) farm ownership is 100 percent. People were however divided on whether the land they own was adequate or not. In some villages land was adequate (47.9%) while in others it was not (46.5%). Land shortage is a serious problem in Masisiwe, Bomalangombe, Mapanda, Igeleke, Mbawi and Ukami. When the sizes of the farms owned was investigated it was revealed that most people own small plots. Given the low yield of agriculture this is serious threat to food security. The study indicated that the majority of population in the catchment own farmland ranging between 1 and 3 acres while 24.6% own farmland between 3.1 and 10 acres. 7.1 percent of the respondents own less than an acre while there are few who own farm land above 10 acres. The indication is that land ownership will continue to diminish as population increases. Under customary law land is parcelled to male children meaning that the holding gets smaller and smaller from one generation to another.

3.4.9 Sources of Energy

Fuel wood is the main source of energy used by 98% of the catchment villagers for cooking., Kerosene is used for lighting. It is not anticipated that with the provision of electricity people will shift to electricity as an alternative to fuelwood. Electricity at this stage can be used by very few people for lighting but can be installed in public places and in some businesses like welding and milling. Clubs and bars can also benefit from power supply.

In the face of increased pressure on renewable resources and household budgets, it is important that people are introduced to alternative sources of energy. Energy saving stoves, for example, could well be taken up by local people so that pressure on forests is reduced. Although these stoves are not used in the catchment villages, but there are people who are trained in making the stoves for example in villages of Mwatasi and Mbawi.

3.4.10 Settlement Pattern and Infrastructure Services

Owing to the topographic pattern most of the village settlements stretch along the major road linking one settlement to the other. Houses in these villages are rather scattered whereby farming activities and livestock keeping are carried out within the confines of the compounds. The structures are usually built with burnt brick and roofed with hatching material and a few with corrugated iron sheets. Most of these settlements are located on the hilltops and dwelling units are linked with footpaths. Most of the villages have primary schools, dispensaries, villages offices, religious buildings and retail shops. However they lack basic community facilities such as vocational training schools, secondary schools and in a number of villages dispensaries and potable water. Almost all villages lack electricity and telephone services both landline and mobile. Road network and condition is relatively poor both in terms of convenient link between one village and another. For example there is a poor road link between Igeleke and Ilogombe. One has to travel via Mapanda to reach Igeleke. Linkeage between the two villages is facilitated by footpaths. It was further observed that the poor road condition required one to have a four wheel drive vehicle to travel across villages especially during the rainy season. See Figures 3.14, 3.15 and 3.16

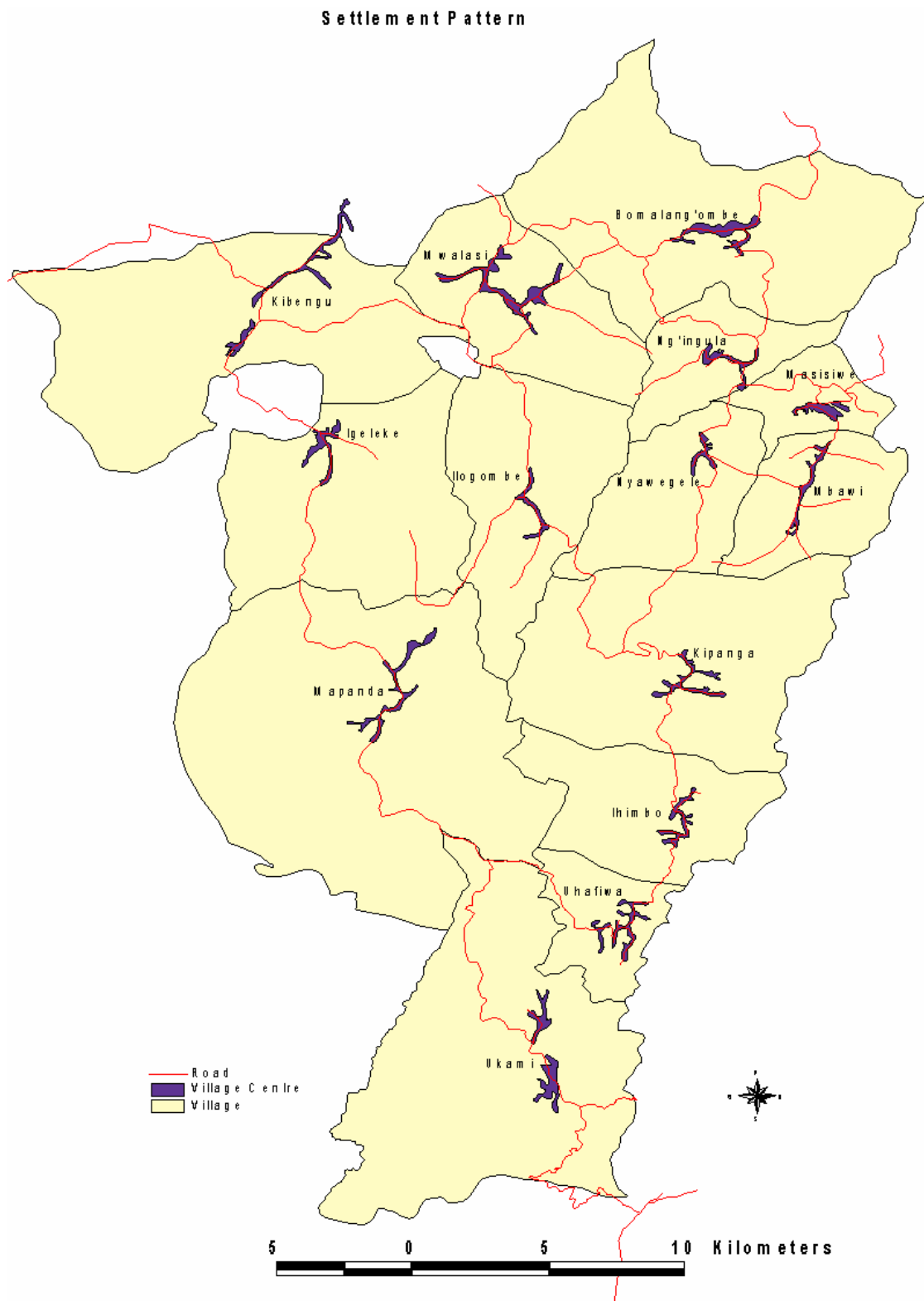


Figure 3.14 Settlement Patterns



Figure 3.15 Socio-economic Services

Infrastructure _ Roads and Village Centers

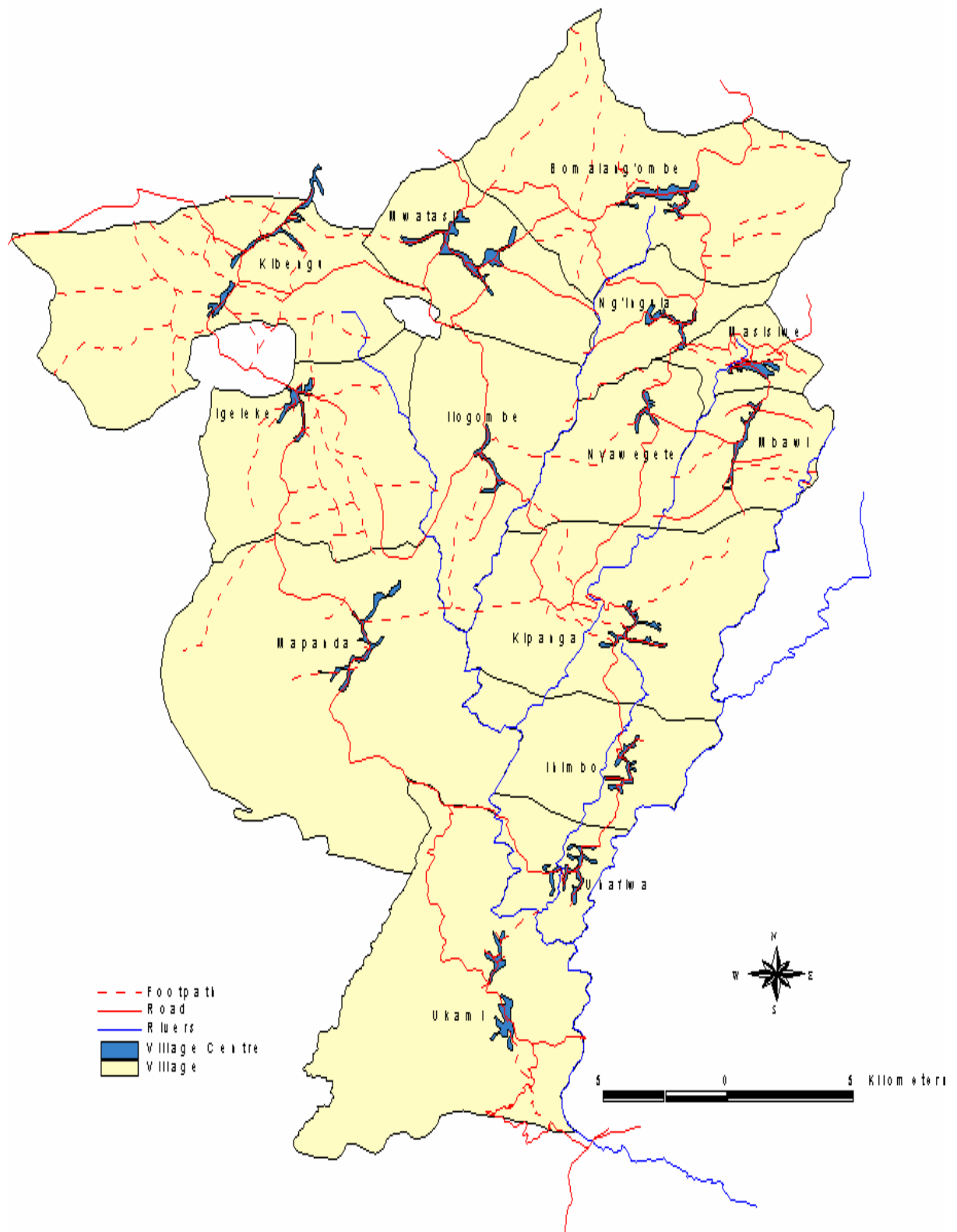


Figure 3.16 Infrastructure

3.4.11 Planning Process

a. Village Planning

The planning process or procedure starts from the sub-village level where members discuss the affairs of the community. Through the village executive officer (VEO) these matters are conveyed to the secretaries of the three village committees: planning, economic and finance. Each village committee deals with particular issues brought up from the sub-villages.

Subsequently, the secretaries, together with the VEO, put up the village plan and present it to the village Government and the latter the village assembly. As the lowest level of local government, the VG is composed of the chairperson, the village executive officer, 25 village government members plus sub-village chairperson. During its meetings, the village government co-opts other members from institutions and departments who are living in the villages who provide technical backstopping.

A common pattern for making a decision regarding development is that the respective village government committee makes decisions. The plans are discussed and integrating at a village committee (VGT). The village chairman (VC) working together with the Village Executive Officer then announces VGT Decision /plans or project at the village assembly (VA) and informs sub-village leaders of the modalities of work i.e. manpower needed per planned activities. At times plans are explained to the village leaders who in turn explain to their communities.

Under normal circumstances after the plans have been presented at village assembly they are forwarded to the ward where they are discussed at the ward development committee (WDC or BAMAKA). Village leaders, VEO, the ward councilors and the Ward Executive Officer (WEO) are all members of BAMAKA. Plans requiring support are forwarded to the Divisional Development Committee (BAMATA) and to the District.

b. Ward Planning Level

Each village within a ward submits its plan to the ward executive officer who is the secretary of Ward Development Committee (WDC). The WDC in turn discusses village plans and makes some decisions or adopts the plan and submits it to the district.

c. District Planning Level

On the district level the District Planning Officer (DPLO) reviews plans. Subsequently, the plans are forwarded to various district council assemblies for approval and for implementation. However some of the plans are sent to the central government in cases of project that requires the district to seek grants from the central government. At each planning level, that is, from the village to the district, there are certain plans that a given level has the ability to implement using local resources and initiatives

The planning mandate of the District Councils is provided within the Local Government Act of 1982. Usually the planning period starts from the January from the Sub committee levels. The fiscal year is January to December while that of the central government is July-June of each year.

By the end of August every year, plans from the village and ward level are supposed to have been submitted to the district headquarters for scrutiny. The plans are tabled to the relevant council committee before being submitted to the finance and planning committee where a

District plan is formed and submitted to the district council assembly for approval. The district budget book that comprises detailed explanations of income and expenditure on recurrent and development activities is then submitted to the proper officer (Regional commissioner) by 15th December. Once the proper officer has given his final approval the District council is allowed to make any expenditure.

3.4.12 Institutional Capacity at District Level

In Tanzania, districts have been vested with more administrative and management powers. The role and position of district councils in the catchment resource use and management is crucial. Mufindi District is responsible for collecting levies and taxes accrued from natural resources. The council is close to the local community, which is also the main resource users and grass roots stakeholder. Despite the fact that few forest reserves in the catchment are under the district authority, Mufindi District still has a stake in the central government forests. The district has due responsibility and legal powers to regulate forest resource use, for example in issuing felling licenses and controlling illegal activities e.g. agriculture encroachment and illegal timber falling¹⁸

Equally important to mention is that village management plans and By-laws have to be first approved by the district before they are implemented. For a long time the districts have had their own By-laws though their enforcement became complicated due to the inadequate staffing levels, lack of proper logistics and poor participation at lower levels.

The government system permits villages to report to the district authorities through wards and divisions. The transformation and decentralization of administrative and resource management powers to the district by the central government is still in process. There are hanging concerns over the process. This is because full delegation of responsibilities is yet to be achieved. For example, the districts are not conferred with full power in issuing forest use permits, as they have to seek the consent of the Director of Forestry and Beekeeping. To this regard, full empowerment to the district on the use of the resources is required.

a. Functions and Duties

The local government authorities that include Districts, Wards, Villages and sub villages were established by virtue of the Act of Parliament No. 7 Section 112 of 1982. Under this act it provides for the following, including planning:

- ♦ Promote the social welfare and economic well being of all persons within its area of jurisdiction
- ♦ To further the social and economic development of its area of jurisdiction.
- ♦ To ensure control an improvement of agriculture, trade, commerce and industry
- ♦ To ensure furtherance and enhancement of the health, education and the social, culture and recreational life of the people.
- ♦ To formulate, co ordinate and supervise the implementation of all plans for the economic, commercial, industrial and social development.
- ♦ To make By-laws applicable through out its area of jurisdiction and to consider and approve By-laws made by village councils of the district council concerned.

¹⁸ Mufindi District Council: The Catchment Management Project, 2003

- To consider, regulate and coordinate development plans, projects and programmes of villages in the districts so as to ensure the more beneficial development and mobilization of the productive forces in the villages and their application
- To take the necessary measures of the prevention of the soil erosion and the protection of the crops.
- To prohibit or regulate the cultivation of crops or a category of crops
- Prohibit or regulate the use of any agriculture land.
- Prescribe steps to be taken by the occupier of any agriculture land for the purposes of maintaining and improving its productivity and preserving the fertility of the soil.
- Make provision for the prohibition or regulation of livestock husbandry
- Prohibit or regulate the movement of any livestock in or through any area in the District.
- Prescribe methods of husbandry in relation to the keeping or grazing of any livestock
- Restrict the kinds or members of the livestock, which may be kept in any agriculture land.
- Prepare planning schemes and undertake measures required by any law for the time being in force relating to development in the area.

b. Personnel

Under the Local Government Service Act 1982, the district councils have the following sources of personnel

- Staff seconded to the District Council by the Central Government.
- Staff employed by the local government commission and seconded to the district
- Staff employed by the district council

c. Financial Capacity

The local Government Financial Act of 1982 Section 9(14) stipulates four sources of revenues for both the village and district councils as grants, loans, taxes and overdrafts

The major sources of district revenue are grants from the Central government, followed by various taxes and levies imposed as per Section III of the Local Government (District Council) Financial Act of 1982. The development levy was the essential source of district revenue, however from this fiscal year the government has waived it and the Central government will support district authorities with funds from the central government. Property tax, crop cess from cash crops, log sales, livestock levy and various licenses are also provided important earnings.

d. Legal Powers

The state legislation has invested the district to undertake the following¹⁹

- Take the necessary measures for the prevention of soil erosion and protection of agriculture products
- Prohibit or regulate the cultivation of crops or a category of crops
- Prohibit or regulate the use of any agriculture land
- Make provision for the prohibition or regulation of livestock movement through any are in the district.
- To formulate, coordinate and supervise the implementation of all plans for economic, commercial, industrial and social development in the in its areas.
- To monitor and control the performance of the duties and functions of the council by the departments of the council and its officers and staff.
- To ensure the collection and proper utilization of the revenues of the council
- To make By-laws applicable through out its area of jurisdiction and to consider and approve By-laws made by village councils within its area of jurisdiction
- To consider, regulate and coordinate development plans, projects and programmes of villages and townships authorities so as to ensure the more beneficial development and mobilization of productive forces in the villages and township towards economic well being of all persons within its area of jurisdiction
- To further the social and economic development of its areas
- To enact By-laws that it deems necessary, desirable, conducive or expedient for six permanent committees of the District Council.

3.4.13 Past Mitigation Activities

The villages in the upper catchment area have benefited from environmental conservation training and economic activities initiated and funded by HIMA. These activities include PRA training, training in terracing and tree planting.

In the lower catchment villages i.e Ukami , Uhafiwa, Ihimbo. Kipanga and Mapanda awareness creation was carried out by CMP²⁰. This included sensitising village governments, village environment committees and paraprofessionals. The project emphasized that the coordination which was carried out by NORPLAN would be transferred to local governments where the village governments and their environmental committees would take overall responsibility of the project activities.

Mufindi District has been involved in education campaigns on the importance of soil conservation on farm land and environmental issues. Generally the districts showed a sense of ownership of individual programs and activities e.g. MUAJAKI, SE-MAKI and CMP.

¹⁹ Mufindi District Council: The Catchment Management Project, 2003

²⁰ CMP – Catchment Management Plan by Norplan 1999

The districts actually reported monthly and quarterly on mitigation activities in the catchment.

During this study, we gathered that both the activities and spirit started a downward trend after ongoing projects came to an end in 2003. Training and conservation activities have slowly declined since the projects ended. This may translate to mean that the projects objectives were not internalised by the villagers.

3.5 Farming Systems

Field survey from this study has revealed that the farming systems in the villages in KRC can be categorised into three main components. These are namely crop production, livestock keeping and agro-forestry. The extent of involvement by villagers in these activities of livestock keeping, crop production and agro-forestry varies from one village to another depending on the prevailing socio-economic and physical environment.

Agriculture is the most important activity in the catchment accounting for approximately 75% of the total landuse.

3.5.1 Crop Production

Like in many parts of the rural areas in Tanzania crop production is the dominant economic and the major land use activity undertaken by most of the households in the Kihansi River Catchment area. In this study it has been observed that households in all of the 14 villages in the catchment depends almost entirely on small scale crop production as their main sources of livelihood to provide food to the household as well as sources of income. Main types of crops produced are maize, beans, peas, Irish potatoes, sweet potatoes. Other crops include wheat, finger millet and vegetables. These crops particularly maize, beans and peas are produced partly as a source of food and cash income to households. Coffee and pyrethrum were introduced especially in villages in the upper part of the catchment including Mapanda Village by HIMA and CMP. However, such crops were abandoned due to lack of reliable market

Most of the food crops are cultivated in the upland during the rainy season as well as in the valley bottom (vinyungu) during the dry season. Such a system is important in sustaining household food security. However, cultivation in the valley bottomstreams draining to Kihansi River, which many constitute, will affect water flows as well as accelerating erosion and siltation in the downstream.

Initial agricultural land preparation is done by various methods. However, slash and burn using fire has been reported to be a common practice used by majority of households especially in villages such as Mapanda, Igeleke,, Kipanga, Ihimbo and Ukami.

Most of the farmers are small farm holders using mainly hand hoes as main tool for cultivation and family as their main sources of farm labour. However, few household were reported using tractors and ox-plough in Mapanda, Igeleke, Ilogombe, Mwatasi, and Kibengu Villages which have gentle and flat terrain. The rest of the villages use entirely

hand hoes for cultivation. This has been partly due to lack of capital to acquire farm implement (such as tractor and ox-plough) and mountainous terrain of many villages in the catchment which limit use of such implement.

a. Flat Cultivation

Flat cultivation and use of ridges are the common cultivation practices in the KRC area. About more than 70% of the households in the catchment practises flat cultivation especially in the production of maize, beans, finger millet and wheat in the upland areas including steep slopes and in the valley bottoms. While almost all households practices ridge cultivation when they mainly grow peas and sweet potatoes both in the upland and valley bottoms. Thus to most households use of ridges is more linked to the type of crop to be cultivated than for soil and water conservation. However, in comparison to the upper part of the catchment there are relatively more households using ridges for production of maize and beans in the steep slopes in Uhafiwa, Ukami and Mapanda Villages compared to the most of the villages in the upper part of the catchment. Probably this has been due to the concerted effort by CMP project. Despite concerted effort made by HIMA and CMP to raise awareness on environmental conservation by training farmers on the use of sustainable soil conservation measures such as contour terraces and ridges, only few people still practising. Many people still cultivate crops in water sources and in the streams as well as flat cultivation in the steep slopes

b. Fertilisers

Declining agricultural production over time has been reported even after the environmental conservation initiations by CMP and HIMA. Such as situation has been attributed to low soil fertility and inadequate agricultural extension knowledge. Very few households use fertiliser to improve soil fertility and improved seeds to enhance crop productivity. Thus the overall consumption of fertiliser is insignificant especially in the remote villages with transport problems including Ihimbo, Mbawi, Masisiwe, Uhafiwa, Kipanga and Ng'ingula Villages.

c. Extension Services

With the coming to end of HIMA and CMP Projects, project on soil and water conservation have also stopped. However, in Mapanda Igeleke, Ilogombe and Kibengu Villages, there is on going extension services focusing on training farmers on better methods of improving production of beans, peas and establishment of SACCO. Such extension service is supervised and financed by District Agricultural Development Support programme (DADS). The extension services currently provided under (DADS) is not enough as it covers only few villages and on specific item of their interest. Most of the household in the survey villages want to be trained on good crop and animal husbandry including soil and water conservation, good methods of rearing animals such as pigs, goats and dairy cow and establishment of small credit unions in villages.

The demand of agricultural extension service from farmers in the catchment is high compared to the available services. Most of the household in all the survey villages reported that the level of available extension service is very low some reported missing it completely

especially after the end of HIMA and CMP projects. Some of the extension officers are unable to reach farmers at the appropriate time. For example in Mapanda ward there is only one agricultural extension officer who serves five villages and some of the villages have not seen him for more than six months. Such an extension officer although he has motorbike he cannot reach all the villages due to lack of cash to maintain his motorbike and to buy fuel. In Kipanga village the agricultural extension officer who is based in Ilagombe village went for studies one year ago without replacement. While in Bomalang'ombe ward there are two extension officer one based in Mbawi Village (livestock officer) and the other one based in Bomalang'ombe. Most of the villagers in this ward are complaining of inadequate and inefficient extension services.

3.5.2 Livestock Keeping

Livestock keeping is also another farming system or key component of the whole farm system and an important source of livelihood in the catchment villages. The most common type of livestock is swine (between 40- 60% of households), as compared to goats, sheep, chicken and cattle. There is an opportunity to improve pig production given the given high prevalence of piggery activity.

Cattle especially the local breed is found in small number in Mapanda, Kibengu, Igeleke, Bulyang'ombe and Ilagombe. Zero grazing involving improved breeds has been encouraged especially during the HIMA project and should continue where appropriate.

Given such opportunities of keeping livestock the integration of livestock into cropping system is very minimum. Very few people reported to use manure in their garden. Villagers have indicated that it is very bulky to carry manure to their farms. Extension knowledge is needed to educate people on the needs to utilise crop residues from the farms as fodder while livestock provides manure to the field. There are also opportunities to plant fodders in the contour terraces which provide feeds to animal as well as conserving the soil. Moreover, through sales of small ruminants such as goats and sheep and chicken can provide good source of income to complement income from agricultural activities.

3.5.3 Agroforestry

New agroforestry systems were developed and introduced by HIMA in the catchment villages. In each village under HIMA and CMP small groups were established and provided with short training followed by provision of seeds including fruits seeds. Such groups have the task of planting the seed and distribute the seedling freely to villagers. The most common tree species planted includes *Pinus patula* and *Grevillea robusta*. Such trees were found in most of the villages planted in the farm borders as well as woodlots especially in the villages in the upper part of the catchment such as Masisiwe, Mbawi, Kipanga, Ilagombe and Ng'ingula. Also fruits trees such as pears and peaches were planted mostly around homestead in most of the villages. However, it was noted that in some of the villages such as Mbawi, Ng'ingula and Masisiwe which are not easily accessible especially during rain season such fruits were noted rotting in the farm due to lack of market. In villages close to the roads such as Mwatasi, Mapanda, Kibengu and Igelege, some villagers are involved in selling of timber and non timber products to provide sources of household income. Huge

trucks were observed coming from urban centres to load timber especially in villages which are easily accessible by roads. Besides timber the other products such as fuelwood, building poles are used for heating, cooking and construction within the village.

3.6 Impacts of Human Activities on the Kihansi Catchment

A catchment is the source area for runoff flowing to a particular point. The soils, geology, water and vegetation within a catchment are all interrelated; actions in one part of the catchment can affect other parts of the catchment. There is very little human activity that does not have an effect on the catchment in some way. The review of the impact of human activity on the status of the Kihansi basin is summarised below:

a. Soil erosion and sedimentation load

Even though monitoring data on sedimentation load has not been established estimates by TANESCO revealed an average inflow of sediment load into the reservoir as 60X106 kg per year. If continued human activities are not properly managed in the upstream sediment load is likely to increase with adverse consequences on the Kihansi reservoir

b. Deforestation

Analysis on land cover changes indicate that forest cover decreased by approximately 2% between 1999 and 2005. With increased population and human activities there will be continued impact on forests.

c. Land cover changes

Analysis on land cover changes show that there is a considerable loss in grass/bushland at a rate of 38% and on grass/bush scattered cultivation at a rate of 33%. These cover changes essentially were related to establishment of cultivation activities.

d. Loss of soil fertility

Results from field studies show that crop productivity has decreased from 8-10 bags of maize per hectare to 2-4 bags. This is essentially due to loss in soil fertility and poor farming systems. In some villages soil erosion was observed.

SECTION 4. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

4.1 Policy Framework

NATIONAL PLAN FOR AGENDA 21 (1993)

Agenda 21, adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, paved the way for the development of country plans for sustainable development, and resulted in the production of country Agenda 21 profiles. The (former) Ministry of Tourism, Natural Resources and the Environment produced the National Plan for Agenda 21 in 1993, covering four major areas: social sector, natural resources, economy and institutional aspects. This document laid the basis for development of later policies, such as the National Environmental Policy, National Environmental Action Plan, and the National Conservation Strategy for Sustainable Development. These policies and legal frameworks as well as others such as the Wildlife Policy 1998 and the Environmental Management Act enacted through the 90s to present lay a strong foundation upon which the local structures described in section 3 can become better supported and integrated.

NATIONAL ENVIRONMENTAL ACTION PLAN (1994)

The National Environment Action Plan (NEAP) – developed by the former Ministry of Tourism, Natural Resources and the Environment – identifies five major problematic areas which require urgent action. These are: (i) land degradation; (ii) lack of accessible, good quality water; (iii) pollution; (iv) loss of wildlife habitats (e.g. deterioration of marine and freshwater systems); and (v) deforestation. The NEAP describes the following responses undertaken to address issues in the field of water/aquatic resources: i) enactment of legislation to control water pollution; ii) review of sectoral policies in the Ministries of Agriculture and Food Security, Water, Forestry, Population, Land, Housing and Human Settlement; iii) actions required to address the wetland and their resource base, including a) EIAs to be undertaken in large investments in wetland areas; b) establish Regional District Coordinating committees for rivers and lakes; c) study the underlying causes of land use conflicts related to utilization and identify appropriate property rights; d) consider the development of a National Wetlands Policy or incorporation of specific wetland policy into the National Environmental Policy (NEP); e) monitoring of aquatic ecosystems for evaluation and better decision making; and f) promotion of international cooperation for the management of shared wetlands. NEAP identifies the following institutions as lead agencies in the management of aquatic habitats: The Vice President's Office; Ministry of Natural Resources and Tourism; Ministry of Water (now MWLD) and the Ministry of Lands, Housing and Human Settlement. NEMC is recognized as one of the key collaborators

NATIONAL CONSERVATION STRATEGY FOR SUSTAINABLE DEVELOPMENT (1995)

The National Conservation Strategy for Sustainable Development (NCSSD) for Tanzania is a framework for integrating development and environment in order to achieve rational utilization of natural resource base. It was formally submitted 10 May 1995 to the Permanent

Secretary of the Ministry of Natural Resources and Tourism (MNRT). NCSSD addresses nine program areas for environmental action, one of which being the promotion of sustainable utilization of water, wetlands and their biodiversity. In order to meet the objective of the sustainable use of wetland resources, NCSSD suggests the following actions: i) develop appropriate small-scale water harvesting techniques to alleviate water shortages for domestic and agricultural purposes; ii) study the underlying causes of land use conflicts relating to wetlands utilization and identify appropriate property rights and incentive for more environmentally sound use of these resources; iii) develop, and or review key sectoral policies for example Water Policy, National Environmental Policy, Forest Policy in order to ensure that they encompass wetland management; and iv) establish regional / district coordination committees for rivers and lakes whose duties among others shall include assessing ecosystem diversity and pollution levels especially for those rivers and lakes under threat in terms of biodiversity and pollution.

The NCSSD further proposed the lead agencies responsible for sustainable utilization of wetlands. They include the Ministry of Natural Resources and Tourism, Ministry of Water, Planning Commissioner, Ministry of Lands and Human Settlement, Ministry of Agriculture and Food Security, Ministry of Justice, the Prime Minister's Office and the Vice President's Office. It also emphasized the involvement of NGOs, private sector and local communities to participate in the management of wetlands and other ecosystems. Whilst NCSSD acknowledges that the depletion of grassland, woodland and forest resources is of great concern for the natural environment and economic development in Tanzania, the role wetlands play in the development of the national economy is not explicitly mentioned. The NCSSD does acknowledge, however that: a) traditionally wetlands have received little attention from the authorities as they have been regarded as unimportant to manage, whilst management is hampered by the lack of clearly defined property rights; b) wetlands currently are often the subject of competing resource use interests; c) loss and degradation of wetlands results mainly from anthropogenic activities such as construction, agriculture (especially irrigation) and hydro-electric power development; and d) wetland management is constrained by the lack of data and knowledge of wetland ecosystems, which, coupled with the lack of institutional capacity to manage these resources effectively, undermine the sustainable use and preservation of critical wetlands.

NATIONAL LAND POLICY (1996), THE NATIONAL LAND POLICY (1996)

These are developed by the Ministry of Lands and Human Settlements with the main purpose of ensuring wise use of land, guide allocations, prevent degradation and resolve conflicts. On the issues related to environmental management, this policy is one of the major guiding principles to local authorities, which sorely need of decision making mandates on land use and resources. Security of land tenure and resources influences the level of investment on land and conservation of land based natural resources. In Tanzania, the President owns the land in trust for present and future generations. The Commissioner for Lands acts on behalf of the President and administers the land. The dual system of land tenure introduced by the colonial regime has been maintained by the NLP. Right of occupancy, which is the main form of tenure, can either be acquired through a grant by the Commissioner for Lands or through custom and tradition.

The NLP tries to protect the environment and natural resources. It reserves village lands and some communal areas for conservation purposes (e.g. forests on village land). Furthermore, the NLP protects highly sensitive areas such as water catchment areas, forests areas of

biodiversity, national parks, wetlands and etc. The NLP declares, “mechanisms for protecting sensitive areas will be created.... These areas or parts of them should not be allocated to individuals” (Mniwasa & Shauri, 2001).

The NLP makes some very critical references to wetlands, although in other sections in the policy it explicitly recognizes the values and functions of wetlands. Clause 7.6.0 states that wetlands are considered as wastelands and are thought as being not useful for social and economic development. The Policy states that wetlands will be properly studied and proper land uses shall be determined. Wetlands will be allocated to appropriate users. However, in clause 4.2.9 on protection of sensitive areas, the Policy recognizes that sensitive areas have been degraded and that mechanisms for protecting sensitive areas are to be created. Sensitive areas are defined as water catchment areas, rivers, river basins and banks and areas of biodiversity. According to the NLP, these areas, or parts of them should not be allocated to individuals. In addition, the Policy is explicit that marginal land areas will be defined as a tenure category requiring special development conditions and punitive charges will be levied for incompatible use and illegal development. Clause 7.9.0 on protection of hazard land states that there is increasing encroachment on hazard lands for housing and other developments in towns. Such areas including river valleys, areas of steep slopes, mangrove swamps, marshlands are being intensively developed. Apart from the dangers that they pose to life and property, such developments contribute to land degradation, pollution and other forms of environmental destruction.

SUSTAINABLE INDUSTRIAL DEVELOPMENT POLICY (URT, 1996)

The Sustainable Industrial Development Policy (SIDP) developed by the Ministry of Industry, intends to promote an environmentally friendly and ecologically sustainable industrial sector in Tanzania. It offers the following pledges:

- ♦ The government will carry out sensitization on environmental awareness in its broader application in relation to people, land and wildlife,
- ♦ The government will forge deliberate and mandatory devices to reactivate legal mechanisms to enable involved institutions to be more effective in matters of environmental management,
- ♦ An appropriate motivational mechanism will be provided within the Investment Promotion Act geared to cater for promotion of investments which contain anti-pollution programs,
- ♦ Environmental Impact Assessment (EIA) and appropriate mitigation measures will be enforced for all projects at pre-implementation stage,
- ♦ The government will promote the continuous application of an integrated preventive environmental strategy to industrial processes, products and services. This strategy will include propagating efficient use of raw materials and energy; elimination of toxic or dangerous materials, as well as reduction of emissions and wastes at source.

NATIONAL ENVIRONMENTAL POLICY (1997)

The National Environmental Policy (NEP; 15 October 1997) – developed by VPO – addresses the state of the environment in Tanzania, overall policy objectives, sectoral and cross-sectoral policies, instruments for environmental policy and institutional arrangements. Six main environmental problems are identified, of which two are relevant at Kihansi,

namely i) loss of wildlife habitats and biodiversity, and ii) deterioration of aquatic systems. The cross-sectoral policy on biodiversity emphasizes the need to (sustainably) exploit the country's rich biodiversity. The sectoral policy on water and sanitation emphasizes the protection of water resources, including improved management and conservation of wetlands, integrated planning of water resource use that includes protection of catchment areas, and the institution of appropriate user-charges that reflect the full value of water resources. The sectoral policy on wildlife states that these resources shall be protected and utilized in a sustainable manner on the basis of careful assessment of natural heritage in flora and fauna fragile ecosystems, and that adverse environmental impacts in conservation areas will be minimized by <means of> EIA studies. Regarding EIA, the NEP states that "It shall be a mandatory requirement to ensure that environmental concerns receive due and balanced consideration in reconciling urgent development needs and long-term sustainability, before a final decision is made. In this way, environmental considerations will not become an afterthought in planning and decision-making, but rather, part of our consciousness and awareness of our development realities."

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES AND PROCEDURES (1997)

NEMC prepared (draft) Environmental Impact Assessment Guidelines and Procedures in 1997 to guide developers to carry out development projects in an environmentally responsible way. These Guidelines and Procedures hold particular importance in so far as they have sought to incorporate issues of public participation and access to information in environmental decision-making processes in respect of projects with likely environmental impacts. The draft EIA guidelines and procedures envisage the formulation of an Environmental Law, and propose the establishment of a national Environmental Regulatory Body (ERB) which is to oversee Environmental Units (EUs) at the district and sectoral levels. The ERB and EUs would be responsible for screening projects and reviewing EIA reports. To date, however, these guidelines and procedures have not been incorporated into legislation.

WILDLIFE POLICY OF TANZANIA (1998)

The Wildlife Policy of Tanzania (WPT; March 1998) – developed by the Ministry of Natural Resources and Tourism – provides a background on the country's wildlife resources and potential, and roles of various institutions involved in wildlife management. Relevant to the LKHP-EMP are the strategies for protecting biodiversity, specifically iv) giving special conservation status to rare, or endangered wildlife species, and v) incorporating important wetlands into the wildlife protected area network.

The Protected Area (PA) network has been established for various reasons, including the 'conservation <of> viable populations of species making up Tanzania's fauna and flora, with emphasis on endangered, threatened, endemic species and their habitats'. Relevant to the LKHP-EMP is 'strategy for conservation and management of protected areas' v) maintaining PGRs <Partial Game Reserves> in order to enhance its intent by creating a category of Protected Species. Much of the WPT is devoted to value and exploitation of wildlife resources, community benefits, human-wildlife interactions, trade in wildlife and wildlife products. The role of the government – including MNRT – is that of administration of wildlife laws and regulations, pursuing sound management policies, issuing and administering wildlife resource rights, developing management plans for wildlife protected areas, collecting royalties, fees and concession payments, coordinating activities of the

wildlife industry, ensuring appropriate wildlife management skills, controlling problem animals, ensuring conservation education, and establishing extension services in rural communities.

NATIONAL FOREST POLICY (1998)

The National Forest Policy (NFP; March 1998) consists of a fully revised edition of the first NFP (1953), building upon the experiences of the Tanzania Forestry Action Plan (1988-1994). The NFP consists of five chapters, of which 1) provides a general framework, 2) lists main sectoral problems and opportunities, 3) provides goals and objectives, 4) concerns policy statements, and 5) lists roles and responsibilities. Part 2.3 deals with biodiversity conservation, describing the importance of forest ecosystems for maintaining biodiversity, and the threats to biodiversity. One of the four main objectives listed in chapter 3 focuses on 'ensured ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility', which translates into one of the four main policy areas 'ecosystem conservation and management'. Forest Land Management (part 4.1.1) states that 'Forest reserves of national strategic importance, such as critical watersheds and forest areas with high biodiversity or endemism may remain under management of the central government. However, the long-term goal is to delegate the management of these reserves to executive agencies when they have developed sufficient and proven capacity.' 4.3.1.1 states that 'New forest reserves for biodiversity conservation will be established in areas of high biodiversity value. Forest reserves with protection of national strategic importance may be declared as nature reserves', and goes on to state that 'The status of existing forest reserves with high biodiversity value will be upgraded to nature reserves to ensure their protection in perpetuity.' 4.3.2 concerns watershed management, and states that 'New catchment forest reserves for watershed management and soil conservation will be established in critical watershed areas.' 4.3.3 deals with wildlife, and states that 'Coordination between the forestry and wildlife authorities will be improved in the management of wildlife inside forest reserve. The National Forest Policy also paves the way for greater local control and co-management of forests and reserves.

NATIONAL BIODIVERSITY STRATEGY & ACTION PLAN (2000)

Tanzania signed the Convention on Biological Diversity (CBD; see 4.3) in 1992 and ratified it in March 1996, thereby committing herself to the conservation and sustainable use of biological diversity. The National Biodiversity Strategy and Action Plan (NBSAP; 2000) was drafted from 1998-2000 by the Division of Environment (Vice President's Office) in order to provide directions to national efforts in the field of biodiversity conservation and utilization. NBSAP provides an overview of the country's biotic wealth and threats, identifies national goals and gaps, and provides a strategy, recommendations and action plan, along with a schedule for implementation, monitoring, reporting, data management, review and evaluation. Relevant to the LKHP-EMP are: i) identification of (para. 45) the lack of protected areas in the Eastern Mountain Arc; ii) Strategic Choices (para.52) 'Developing and establishing mechanisms for identifying rare, endangered and vulnerable species and critical habitats for protection.'; iii) (para. 66) Retaining the ownership of and overall responsibility for management of core biodiversity PAs by the state, to ensure that national priorities are addressed and abuses are controlled. These have been incorporated into actions that need to be undertaken in the medium to long term, along with extending the PA network to include wetlands (among others; action 5.2.7), and giving special conservation status to rare, threatened or endangered species of fauna and flora (action 5.2.8).

NATIONAL ENERGY POLICY (2001)

The final draft National Energy Policy was drafted by the Ministry of Energy and Minerals in 2001 as a revision of the first National Energy Policy of 1992, and subsequently approved in 2003. The overall objective of the revised policy is to ensure the availability of reliable and affordable energy supplies, and their use in a sustainable and rational manner. The aim is to establish efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner. Environmental impacts and hazards are to be addressed by rigorous environmental management regimes on all energy activities and by applying the economic instruments for changing market behavior. The policy does not refer to mandatory EIA, but as a policy statement it aims to 'Promote EIA as a requirement for all energy programs and projects'. Note that economic instruments are unlikely to facilitate significant changes in behavior unless unsound practices meet with disincentives (e.g. prosecutions, fines).

NATIONAL WATER POLICY (2002)

The first National Water Policy (NWP; 1991) focused on participatory planning, and cost sharing in the construction, operation and maintenance of water supply systems. However, this did not adequately address cross-sectoral interests, river basin management, or include 'environment' as one of the fundamental uses of water. The NWP of July 2002 – fully revised by the Ministry of Water and Livestock Development – addresses most of these shortcomings, especially in Section i) on Water Resources Management, which is of direct relevance to the EMP.30 Section i) Part 2 deals with Water and national Socio-economic Development, and paragraph 2.8 on Environment describes instream flows and environmental flows, and the need for these in order to maintain riparian biodiversity, wetlands and aquatic life. Section i) Part 4 deals with Policy Issues in Water Resources Management, and paragraph 4.3 addresses Water and the Environment. The Objective stated in paragraph 4.3 To have in place <a> water management system which protects the environment, ecological system and biodiversity.

The paragraph goes on to state that management of ecological systems such as wetlands, floodplains, estuaries and coastal zones is an integral part of water resources management, but that there are no procedures and guidelines to ensure sustainability of these important ecological systems. Water for the environment, in terms of quantity and quality, ... shall be determined on the best scientific information available.... to maintain the health and viability of riverine and estuarine ecosystems, and associated flora and fauna. NWP (2002) has among its specific objectives the financial sustainability and autonomy of the Basin Water Offices for effective water management. The financial viability of BWOs will, among others, depend on their capacity to collect water fees from users.

THE NATIONAL HUMAN SETTLEMENT DEVELOPMENT POLICY, 2000

The vision of the policy is to have human settlement where everyone has adequate and affordable shelter which is durable, healthy, safe legally secure and matches with the culture of the people. Moreover, the human settlement should be able to provide equal opportunities for development economically, socially, spiritually and culturally. On the issue of village planning the policy states that there shall be participatory village land use planning where villagers shall participate in identifying the critical environmental issues and the preparation

and implementation of plans where by local authority and village government shall play co-ordination role.

4.2 Legal and Administrative Framework

WATER RELATED LEGISLATION

Water resources are controlled by means of the Water Utilization (Control & Regulation) Act No. 42 of 1974, Water Utilization (Control & Regulation) (Amend.) No. 10 of 1981, Written Laws (Miscellaneous) Act No. 17 of 1989, and the Water Utilization (Miscellaneous Amendments) No. 8 1997.

WATER UTILIZATION (CONTROL & REGULATION) ACT NO. 42 OF 1974

The Water Utilization (Control & Regulation) Act (WUA; 1974) consists of nine parts, of which part 1) is introductory and part 2) is related to the establishing of Water Advisory Boards. Parts 3), 4) and 5) are all related to water rights, with 3) focusing on ownership and inherent rights, 4) on granting of water rights, and 5) on revision and variation of these rights. The remaining parts deal with miscellaneous powers, appeals, offences and miscellaneous provisions. Part 4) on water rights states that ‘a Water Officer may grant to any person the right to divert, dam, store, abstract and use water from such source, in such quantity, for such period, whether definite or indefinite, and for such purpose as may be specified in the water right, subject to such terms and conditions as he may deem fit’. Clause 17 of part 4) states that water used <among others> for the generation of power shall be returned to the stream or body of water from which it was taken in undiminished quantity, and in an unpolluted form. Clause 19 of part 5) states that the Minister may instruct the Water Officer to revise water rights at any time, if volumes are insufficient to satisfy all water rights in a given area, while clause 20 provides for variation in times of drought, when all water rights may be suspended. Breach of condition is dealt with in clause 23, which states that ‘Where the holder of a water right has failed to comply with any condition, express or implied, subject to which right was granted, or has abstracted or used water in excess of that authorized... the Water Officer may by notice in writing... declare the right to be determined.’ Excess use may also lead to fines or imprisonment (clause 33.3).

WATER UTILIZATION (CONTROL & REGULATION) (AMEND.) NO. 10 OF 1981

The Water Utilization (Control & Regulation) (Amendment) of 1981 further details the establishment of the Central Water Board and its role responsibilities, and provides for the establishment of <river> Basin Water Boards. The second part of the amendment addresses the discharge of polluting effluents into ground and surface waters, and provides a number of schedules on standards for receiving waters (first schedule) and effluent standards (second schedule), plus tables on quality standards for domestic water, and toxicology of various classes of pollutants.

WRITTEN LAW (MISCELLANEOUS) ACT NO. 17, 1989

This Act enhanced penalties and punitive measures for polluters, including introducing the “polluter pays” principle. As a result developers made efforts to rectify their facilities including retrofits to reduce or eliminate pollution released into water bodies.

WATER UTILIZATION (MISCELLANEOUS AMENDMENTS) NO. 8 OF 1997

The Water Utilization (Miscellaneous Amendments) of 1997 deals with urban water (part 2), water utilization (part 3) and water works (part 4). Only part 3 is of relevance to the EMP; this redefines 'Minister' and 'Principal Secretary', updates the level of fines, provides for a revised composition of the Central Water Board, and states that Basin Boards are to be financially and administratively autonomous.

WATER UTILIZATION ACT (DRAFT)

The draft Water Utilization Act – that builds upon the new National Water Policy (2002; see 2.4) – will soon be submitted to Parliament for approval.

WILDLIFE CONSERVATION ACT (1974)

The Wildlife Conservation Act (WCA; 1974) is divided into nine parts, of which 1-2 are introductory, 3 deals with protected areas and general restrictions, 4-7 are about wildlife utilization (e.g. hunting, capturing, photography, trophies), 8 is about offences and 9 concerns miscellaneous provisions. Sections relevant to the LKHP-EMP are mainly in part 3. The President may declare any area a Game Reserve, while the relevant Minister

(i.e. of the Ministry of Natural Resources and Tourism) may declare any area a Game Controlled Area. Possession of weapons, felling of trees, lighting of fires, grazing of livestock, killing or capture of wildlife, and habitation are not permitted in protected areas, except under strict permits

(e.g. for game hunting). Part 2, clauses 13 and 14 deal with Partial Game Reserves, which may be declared by the Director (of the Wildlife Division) for 'any animal or class of animals' and are thereafter referred to as 'protected animals'. According to the WCA, PGAs are to be established solely for protection of specific wildlife species, which are protected from hunting, collecting, injury and molestation. Part 4, clause 32 deals with capture of wildlife, and states that the Director may grant a capture permit for providing specimens for zoological gardens, for scientific, cultural or educational purposes or any purpose the Director considers to be of national interest. The attached game schedules (1-4) include mammals and bird species only. The Wildlife Conservation Act is currently (June 2003) under review and is expected to be fully revised in the near future.

THE LAND ACT (1999) & LAND REGULATIONS (2000)

The Land Act No. 4 of 1999 and Land Regulations 2000, include a vast array of sections on allocation committees (179 & 12), conditions of rights of occupancy (4), fees (174 & 179), fines (46 & 179), use and management of public rights of way (154 & 179), small mortgages (114 & 179), disposition of right of occupancy (37 & 179), composition and procedures of the national land advisory council (17 & 179), ceilings on land occupancy (21 & 179), assessment of the value of land (179), procedures for the transfer of land (5 & 179), management of land compensation fund (173 & 179), compensation claims (179), prescribed lenders (37 & 179), applications for orders of possession of leased land (90 & 179), and functions of authorized officers (10 & 11). Relevant to LKHP-EMP is the section (5 & 179) on procedures for the transfer of land. General, reserved or village land may be transferred by means of a village council recommendation to the village assembly. Following this, the authorized officer should then immediately submit the village resolution to the

Commissioner. Alternatively, the Minister may send notice <regarding land transfer> to the village council, which should then send a resolution to the village assembly. Claims for compensation may be submitted to the Land Compensation Fund by holders of a granted right of occupancy over general or reserved land which is transferred to village land.

THE FOREST ACT (2002)

The Forest Act (No. 14 of 2002) consists of 12 parts, of which 1 and 2 are introductory, with part 2 providing the objectives of the Act, and listing – among others – the types of forests in Tanzania. Part 3 deals with management plans (and what these are to entail), which are mandatory for all forest reserves and private forests. Part 4 deals with private forests, including forests held in concession, and the rights and obligations of the owner or leaseholder. Part 5 deals with Forest Reserves, including the types of reserves, procedures for declaration of national and local authority reserves, investigations of claims to rights in proposed reserves, activities prohibited in forest reserves without permission, allocation of management responsibilities, boundaries of reserves, powers to change and de-gazette forest reserves, management of national or local authority reserves, and issues arising from village land forest reserves and community forest reserves. Part 6 deals with permits and licenses for activities in reserves, application for, and granting of permits, modification, surrender and suspension of permits. Part 7 deals with trade in forest produce, including restrictions on exports, and authorization of inspectors. Part 8 deals with conservation of trees, wild plants and animals, including reserved trees, restrictions on cutting of trees, protected wild plants and animals, and sovereignty over biological resources in forests. Part 9 deals with fires, and includes restrictions on burning of vegetation, orders in relation to fire breaks, and rights to recover damages. Part 10 deals with establishing of funds and powers to charge fees, 11 deals with offences and penalties, and 12 deals with miscellaneous provisions. Relevant for the LKHP-EMP is that the Act does not specifically provide for the active conservation of biodiversity, other than stating that extraction (e.g. of timber) is not allowed if this affects biodiversity, and that listed wild plants and animals are not to be interfered with in any way. Also relevant – given the incidence of wildfires in the Kihansi area – are the provisions regarding fires, which are prohibited outside personal compounds, and the prohibition of fires for which there is reasonable cause to believe that they may spread and so cause damage to property of other persons or the state. Of interest to the EMP is that the Minister may, by means of an order published in the Gazette, revoke the declaration of all or part of a forest reserve, or alter the status of any type of reserve.

ENVIRONMENTAL IMPACT ASSESSMENT

Tanzania has yet to develop effective environmental standards or institute a comprehensive system of EIA (Mwalyosi & Hughes, 1998; Lissa, 1999; ILFEMP, 2000; UNDP/UNEP/GEF, 2001). Where these tools are currently applied, this is usually due to external pressure from a donor or an international corporate policy (ILFEMP, 2000). The detailed systematic review in Tanzania by Mwalyosi and Hughes (1998) showed that EIA has had very little impact on decision-making. In most cases EIAs were extremely late in starting, under-resourced and generally omitted to involve other stakeholders to any meaningful extent. Also, compliance with recommendations of EIA has been the exception rather than the rule. According to Lissa (1999), “the overriding desire to create a ‘conducive environment’ for investors explains the omission of EIA requirements in <Tanzanian national> investment law, as well as the politico-bureaucratic control of the EIA processes in other legislation which regulate investment in the country. The effect has been that even

where statute requires compliance with environmental considerations, in practice this is either totally ignored or its spirit subverted while keeping intact the veneer of legality.” Although EIA Regulations and Guidelines have been established, there is currently no supporting EIA legislation in place.

FISHERIES ACT NO. 6 (1970) & PRINCIPAL FISHERIES REGULATIONS GN 317 (1989)

The Fisheries Act is the main law enacted by government to address problems such as over-exploitation of fisheries resources, and establishes a general prohibition on fishing without a permit/license. Terms and conditions of the license must be followed for businesses involved in the fisheries sector. Section 7 gives the Minister responsible for Fisheries the authority to formulate regulations about all aspects of fishing, including for the purpose of protecting, conserving, developing, regulating or controlling. Specifically, the Minister may make regulations pertaining to environmental concerns with regard to types of fishing gear, prohibited types of fishing, pollution, protection of spawning areas, and restrictions on capture, removal or destruction of any variety of fish, aquatic flora, fish product or product of aquatic flora. The Principal Fisheries Regulations further stipulates requirements regarding registration and licensing of fishing boats, prohibition of the use of explosives and poisons, pollution of surface waters.

LOCAL GOVERNMENT ACTS NOS. 7 AND 8 (1982) & DECENTRALIZATION OF GOVERNMENT ADMINISTRATION (INTERIM PROVISIONS) ACT.

The Local Government (District and Urban Authorities) Acts have given authority to local government to regulate those matters traditionally of a local nature, such as agriculture and livestock grazing. According to the Local Government (District Authorities) Act, District Councils shall have power to prescribe steps to be taken by the occupier of any agricultural land for the purposes of maintaining and improving its productivity and preserving soil fertility. The First Schedule of the Act, empowers District authorities to prevent, among others, improper cultivation techniques by controlling fires. Many By-laws (subsidiary legislation) have been enacted by districts, township and urban authorities, in relation to the Acts for further regulation of agricultural development. These By-laws may for example be related to prevention of cultivation or tree felling from certain sensitive areas, or for the prohibition of grazing within Dar es Salaam City.

THE NATIONAL ENVIRONMENT MANAGEMENT ACT NO. 19 OF 1983

The National Environment Management Act established the National Environment Management Council. NEMC's functions include advising the Government on all matters relating to the environment and formulating policy on environmental management. It also includes co-coordinating the activities of all institutions concerned with environmental matters; evaluating existing and proposed policies and activities on pollution control and enhancement of environmental quality; recommending measures to ensure government policies take adequate account of environmental effects, and developing EIA guidelines. NEMC is currently the designated authority to carry out the review of EIA, monitoring and auditing of environmental performance of the project.

VILLAGE LAND ACT NO. 5 OF 1999

The Village Land Act of 1999 was enacted specifically to cater for the management of and administration of land in villages. The Act empowers the village council to manage all village lands in accordance with the principles of a trustee with the villagers being the beneficiaries. In the project area, Villagers own land under customary law.

ENVIRONMENTAL MANAGEMENT ACT

The National Framework Environmental Law or Environmental Management Act has recently been adopted but not yet widely applied. The Office of the Vice President (VPO) is coordinating this activity. Because of the many existing sectoral laws addressing environment, the process of forming an “umbrella” environmental law aims at harmonizing existing sectoral laws as well as aligning them where they are conflicting. The new environmental law is envisaged to bind the sectoral laws and make them more effective. The new law may influence the EMP in several ways. Some of these are outlined below:

Conservation Fund In the new law it is proposed that a Conservation Fund be established. It is through the conservation fund, which will be centrally managed, that costs such as mitigation costs and monitoring costs will be derived. In such a situation companies like TANESCO will be required By-law to deposit the money for conservation in this fund.

Decommissioning Bond. In the new EMA it is proposed that companies be required By-law to deposit a bond that will be for decommissioning purposes. If after the life of a project proper decommissioning is done then the bond will be released to the company, otherwise it will be used for decommissioning purposes.

Status of Conservation Areas. In the new law it is also proposed to establish a special status for areas that need to be protected for environmental reasons. In the new law it is possible for the Government to declare an area “ Protected for Environment” and then the state will be the custodian of the area. The status of the Kihansi Gorge as proposed in the EMP is partial Game Reserve whereby TANESCO owns it for Watershed and Biodiversity Conservation, while the Wildlife Division will be co-managing the area for the actual implementation of the conservation issues. Under the new law, this area could be defined as a protected area for environmental reasons.

Provision of a tool to deal with defaulters. The new law will definitely provide a necessary tool to deal with defaulters. In future it may be possible for TANESCO or any other company in the Lower Kihansi area to be taken to court for not discharging its commitments as stipulated in the EMP

BY-LAWS AND ISSUES COVERED

The district and village By-laws have focused on the following issues:

Protection of water sources: Iringa district By-laws provides that no one is allowed to farm, use fire, cut trees or do anything that might lead to pollution in the areas which is less than 100m from water a source. The village By-laws support these albeit without distance specification.

Avoidance/Prevention of land use conflicts: The village By-laws restrict uncontrolled grazing of livestock outside specified areas and provides for need to respect property (land and water rights) i.e. prohibiting trespassing

Prohibiting destructive use of forest resources: Village By-laws prohibit the use of wildfires and unlicensed harvest of forest resources.

Encouraging use of better farming methods: Village By-laws restrict use of quarry (sensa) farming in all slopping areas. District By-laws have set the maximum of 30% of slope for people to farm without terracing. It also provides for use of animal manure in farming and adopting advices from extension officers.

Increase in Production: The village By-laws require every able-bodied man/woman to participate in production and decision making activities. District By-laws have set a minimum of 4 hectares per household to be farmed for cash and food crops.

Conservation of natural resources: District By-laws stipulate that for those people owning in slopping area, where they are not using it now, they should plant trees for conservation of that land.

4.3 Existing Plans

Plans that were made available to the Consultants were as follows:

MUFINDI DISTRICT CATCHMENT MANAGEMENT PROJECT, 2003

The plan was prepared to state the role of different actors as co-ordinated by the Mufindi District Council to improve soil and water conservation, productivity and income of the people around the catchment area. The plan starts by analyse the legal mandate of different government institutions to manage resources and intervene development in the district. These are as provided in local authorities (district authorities) Act No. 7 of 1982. Some of the proposes that have been put in place are

- ♦ to improve the capacity of staff, institutions and local people around the catchment area
- ♦ to apply conservation measures in the area
- ♦ to encourage small animal husbandry in the area

IRINGA DISTRICT CATCHMENT MANAGEMENT PROJECT, 2003

This plan was prepared with the purpose of improving farm production among farmers in the catchment are sustainable management of land and water resources. Using the mandates of different government actors, as provided by Local government (District authorities) act No. 8 of 1882 some of the relevant proposal are:

- ♦ to improve crop husbandry in the catchment area
- ♦ to introduce proper land use management
- ♦ to improve soil fertility
- ♦ to improve the capacity of district and local communities

- ♦ to introduce alternative sources of energy (to firewood)

KIHANSI AREA CONSERVATION PLAN, 2001

The plan's overall objective was to ensure sustainable management and conservation of biodiversity, land and water resources in the Kihansi Conservation. Through this overall objective TANESCO, who was the client of this plan, would ensure that a sustained supply of water is maintained for continued power generation at the acceptable environmental and economic costs. Among the major problems addressed by the plan are:

- ♦ increase in human population pressure in the catchment;
- ♦ expansion of farmland increase in livestock rearing;
- ♦ increase in water abstractions, increase in boundary conflicts; and
- ♦ increase in incidences of fire and increased loss/destruction of biodiversity.

Among the strategic proposals put forward by the plan are:

- ♦ Promoting sustainable agriculture in areas adjacent to the TANESCO land area
- ♦ Sustainable livestock keeping
- ♦ Control of wildlife and sporadic fires
- ♦ Minimizing boundary conflicts
- ♦ Sustainable water use
- ♦ Sustainable harvesting of vegetation
- ♦ Prevention of siltation of Kihansi reservoir
- ♦ Conservation of biodiversity
- ♦ Forbid hunting in the area and
- ♦ Conservation of wetland areas

VILLAGE LAND USE PLANS

Presently there are no village land use plans within the catchment area. Examples from Msola and Kiberege villages land use plans, 2003 were drawn to illustrate the content and type and forms of these plans. Such plans attempt to address similar problems related to low agricultural production, distribution of land uses, poor farming technology, accessibility to markets, and lack of social facilities.

LOWER KIHANSI HYDROPOWER PROJECT UPDATED ENVIRONMENTAL MANAGEMENT PLAN (LKHP), 2004

The plan was an update of the Environmental Management Plans that were prepared and instituted earlier. This LKHP, apart from identification of environmental impacts and review of the success of mitigation measures, also includes impacts monitoring and environmental auditing.

On the impacts identification, the following are pointed:

Removal of original vegetation, altering of drainage, noise, possible spillage of oil, fuels and lubricants, vibrations and dust pollution were characteristic effects of the phases involving exploration, road, tunnel, housing, powerhouse and office facility construction, all of which impacted the local fauna overall.

Greater access and an increase in human presence generally disturbed wildlife, and perhaps more significantly, added to poaching of particular species (e.g. mammals and birds).

Creation of a lacustrine environment in the impounded area, after dam construction, created a new habitat, for example, for certain birds and (introduced) fish.

Reduced volumes of water flowing in the river below the dam resulted in critical changes for aquatic and wetland species – especially for aquatic insects, macro invertebrates, and fish – but also for forest species, as the lowering of the forest humidity changed the microhabitats, reduced food availability for certain species, and increased the risk of fire.

The influx of a large number of temporary workers – of which a significant number have become permanent residents in the project vicinity and upstream in the Kihansi Catchment. The impact on the local natural ecosystem (due to increased pressure /resource exploitation, especially water abstraction), and the local physical and social infrastructure (to provide the services needed by a much larger population).

Expansion of malaria endemic area to include the Udzungwa Plateau, which had been malaria-free in the pre-project period.

Among the mitigation measures in to proposed include:

- ♦ Awareness and incentive schemes on utilization of natural resources and monitoring the use of water.
- ♦ Provision of employment to the local community, special presence
- ♦ Provision of environmental health services and social facilities
- ♦ Sprinkler systems installation and operation;
- ♦ Fountain jets installation and operation;
- ♦ *Ex situ* captive breeding program for the Kihansi Spray Toad (*Nectophrynoides asperginis*);

Upkeep of the Kihansi Gorge ecosystem maintenance infrastructure, including walkways, ladders, bridges and a small shelter and any other facility required/installed in the future.

In addition, ecological studies, mainly focusing on the Kihansi Spray Toad, urgently need to be carried out in order to properly understand its behavior, population dynamics and ecological requirements. These will be termed the Kihansi Scholarship studies. It should be noted that some of these problems and mitigation measures are outside the purview of the LWCP.

4.4 Key Stakeholders

NATIONAL ENVIRONMENT MANAGEMENT COUNCIL

The National Environment Management Act, 1983, provides for the establishment of the National Environment Management Council (NEMC) within the Vice President's Office. NEMC's principal functions are to advise the Government on all matters relating to the Environment, in particular:

The National Environment Management Act also establishes the office of the Director General of the Council who is the Chief Executive Officer with wide ranging duties in environmental matters. This individual is, for instance, duty-bound "to consider means and initiate steps for the protection of the environment and for preventing, controlling, abating or mitigating pollution; and investigate problems of environmental management, among others".

It is on the basis of the above statutory functions that NEMC has been reviewing various development projects in the country in order to ensure that they conform to requisite national, and a number of specific institutional environmental performance standards.

NEMC is the national agency responsible for EIA, and in that role prepared the (draft) Environmental Impact Assessment Guidelines and Procedures of 1997.

VICE PRESIDENT'S OFFICE / DIVISION OF ENVIRONMENT

The Division of Environment (DoE) has been established within the Vice President's Office as the working level cell of the Ministry responsible for Environment. Unlike the NEMC it is not a statutory body, but only a unit within the VPO. The DoE undertakes the following:

- ♦ Policy analysis
- ♦ Development of policy options
- ♦ Coordination between broad-based environmental programs, plans, and projects that go beyond single-sector approaches
- ♦ Facilitation of meaningful involvement by civil society to broaden consensus and reduce insularity.

Overlapping mandates between the Division of Environment and NEMC, which were to be resolved under the World Bank-funded Institutional and Legal Reform Study (1997), remain but have more recently come under the scrutiny of the aforementioned ILFEMP review process.

NATIONAL WETLANDS TECHNICAL COMMITTEE/NATIONAL WETLANDS STEERING COMMITTEE

Initiatives for Tanzania's accession to the Ramsar Convention and formulation of corresponding wetland management programs were commenced in the early 1990s. The initiatives under the National Environment Management Council (NEMC), with technical support from the World Wildlife Fund (WWF) and the International Union for Conservation of Nature and Natural Resources (IUCN), resulted in the establishment of the National

Wetlands Technical Committee (NAWETCO) and the National Wetland Steering Committee (NAWESCO).²¹

NAWESCO was established in 1992 and had over 20 members (technical experts) from government sectors, institutions and NGOs whose activities directly impacted on the wetlands. Originally, NAWESCO was to have members directly or indirectly involved in wetland management processes and was to be the highest decision making body in that role. Though NAWESCO did not sustain its operations, NAWETCO did function for a period and produced the document “National Wetland Policy Framework” (1996). Its operations also ceased after the wetlands mandate was shifted in 2000 from NEMC to the Wildlife Division of the MNRT.

WILDLIFE DIVISION OF MNRT

The Wildlife Division of MNRT is the official custodian of the Ramsar Convention. For day-to-day coordination of wetland-related matters, a Wetlands Unit was established in 2000 within the Wildlife Development Section of the Wildlife Division.

Two functional committees have also been established. One is the National Wetland Working Group – which has 30 members from ministries, public institutions, academia, research institutions, and NGOs (international and local). The Ministry of Water and Livestock Development, TANESCO and NEMC are members to this advisory body. A second was the Steering Committee – which consists of the permanent secretaries of eight key institutions (i.e. Ministry of Natural Resources and Tourism, Ministry of Agriculture and Food Security, Ministry of Lands and Human Settlement Development, Ministry of Water and Livestock Development, Vice President’s Office, President’s Office, Regional Administration and Local Government, President’s Office, and Planning and Privatization. The Steering Committee has the following tasks:

- ♦ To take coordinated decisions on any major wetland related matter;
- ♦ To secure harmonization and coordination of plans, strategies and policies as advised by the National Wetland Working Group;
- ♦ To take coordinated decisions regarding national development
- ♦ Projects and plans to be executed in wetland areas; resolution brought forward by the National Wetlands Working Group and give directives as necessary; and
- ♦ To become familiarized with the Ramsar Convention and secure the inclusion of the relevant actions and resolutions in Ministerial plans and budgets in order to facilitate implementation of the convention.

²¹ Efforts on the wetlands front gained momentum after the wetlands conservation conference of the Southern African Development Community (SADC) held in June 1991. At that time each SADC member country was urged to formulate its own wetlands program. A workshop on Tanzania’s wetlands was organized with assistance from IUCN Regional Office for East Africa, and one of the recommendations that emerged was to form a national Wetland Technical Committee (NAWETCO; Kamakala & Crafter, 1993; ARCADIS Euroconsult, 1998).

IUCN TANZANIA COUNTRY OFFICE

The International Union for Conservation of Nature (IUCN) country office in Tanzania complements the secretariat of the IUCN's Eastern Africa Regional Programme (EARP) that is located in Nairobi. The mission of the Union is "to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable." The mandate of the office includes planning and implementation of the Eastern Africa Regional Programme (EARP); support to the IUCN Members and Commissions; and representation of the IUCN Union in Eastern Africa. The regional programme consists of four ecosystem related thematic areas namely: Drylands, Tree dominated Ecosystems, Coastal and Marine, and Water and Wetlands. There are six service thematic components that are central to the EARP including: Social Policy, Biodiversity Economics, Conservation Areas, Conventions Implementation, Environmental Planning and Support to Environmental NGOs. The Tanzania Country Office has proposed to produce a Red Data list of endangered species of flora and fauna, but they have yet to secure funding.

NON-GOVERNMENTAL ORGANIZATIONS

The role of NGOs is generally perceived to be that of promotion of forest conservation awareness and education, and the financing of related activities. The role of NGOs in the management of environment may be viewed at two levels:

- ♦ International NGOs with local offices – such as the World Wildlife Fund (WWF),
- ♦ Birdlife International and the
- ♦ Wildlife Conservation Society (WCS), and
- ♦ Local NGOs such as the Wildlife Conservation Society of Tanzania (WCST) 32 and the Tanzania Forest Conservation Group (TFCG).

The International NGOs, tend to have sounder financial resources and a wider network of expertise. The role of International NGOs in developing circumstances has been to work with local NGOs and government departments with the intention of building capacity in their areas of responsibility and specialization. They provide financial resources, knowledge (literature and access to data bases), support seminars and workshops and awareness campaigns. At times NGOs act as effective agents of change by harnessing official and civil society interest groups towards common objectives and outcomes.

Local NGOs, on the other hand, are especially good at working with grassroots stakeholders. In most cases their primary focus is on awareness raising, capacity building, lobbying decision makers and dissemination of information.

LOCAL COMMUNITIES

In Tanzania, the role of local communities includes conservation and management of village forest reserves and trees on farms, joint management of forest reserves, and the production of subsistence forest products such as fuel wood and poles. The private sector is mainly involved as concessionaires in the forestry industry, investing in harvesting, sustainable exploitation, and job creation.

LOCAL GOVERNMENTS

Local governments is responsible for coordination of forestry extension, revenue collection, law enforcement, tree planting and seedling production, and the management of local government reserves. There are two district councils in the catchment. The Kilolo district and Mufindi district.

As acknowledged in the NFP (1998), improvements in the links between the sectoral administration at the district and regional levels would contribute to removing a number of difficulties related to coordinating forest management activities. Central capacity – i.e. human resources, finances and materials – to provide administrative and technical guidance is inadequate for meeting the challenges this sector faces. Current information systems and databases do not fully reflect a sufficient level of information for effective decision-making. Law enforcement resources are also extended beyond their capacity. For some of the above reasons, coordination with other relevant sectors is below targeted levels.

TANESCO

TANESCO is a parastatal organization under the Ministry of Energy and Minerals. TANESCO generates, transmits, distributes and sells electricity, and owns most of the electricity generating, transmitting and distributing facilities in Tanzania. The generation system is made up of hydro powered and thermal powered facilities. At present, the installed capacity of the aggregate grid is about 770MW of which 559MW, or 73%, is hydro and the rest thermal power. Hydropower energy production – with three major plants located on the Great Ruaha, Pangani and the Lower Kihansi – varies according to hydrological conditions, but on the whole is used primarily for providing base load. Thermal power is used primarily for peak load. With the exception of the gas turbines, most thermal plants are old, and a lack of access to replacement parts increases their downtime.

In order to meet demand, TANESCO also imports power from Zambia and Uganda. It has also entered into Power Purchase Agreements (PPAs) with smaller producers such as Kiwira Coal mine and Tanwat Limited. Prior to September 1999, TANESCO's structure was decentralized with the distribution activities divided into seven Zones.

In 1992, the Government of Tanzania established the Parastatal Sector Reform Commission (PSRC) whose main responsibilities are to facilitate the privatization of the public corporations with the aim of enhancing their efficiency. In line with this effort, the Government of Tanzania has removed TANESCO's monopoly as the sole power generating and distributing company. It has also been recommended to unbundle TANESCO into a number of smaller private sector marketing and distribution companies, and maintain only a single transmission unit. The generation sector of TANESCO, however, is likely to remain a parastatal under this proposal.

RBWO

The RBWO has overall responsibility for water management of the Kihansi River. RBWO oversees compliance with the provision of the Water Act and must ensure that conflicts regarding water rights amongst all users are minimized. It also has responsibility for issuance of water rights and approvals for changes in water use.

The RBWO is responsible for monitoring the environmental flow of the Kihansi River. It is also responsible for monitoring water off-take along the Kihansi River in the wider catchment, and preventing water losses. It reviews environmental monitoring reports and ensures their distribution to all relevant stakeholders. The RBWO is based in Iringa and is technically and administratively equipped to undertake the above tasks²².

FBD (District Office)

The Forestry and Beekeeping Division (of MNRT) is chiefly responsible for the management of forest biodiversity and compliance with the Forest Act. The FBD reviews environmental monitoring reports and ensures that the reports reach all relevant stakeholders. The local forestry office is based in Mlimba. In connection with the recently initiated World Bank funded Eastern Arc Forestry Management and Biodiversity Protection Project, the Forestry Division's ability to assist in the LKHP environmental mitigation efforts associated with biodiversity conservation will be enhanced.

TAWIRI

The Tanzania Wildlife Research Institute (TAWIRI) is a public institution that was established under the Ministry of Natural Resources and Tourism in 1980. It has a mission of carrying out and coordinating wildlife research in Tanzania with an overall objective of providing scientific information and advice to the government and wildlife management authorities on the sustainable conservation of wildlife.

TAWIRI collaborates with many institutions both local and international, and is the CITES Scientific Authority in Tanzania. Among the local institutions with which TAWIRI collaborates are the University of Dar es Salaam (UDSM), Sokoine University of Agriculture (SUA), College of African Wildlife Management, Mweka (CAWM), Tanzania Forestry Research Institute (TAFORI) and Tanzania Fisheries Research Institute (TAFIRI). Other collaborations include the Tanzania National Parks (TANAPA), Ngorongoro Conservation Area Authority and the Wildlife Division. TAWIRI collaborates also with the Norwegian Institute for nature Research, Wetlands International Messerli Foundation and Various universities in the US and UK.

TAWIRI has five Research Centres in various locations around the country. Of these, the Kingupira Wildlife Research Centre (KWRC), located in Selous Game Reserve is the closest to Lower Kihansi. In addition to these centres, there is a Conservation Information and Monitoring Unit (CIMU) that keeps all data and information on aerial censuses of wildlife. TAWIRI is well placed to take an active role in the environmental monitoring activities in the Kihansi Catchment.

AgES

The Agricultural Extension Service will mainly be responsible for the management of agricultural practices in the catchment. It is also responsible for providing advice on the use and management of agrochemicals, training of villagers from the catchment on best land practices and soil erosion control methods.

²² Updated EMP 2004

Land Office (LO)

The district Land Office is responsible for the management of land uses and land disputes between stakeholders in the catchment. The LO shall also ensure compliance with the Village Land Act.

SECTION 5. EMERGING ISSUES

5.1 Environmental

5.1.1 Land Cover Changes

The analysis of land use change within the catchment focuses on four broad land uses namely: forests, grass/bushland, grass/bushland/scattered cultivation and (intensive semi-intensive) cultivation. The most dramatic changes occurred in the grass bush/scattered cultivation. In the following sections we outline the detailed changes made in each category.

a. Forests

Comparing the land cover in 1999 and 2005 it is found that about 407 ha. of land, which was covered by forest in 1999 is no longer forested. Land covering 192ha, which was under intensive cultivation, has changed into forest. This means forest cover for the catchment area has declined from 8962ha to 8747ha. This is a decrease of 215ha. The change from intensive cultivation to forest could be due to fallow land, which has been abandoned or agro-forest, which appears as forest. There is a 2% loss of forest cover over a period of 6-7 years.

b. Grass/Bushland

Another land use, which is grass/bushland, experienced a substantial change of 8851ha to 5493ha. This represents 38% decrease. The 3358ha were converted into different intensities of cultivation. This means that there is a disquieting increase of converting grass/bushland into different intensities of cultivation. In addition to the loss of grass/bushland to cultivation about 4286ha reverted from grass/bush/scattered cultivation to grass/bushland. In other words 14.5% of grass/bush/scattered cultivation was regenerated mainly to fallowing. This may suggest that fallowing practices are positively contributing to vegetation regeneration but it might be difficult to sustain in a growing demand for land.

c. Grass/Bush/Scattered Cultivation

The land cover under grass/bush/scattered cultivation decreased from 29510ha to 19667ha, which is 33% decrease. Detailed analysis of this change indicates the following:

- ♦ The grass/bush/scattered cultivation area of year 1999 was drastically reduced to 10713ha in 2005
- ♦ 7151ha of grass/bushland in 1999 was grass/bush/scattered cultivation
- ♦ Likewise 1803ha of land under intensive cultivation in 1999 became grass/bush/scattered cultivation in 2005.

d. Cultivation

About 48% of the total land within the catchment falls under cultivation. Intensive and semi-intensive cultivation include settlement areas, village centres and infrastructure. Overall Intensive and semi-intensive cultivation land cover has remained almost the same. However, dynamics within this land use shows that substantial amount i.e. 5153ha of grass/bush/scattered cultivation was converted into this land use. Likewise 357ha and 105ha of grass/bushland and forestland respectively was cleared for intensive cultivation.

Approximately 9358ha was classified as semi-intensive in 1999. Our analysis has re-classified this into grass/bush/scattered cultivation. Under the new classification 13284ha of land are under semi-intensive cultivation in 2005 and 3628ha of intensive cultivation became semi-intensive. About 9358ha of grass/bush/scattered cultivation became semi-intensive. Approximately 298ha, which were under grass/bushland, was cleared for semi-intensive cultivation (Table 5.1).

Table 5.1 Land cover changes

Landuse/land cover	Size in Ha		Rate of change/ remarks
	1999	2005	
Forest	8962	8747	
Grass/bushland	8851	5493	38% loss
Grass/bush/scattered cultivation	29510	19667	33% loss
Intensive	14088	14080	
Semi-intensive cultivation	0	13284	Due to reclassification
Changes less than 100ha		140	
Total	61411	63416	

Source:

Following are the main issues under land cover changes:

- ♦ Flat cultivation has been noted as one of the main factors contributing to soil erosion (Approximately 70% of the households apply flat cultivation as their main farming practice). There are very few households practising ridge cultivation and contour terraces on upland areas. Such poor farming methods have lead to decline in soil fertility may lead to increased sedimentation.
- ♦ Villagers cultivate in vinyungu.
- ♦ Digging of fishponds. There are about 76 fish ponds constructed on streams flowing to Kihansi River.
- ♦ Use of fire for farm clearing has resulted into frequent destruction of vegetation cover.
- ♦ Lack of adequate knowledge on tree planting and management.

5.2 Hydrology

5.2.1 Water Yield

Based on the flow data (1999-2003) highest average monthly flows were at the time of highest rainfall in April and with highest value of 40 m³/s at the dam site on April 2002 . The occurrence of the lowest monthly average flow have been varying (October to December), with an isolated case January 1999. The lowest monthly average flow of Kihansi river at NC3 is about 7m³/s and in many cases occurs in November.

Therefore the average monthly volume of inflow through the river gauging station NC3 into the dam has the annual variation with the minimum of 18,144,000 m³/month (October /November) and a maximum value of 103,680,000 m³/month.

5.2.2 Future Water Requirement

The main economic activity in the catchment is small scale farming, which currently have negligible impact on the runoff quantity from the catchment area, although its important to formulate a monitoring mechanism for quantifying the changes over time.

Therefore apart from water requirement for the power generation, the domestic water demand is the only parameter, which could be reasonably estimated.

The population projections based on this study Table 3.5 shows that on the average the growth rate is 1.9% .and by the year.2015 population increase will be recorded in all villages. Over all projections show that the population in the catchment will increase to 49470 in 2015 and 59776 by the year 2025.

Considering planning horizon of 10 years and 20 years and the per capita demand of 40 l/c/d (Village centres)²³ the water demand will be 59,320 m³/month and 71,730 m³/month by the years 2015 and 2025 respectively.

Therefore, with the present quantities of runoff maintained, the monthly water demand by the year 2015 will be about 0.33% (18,144,000)and 0.06% (103,680,000) of the minimum and maximum present monthly flow into the Kihansi reservoir respectively.

Also the estimation of the year 2025 results into monthly water demand being 0.39% (18,144,000) and (103,680,000) 0.07% of the minimum and maximum present monthly flow into the Kihansi reservoir respectively. The overall observation out of these results is that the water in the catchment area could be well utilised without affecting the requirement to the hydropower station. However the issue of sedimentation needs to be addressed.

²³ Ministry of water & Livestock Design Manual

5.2.3 Sedimentation

Sediment transport and sedimentation is one of the major problems resulting from the on going human activities within the catchment area. In the previous studies some data analysis have been carried out to the river processes as part of CMP (KCMPP, Final report, April 1999). These included calculation of the sediment transport load from three river gauging stations, namely NC3 (dam site), NC1 and Ruaha at Uhafiwa.

In this study was assumed that all the sediments transported in the river will eventually reach the reservoir and contribute to the sedimentation. Therefore the data indicates the variation of the sediment load transport into the reservoir over the year.

TANESCO has confirmed that after the completion of the CMP project, no further data collection is carried out at the gauging stations and estimated an average inflow of sediment load into reservoir as 60x 106kg per year.

It is therefore crucial that the sediment gauging practice be established again in order to asses the current situation socio-economic issues.

5.3 Socio-economic

5.3.1 Demographic Trends

There is both in and out migration within the catchment. A high increase in population in Uhami, Ilogombe and Masisiwe villages are noted. Although Mbawi and Kipanga villages showed negative growth. Taking into account current trends it is likely that in ten years time the population in the catchment will increase from 40879 to 59776 in 2025. The picture would however, be different if the inter-censual growth rate of 2.2% was used in stead of 1.9%.

5.3.2 Declining Crop Production

a. Dwindling Fertile Land

Despite farming being the main livelihood activity in most of the villages in the KRC area, trends in crop productivity and yield show a decline. For example in the period of 10 years maize production in one acre stood at 8 bags. In Ukwami village (2005) average yield of maize per acre without use of fertilizer has dropped to 2-3 bags. The cause of this problem among others include lack of capital to purchase agricultural inputs and declining soil fertility. For instance only 10% of the house holds use good / high quality seeds. This has compelled villagers to cultivate in vinyungu so as to bridge the gap of yield from the farm. Cultivation of vinyungu which many of them constitute streams flowing to Kihansi River contributes to soil erosion and sediments deposits downstream.

b. Lack of Storage Facilities

Lack of storage and processing facilities discourages and affects the production activities in the catchment.

5.3.3 Limited Land for Cultivation

As population increases accessibility to arable land gradually becomes an issue. In Ukami village for example, most people had farms of 3 acres, which were not adequate to feed the growing household sizes. Due to low productivity per unit area, the tendency has been to clear more land for farming activities. Land scarcity has been reported in the village of Kibengu, Masisiwe, Mwatasi, Vingula, Mbawi and Bomalang'ombe, which are found in the Upper catchment (sub-planning 1 and II)

5.3.4 Lack of Capital

Apart from the lack of capital to establish small-scale non-farming activities, inadequate awareness and knowledge of establishing credit facilities such as SACCOS has contributed to the problem of capital. Even though the villagers indicated their willingness to engage in activities such as dairy cow keeping, lack of capital to purchase these inputs has curtailed their efforts of establishing non-farming activities. In the same way agricultural activities would require purchase of inputs and improved seeds which are hampered by lack of credit.

5.3.5 Lack of Alternative Non-Farming Activities

Crop production is the dominant economic activity of most of the households in KRC area. It has been noted that 12 out of 14 villages in the catchment area depend almost entirely on small-scale crop production as the main source of livelihood. Even though livestock keeping is also non-farming and a potential source of livelihood, it is undertaken at a very low scale compared to crop production. The lack of alternative non-farming activities has limited opportunities for livelihood improvement but also on natural resources as households have to depend entirely on land and water resources.

5.3.6 Poor Access to Markets

Poor road transport, lack of public transport, high transport cost, high prices of agricultural inputs including fertiliser and improved seeds which many farmers cannot afford, topographical constraints e.g. from Ilogombe village to nearby village of Nyawegete, has limited the villagers' access to markets and contribute to low income from agriculture as well as limiting livelihood opportunities. For example the Kihansi road that link Ukami village and other villages in the catchment is not easily passable by car during rainy season. Most roads in Kipanga and Masisiwe, are passable only by four wheel vehicles.

5.3.7 Lack of Potable Water

Water is a major problem in all the catchment villages. Only a few villages Bomalangombe, Kibengu and Ng'ingula have a piped water system. The piped water scheme in Mwatasi is

no longer operational. Although water for domestic use is sufficient in most of the catchment villages it is neither clean nor safe. Most villages rely on traditional wells and streams which are polluted during the rain season. As a result poor water quality, water borne diseases (e.g. dysentery, diarrhoea) and birhazia are very common.

5.3.8 Inadequate Farming Skills and Knowledge

Inadequate knowledge on farming systems and livestock husbandry is an issue throughout the catchment.

Existing swidden systems may be effective at maintaining a relatively stable ecosystem under low land pressures and the analysis of landuse change reveals reversion of bush cultivation to pure bush and forest in places. However, the economic and demographic change and projections reveal that newer more intensive systems are needed. Outside ideas, technologies and support systems have an essential place in the adoption of new systems and practices. Populations in the upper catchments are prepared and retain some knowledge from earlier efforts but have become somewhat skeptical due to the manner in which earlier project support ended.

5.4 Emerging Institutional Issues

5.4.1 Participatory Planning

The legal and policy frameworks require public to participate in decision making on all environmental issues, including planning. However villagers especially in Mufindi district complain over limited involvement in the decision making. Responsibilities at local level are higher but there is lack of capacity to execute those responsibilities. The willingness of the villages to participate is a potential for not only in making a realistic conservation /development plan but also in its implementation

5.4.2 Enforcement of Planning Agreements

The existing By-laws cover almost every environmental issue at the district and village level. However they are not enforced and people are not abiding to them. The By-laws focus is one sided as they are restrictive in nature and do not offer alternative choices.

5.4.3 Conflicting/Overlapping Mandates

There are conflicting mandates between central government and district and village level institutions e.g. District authorities have mandates to decide on use of resources but at the same time central government authorities are responsible for declaration of conserved areas and protection or revocation of rights.

SECTION 6. PLANNING GOALS AND OBJECTIVES

6.1 Overall Goal

The overall goal of the LWCP of the Kihansi Catchment is to contribute towards poverty reduction and landscape conservation while sustaining electricity production within Kihansi through: 1) assessment of changes in the catchment as a result of hydro dam construction; 2) promotion of stakeholder collaboration in decision-making and natural resource management; and 3) application of proposed management measures at catchment and landscape levels.

The proceeding sections have developed a foundation for the guiding objectives and proposals which follow in the remainder of the document. In particular, Section 4 describes the negative environmental impacts, principally from unsustainable farming practices, of human activity in the upper catchment. The analysis has led to a number of suggested mitigation measures; these are drawn together as a set of methods and proposals (Section 7) that together with the design for implementation and monitoring (Section 8), constitute the core of the LWCP.²⁴

6.2 Goals and Objectives on Environment

The main objective under the environmental conservation is to contribute towards sustainable natural resources management and biodiversity conservation in the catchment.

The specific objectives under this goal are:

- ♦ Encourage application of specific management measures for different landscape units.
- ♦ Reduce land degradation. In this context reduction of land degradation refers to minimization of loss of natural vegetation and sustaining the existing land cover.
- ♦ Encourage landuse practices that minimise soil erosion and therefore reducing sediments deposition in the dam.
- ♦ Provide positive incentives for different stakeholders to practice soil and water conservation measures in a sustainable manner.
- ♦ Raise conservation awareness and enhance its application in environmental conservation and natural resources management among stakeholders.

²⁴ The Interim Report presents the proposals and activities as well as the institutional and funding arrangements illustratively. At this time, the core plan elements are subject to further elaboration and an important phase of stakeholder review and participation. Additionally, the Consultant is exploring potential institutional alliances and funding options that will be outlined more definitively in the final LWCP report.

6.3 Goals and Objectives on Poverty Reduction

The main goal under poverty reduction is to contribute towards improved livelihood of the people and the households within the catchment area.

The specific objectives are:

- ♦ Introduce and establish alternative sources of livelihood particularly non-farming livelihood activities.
- ♦ Strengthen the existing agricultural system focussing on crop production, agro forestry and animal production and marketing.
- ♦ Expand transport services within the catchment area to facilitate haulage of crops and availability of inputs and commodities focussing on improved road conditions, storage facilities and public transport.
- ♦ Increase marketing opportunities within the catchment.
- ♦ Improve primary school facilities and introduce secondary school and vocational training centres.
- ♦ Increase accessibility to health service among the population within the catchment area.
- ♦ Increase accessibility to potable water supply
- ♦ Improve sanitation services within the catchment area.

6.4 Goals and Objectives on Stakeholders Collaboration

The main goal under stakeholders' collaboration is to achieve enhanced institutional capacities for participatory and integrated resource management.

The specific objectives are:

- ♦ Enhance participatory and integrated land use planning at catchment and village levels.
- ♦ Develop and support good governance practices at village and catchment levels.
- ♦ Expand and improve the delivery of extension services in soil and water conservation, crop production and livestock development and marketing.
- ♦ Establish and enhance community based groups e.g. SACCOS

SECTION 7. PLANNING PROPOSALS

7.1 Introduction

LWCP provides a coordinated and cooperative approach for all relevant land and water users and stakeholders in a way that they can protect Kihansi River from existing and potential impact. It is an overarching vision of the LWCP to create a vehicle whereby people from these communities could come together with a common desire to protect the catchment, improve the environment and quality of life within the catchment in which they live. The end result would be to sustain the downstream water body to generate electricity thus contributing to the quality of life for Tanzanians as a whole.

In addressing the issues arrived at in Section six, planning proposals are formulated. The planning proposals are organised according to the three main goals and objectives formulated under chapter six. The three main goals focus on

- ♦ Environmental aspects
- ♦ Poverty reduction; people's aspect and
- ♦ Stakeholders collaboration; institutional aspect

The proposals have been divided into two main parts. The first part includes the catchment wide proposals and the second part contains proposals directed to specific sub planning areas.

7.2 Catchment Wide Proposals

7.2.1 Environmental Aspects

- a. Encourage application of specific management measures for different landscape units.

Given that the catchment area is not homogeneous, it is proposed to subdivide the area taking into account biophysical, socio-economic, and village boundaries, by overlaying village administrative boundaries, landscape units and hydrological sub catchments, five sub-planning areas were identified (Figure 7.1). These sub-planning areas differ in terms of land use land cover dynamics, hydrological characteristics and slope elevation patterns and social economic dynamics. They therefore require different conservation and development planning interventions. The five sub-planning units as shown in the Table 7.1 below:

Table 7.1 Sub-Planning Areas

Sub-planning area	Landscape Unit²⁵	Sub-catchments	Villages
I	Highland with slopping terrain	Ilogombe, Muhu and Mapanda	Kibengu, Mwatasi, Ilogombe, and Igeleke
II	Highlands with moderate to very steep terrain	Muhu, Mkalasi, Ruvala and Mapanda	Boma la Ngombe, Ng`ingula, Masisiwe, Mbawi and Nyawegete
III	Highlands and hills with moderate to very steep terrain	Mapanda, Mkalasi and Ruvala	Kipanga and Mapanda
IV	Hills with moderate to very steep terrain	Nyazunwa, Lower Ruaha, Mhalala and Mapanda	Ihimbo, Uhafiwa and Ukami
V	Predominant hills and a bit of highlands	Ruvala, Upper Ruaha and Lower Ruaha	Udzungwa forest reserve

²⁵ Titling of the landscape units is being refined so that the five categories can be easily distinguished

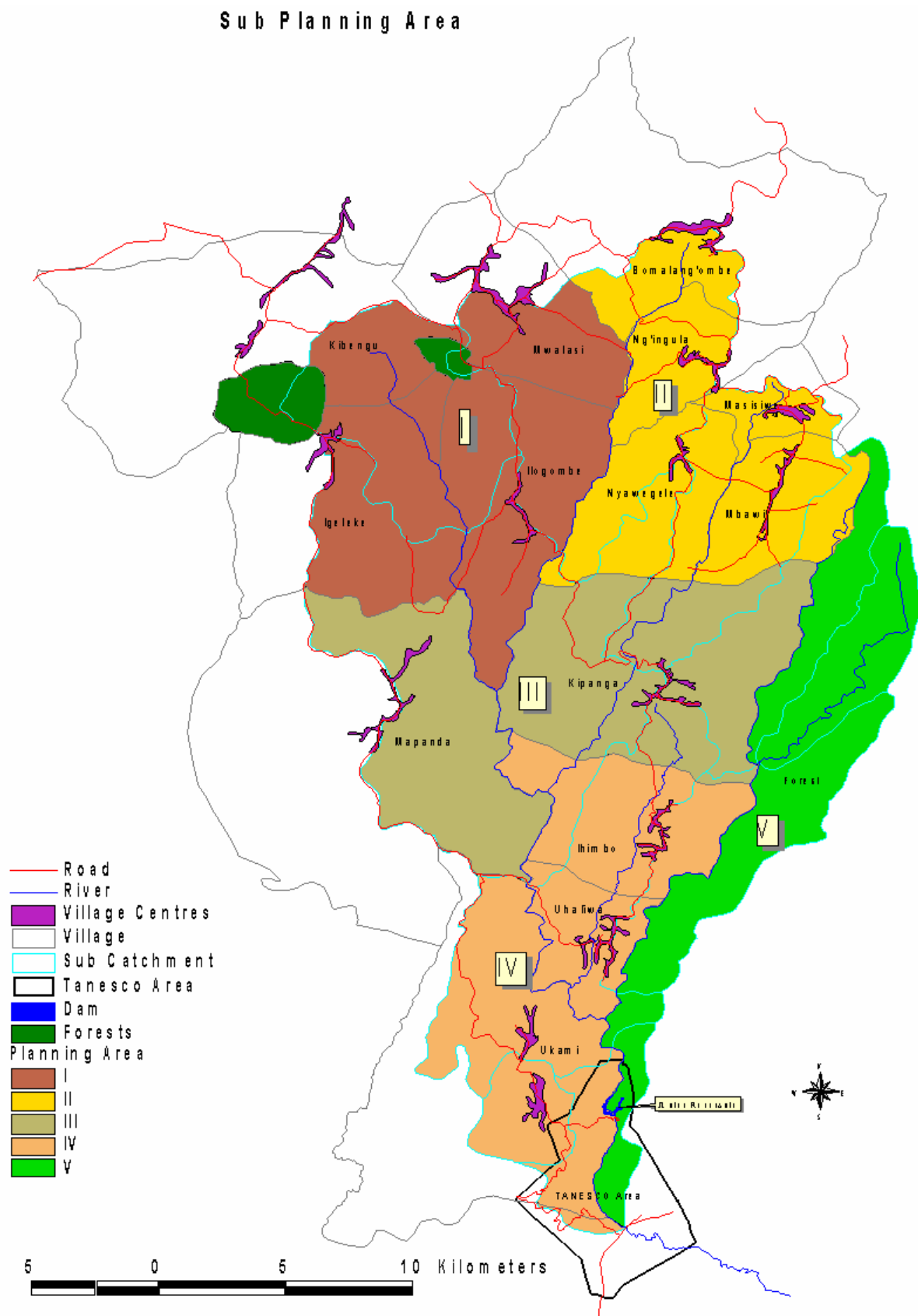


Figure 7.1 Sub-Planning Areas

b. Reduced land degradation and encourage sustainable land use practices

Key issues under this objective include minimization of natural vegetation loss, soil conservation and increased land productivity. The following measures are proposed:

- ♦ In order to reduce vegetation loss, it is proposed that afforestation activities especially in sub-planning unit I and IV be enhanced.
- ♦ In addition, it is proposed that alternative energy sources be introduced and sustained. Also facilitate the establishment of electricity power supply to strategic areas such as secondary schools, dispensaries, religious centres and where feasible private house connection.
- ♦ In order to control soil erosion and increased land productivity it is proposed that intensive cultivation through enhancing application of organic fertilizer, mixed cropping, contour farming and agro-forestry be supported. Contour farming is particularly important in sub-planning zone II, III and IV.
- ♦ To control siltation caused by vinyungu cultivation it is proposed that a buffer zone around vinyungu be established through local negotiations in a participatory manner.

c. Raise awareness and enhance its application in environmental conservation

Despite considerable level of awareness in environmental issues among the stakeholders, it is proposed that continued efforts should be made to sensitise all the stakeholders.

In addition it is proposed that modalities for implementing environmental conservation measures and sustainable land use practises should be developed, implemented and enhanced.

d. Provide incentive to practice soil and water conservation measures

In order for the villagers to be able to practice soil and water conservation measures, incentives such as improvement of transportation facilities, social services, agricultural services and electricity (where possible) should be provided either from the project, the central government or the districts.

It is also proposed that villages and individuals who practise sustainable water and soil conservation measures are rewarded as recognition of their contribution of good practises.

7.2.2 Poverty Reduction Aspects

a. Alternative Livelihood Sources

It has been established that the main livelihood activities in most of the villages within the catchment area is farming. This has limited flexibility in terms of livelihood opportunities and income generation. It is therefore proposed that alternative livelihood activities are introduced in the catchment area. Such activities may include trading, small scale agro processing industries and expansion of the service sectors. This is particularly important in sub-planning areas III, IV and part of II.

b. Improve Existing Agricultural System and Livestock Husbandry

In order to improve crop productivity it is proposed that programmes to encourage the use of organic and chemical fertilisers, improved seeds and pesticides are developed and implemented. The use of agrochemicals should be carefully managed to minimise negative environmental consequences. This applies to all Sub-planning units.

It is also proposed that in sub-planning areas I and part of II, more livestock keeping activities are improved and expanded.

c. Improvement of transport services

In order to facilitate movement of people, haulage of crops and availability of inputs it is proposed that road condition should be improved to make them passable throughout the year. This is more critical in sub-planning areas IV and part of II.

Coupled with the improvement of road network, storage facilities of crops should be constructed especially in sub-planning areas IV and part of II.

Both the improvement of road condition and storage facilities will stimulate establishment of alternative non-farming livelihood activities

d. Improve marketing opportunities

In sub-planning areas with difficult accessibility, it has been established that crops such as fruits rot in the farms due to lack of market outlets. It is proposed that market outlets coupled with improved accessibility are introduced especially in sub-planning areas IV and part of II and III.

e. Improve education and health services

The general education and health services within the catchment area calls for improvement. It is proposed that studies are conducted especially to the quality and level of accessibility of the existing services. However, it is proposed that at least each village should have a dispensary while vocational training centres and secondary schools are established at ward level.

f. Potable Water Supply

There is an indication that the water supply condition is not satisfactory even though there is a variation across the catchment area. It is proposed that studies are made to determine the status of water supply both qualitatively and quantitatively so as to recommend projects that will aim at improving potable water supply.

g. Improve Sanitation Services

Within the catchment, there was a sanitation project that was implemented during the Kihansi Power Project construction. It is proposed that the best practices emerging from this project are replicated and sustained.

7.2.3 Stakeholders Collaboration

a. Enhance Participatory and Integrated Land Use Planning

The Kihansi catchment area spans into two administrative districts of Kilolo and Mufindi and consists of 14 villages. This calls for a joint management committee at the catchment level to oversee the implementation and overall management of the plan. It is therefore proposed that a joint committee drawing members from the two districts and representatives from the 14 village councils and other key stakeholders is established.

Based on the overall Kihansi Catchment Conservation plan, each village should prepare a detailed land use plan taking into consideration the Participatory Village Land Use Planning Guidelines.

In preparing village land use plans, each village should take into consideration the key elements identified in each sub-planning area.

b. Enhance good governance practices at village and catchment level

In order to ensure trust and ownership of the plans among key stakeholders at catchment and village levels, good governance has to be ensured. It is therefore proposed that transparency, accountability and adherence to guidelines, procedures and other provisions are exercised.

In order to effectively implement governance practises, it is proposed that capacity is developed at district and village levels in terms of dialogue skills, organising meeting and records and record keeping

c. Enhance Delivery of Extension Services

One of the observations from recent studies shows that extension services are very poor. Understandably, extension services play a crucial role for sustainable conservation plan. It is therefore proposed that extensions services are improved in terms of manpower, transportation facilities and funding for provision of these services. Extension services geared towards improved marketing, crop production and livestock development are crucial in this conservation plan.

d. Establish and Enhance Community Based Groups

Presently there are very few community groups focusing on environmental and socio-economic development of the catchment area. Community groups can play a key role in soil and water conservation and mobilisation of capital for agricultural and livestock development. It is therefore proposed that community groups such as water user groups, village community banks, land care groups, bush regeneration and SACCOS are established to support environmental conservation and socio-economic development issues.

The following table summarises the catchment wide proposals.

Table 7.2 Catchment Wide Proposal

Components	Issues / Threats	Specific Proposals	Activities and Mitigation Measures
Environmental Aspects	Variation in landscape characteristics	Encourage application of specific management measures for different landscape units.	• Subdivide the catchment area into sub-planning units with similar landscape characteristics. • Develop specific proposals for each sub-planning area
	Flat cultivation, vinyungu, fish ponds contraction along the River and bush fire	Reduced land degradation and encourage sustainable land use practices	• Introduce ridge cultivation and contour farming. • Introduce buffer zones bordering vinyungu • Establish landcare groups • Establish water user groups

	Lack of adequate knowledge on tree planting and management	Raise awareness and enhance its application in environmental conservation	• Provide training on tree planting and management • Establish landcare, afforestation, bush regeneration groups
	Lack of incentive for practicing sustainable soil and water conservation activities	Provide Incentive to practice soil and water conservation measures	• Provide annual awards • Provide incentives such as electricity, social facilities and utilities.
Poverty Reduction Aspects	Limited livelihood activities (farming)	Establish alternative Livelihood Sources	• Introduce and improve livestock keeping. • Introduce trading activities • Introduce agro processing activities.
	Low soil fertility and limited knowledge on appropriate farming systems and livestock keeping	Improve Existing Agricultural System and Livestock Husbandry	• Introduce use of organic and inorganic fertilisers. • Provide adequate extension services • Introduce crop intensification
	Poor transport and road network	Improvement of transport services	• Improve road link among villages • Improve existing road surface condition • Encourage public transport facilities
	Poor access to markets	Improve marketing opportunities	• Introduce market outlets • Improve existing roads
	Limited health and education facilities	Improve education and health services	• Construct vocational training centres in each village • Construct dispensaries and improve existing services • Construct secondary schools at ward level
	Limited access to decent water supply	Potable Water Supply	• Conduct a study to establish appropriate sources for potable water supply in each village
	Lack of appropriate sanitation options	Improve Sanitation Services	• Provide training on appropriate sanitation options • Develop pilot projects on appropriate sanitation types.
Stakeholders Collaboration	Lack of village land use plans	Enhance Participatory and Integrated Land Use Planning	• Prepare land use plans for each village.
	Limited involvement of villagers in decision making processes	Enhance good governance practices at village and catchment level	• Develop capacity at village and district level in dialogue skills, organizing meetings, recording and record keeping

			• Provide training on governance for village council and district councils
	Insufficient extension services	Enhance Delivery of Extension Services	• Provide sustained and adequate extension services in marketing, crop production and livestock development
	Lack of community based groups	Establish and Enhance Community Based Groups	• Encourage and facilitate the formation of community based groups focussing on water and soil conservation, bush regeneration, afforestation, village community banks, SACCOS.

7.3 Sub-Planning Level Consideration Proposals

The above proposals capture and apply for the whole catchment area. However, the biophysical, socio-economic and administrative (village boundary) variations have necessitated development of specific proposals based on the identified sub-planning areas. These proposals are presented as follows:

7.3.1 Sub-Planning Area I

This is an upper catchment area characterised by landscape units of highlands with sloping terrain. It constitutes the villages of Kibengu, Mwatasi, Ilogombe and Igeleke. Specific proposals are as follows:

a. Encourage appropriate cultivation methods

About 75% of all households in villages within this sub-planning area were reported to practice flat cultivation, which is likely to result into effects of soil erosion. It was further reported that fire was used in clearing farms. This has the effect on biomass and other organic matter.

It is proposed that ridge cultivation and contour farming is introduced in this zone so as to curb possible effects in soil erosion. Also farming practice guidelines for the upper catchment area should be developed for easy use by the villagers. It is further proposed that the use of fire in farm clearing should as much as possible be discouraged through participatory mechanisms whereby villagers are informed on the disadvantages of farm clearing by using fire.

b. Introduce appropriate management measures for vinyungu cultivation

Despite the presence of By-laws restricting people to cultivate vinyungu along the streams and the provision of education on soil conservation, recent studies in the villages of Igeleke, Kibengu and Ilogombe show that most households continue to cultivate vinyungu. In Igeleke village, for example, people cultivate vinyungu in the Nyakahelo stream where also they dug fish pods. This stream leads to Kihansi River.

It is therefore proposed that while appropriate measures are taken to restrict farming vinyungu in the streams employing village By-laws, such efforts should be accompanied with dialogue on how to limit such farming practices concurrent with promotion of non-farming livelihood activities.

c. Land use intensification

This sub-planning area is relatively highly populated with an estimated population of 11,431 (2005 projection). This is approximately 25% of the total planning area (catchment area) population. As a consequence of this increase in population some villages are experiencing land shortage.

It is proposed that appropriate measures for land use intensification be introduced such as use of manures and other organic fertilizers to increase land productivity. In preparing village land use plans, appropriate land use assessment should be carried out so as to examine the viability of the land resource for the growing population.

d. Introduce non-farming and improved livestock activities

Livestock keeping in this sub-planning area is quite minimal. The same applies for other non-farming activities. Piggery is the most popular livestock keeping activity but also conducted at small scale level. It is proposed that improved livestock husbandry is undertaken within the carrying capacity of the sub-planning area.

It is proposed that alternative non-farming activities are introduced such as small scale processing of food crops and fruits, trading and business undertakings.

e. Improvement of community facilities

Despite the high population in this sub-planning area, there is only one dispensary located in Kibengu village. There is no vocational training and secondary schools in all the four villages of this zone.

It is proposed that each village is provided with a dispensary and a vocational training school. Also a secondary school is proposed to be provided at a sub-planning area level. It is further proposed that a programme on improved livestock keeping be introduced to complement the focus on farming activities and diversify livelihood activities for the villagers.

7.3.2 Sub-Planning Area II

This is also part of the upper catchment characterised by highlands with moderate to very steep train. It has characteristics similar to those of sub-planning area I except that it is relatively steeper. It comprises five (5) villages of Bomalang'ombe, Ngingula, Masisiwe, Mbawi and Nyawegete. This sub-planning area has an estimated total population of 16,127 (2005 estimates). Specific proposals for this zone are as follows:

a. Introduce land use intensification

As a result of a relatively high population in this zone, and limited fallow, crop rotation and use of fertilizers, villagers have opted to clearing new land to increase crop production. This practice is also being limited by non availability of arable land.

It is therefore proposed that intensive land use cultivation practices are introduced to sustain land requirements for farming purposes.

b. Introduce soil conservation measures

As was the case for sub-planning area I; flat cultivation has been practiced in almost all the five villages in sub-planning area II. Owing to the relatively steeper slope in this zone, soil conservation measures are more calling.

It is proposed that ridge and contour farming practices are introduced as a soil conservation measure.

c. Improve management measures for vinyungu cultivation

In almost all five (5) villages, vinyungu cultivation has been practiced in valley bottoms and valley slopes.

It is therefore proposed that each village establishes buffer zones along the river valley and adopt progressive measures that limit cultivation along these valleys. Specific focus should be given to catchment valleys and river beds that lead to Kihansi River.

d. Improve livestock keeping and introduce non-farming activities

As was the case for sub-planning area I; livestock keeping is relatively higher than in sub-planning areas III and IV. Coffee and Pyrethrum cultivation that was practiced in some of the villages (Bomalangómbé, Ngingula and Masisiwe) has been abandoned due to limited extension services and market outlets.

It is recommended that livestock keeping is improved and other non-farming activities are introduced so as to provide alternative livelihood opportunities for the villagers.

e. Improvement of transport networks and facilities

The Mwatasi – Iringa road via Bomalangómbé and Ngingula villages is rather poor to facilitate transportation of goods and people to other parts of the sub-planning and catchment area, and the two districts of Kilolo and Mfindi. This has limited access to markets and other facilities that are not available within the zone.

It is proposed that roads linking all the villages within the zone are improved so that it is passable all the year around. In developing Village Action and Annual Plans, roads improvement should be coordinated and provided in integrated approach to facilitate improvement.

7.3.3 Sub-Planning Area III

Sub-planning area III is characterised by highlands with moderate to very steep terrain. It is located in the middle of the catchment area. It comprises only two villages of Kipanga and Mapanda. Estimated population in this zone for the year 2005 is 6,662 people. Specific proposals for this zone are as follows:

a. Encourage sustainable land use practices

Use of flat cultivation in both steep slopes and vinyungu was noted in the two villages. The fact that this sub-planning area is sloping towards Kihansi River means that unsustainable cultivation practices will have a negative impact in terms of sedimentation in the reservoir.

It is therefore proposed that ridge cultivation and contour farming are introduced on the sloping land and buffer zone reserved along river courses especially in those areas where vinyungu cultivation is being carried out.

b. Improvement of transportation

Road accessibility between Kipanga and Mapanda is non-existent. Despite their East-West proximity, one has to travel via Ihimbo and Uhafiwa to the next villages. Besides, the road condition is relatively poor limiting effective transportation of goods, services and people.

It is proposed that the road linking these villages is improved to facilitate year-round passability.

c. Non-farming activities

Non-farming activities in this sub-planning area include timber production, trading, employment in the service sector and local brewing. However, these activities are practised at minimal level to significantly supplement farming activities.

It is proposed that other non-farming activities are introduced as suggested in sub-planning areas I, II, and III.

d. Enhance participation of villagers in managing natural resources

Villagers in Mapanda village, for example, complained about being prevented from cultivating vinyungu, constructing fish ponds and restriction from using the natural forests.

It is proposed that while efforts should be made to sustainably manage the resources, villagers should be the central and the key stakeholders in decision-making and implementation.

7.3.4 Sub-Planning Area IV

This zone is rather critical because it borders the Kihansi reservoir. It is characterised by hills with moderate to very steep terrains. It is comprised of three villages of Ihombo, Uhafiwa and Ukami with an estimated population of 6,659 people (2005). Specific consideration proposals for this zone are as follows:

a. Protect areas bordering Kihansi reservoir.

Since this sub-planning area borders the Kihansi reservoir, it is proposed that more efforts should be made to protect the Kihansi reservoir from siltation and sedimentation. Village land use plans for Ihimbo, Uhafiwa and Ukami should be prepared taking into consideration effective soil and water conservation measures along mountain slopes and river valleys.

Contour farming, ridge cultivation, tree planting and creating buffer zones along river valleys should be observed and adhered to. Similarly a protective buffer zone bordering Kihansi reservoir and Ukami village should be created.

b. Improve transport facilities and network

As was the case for planning area II; road condition in this area is poor and not easily accessible during the rain season. Due to steep slopes, many transporters avoid taking their vehicles to these villages.

It is proposed that the road linking the three villages of Ihimbo, Uhafiwa and Ukami is improved to facilitate passability through out the year and act as the incentive for the establishment of other non-farming activities.

c. Provide incentives to practice appropriate soil and water conservation measures

One of the complaints raised by villagers was the fact that the project could not provide electricity to villages in the catchment area despite the promises that were made before. Besides, the project has never provided other incentives for the villagers to effectively participate in sustainable soil and water conservation measures.

It is therefore proposed that incentives such as electricity, community facilities like dispensaries (Uhimbo and Ukami villages) and road improvement are provided as incentives towards villagers' participation in conservation measures. This is particularly relevant in this sub-planning area that borders the Kihansi reservoir where electricity is generated.

7.3.5 Sub-Planning Area V

This is predominantly a hilly area covered with the Udzungwa forest reserve. It is part of the lower catchment trenching north-south on the eastern part of the catchment area. It is one of crucial water catchments for the Kihansi projects. Analysis of land cover changes that is

largely constituted by this forest shows a slight decrease from 8962ha in 1999 to 8747ha in 2005. This is a decrease of 215ha equivalent to 2.4% of the forest area.

It is proposed that all key stakeholders in forest management are facilitated to actively participate in the management of forest resources. Villages bordering the forest reserve (Ngingula, Masisiwe, Mbawi, Ihombo, Uhafiwa) should prepare integrated physical development plans taking into considerations management measures applied to this forest.

In the following Table 7.2, for each sub-planning area the threats are listed along with the specific proposal addressing the threats, mitigation measures and actors for the mitigation measures.

Table 7.3 Threats – Proposals – Mitigation Measures				
Sub-Planning Area	Issues / Threats	Specific Proposals	Activities and Mitigation Measures	Key Actors
I	♦ Flat cultivation ♦ bush fire ♦ Inadequate farming skills	Encourage appropriate cultivation methods	♦ Introduce ridge and contour farming. ♦ Discourage use of fire for farm clearance. ♦ Develop new commodity chains or improved terms of trade for producers of existing agricultural products. Subsector selection process based on market potential with environmental criteria given additional weight ♦ Develop farming practices guidelines for the upper catchment characteristics for easy use by villagers.	Villagers Extension officers Ministry of Agriculture
	♦ Vinungu cultivation within the river valleys	Introduce appropriate management measures for vinyungu cultivation	♦ Establish a dialogue on abiding to the village By-laws on vinyungu cultivation. ♦ Promote non-farm livelihood activities.	Village government Villagers District council LKEMP
	♦ Land shortage	Land use intensification	♦ Promote use of manure and organic fertilisers ♦ Carry out land viability assessment in each village	Villagers Extension officers District land office
	♦ Limited non-farm livelihood activities	Introduce non-farming and improved livestock activities	♦ Introduce non-farm activities such as trading, business undertaking and processing of food crops and fruits. ♦ Improve the livestock husbandry within the carrying capacity of the area. ♦ Promote SACCOS.	Villagers Private sector Extension officers District land office
	♦ Limited and inadequate community facilities	Improvement of community facilities	♦ Provide dispensaries and vocational training schools in each village. ♦ Improve the quality of service in the dispensaries.	Ministry of Health, Ministry of Education Village government Villagers

II	♦ Low soil fertility, ♦ Limited fallowing, ♦ limited crop rotation and ♦ inadequate application of fertilizers ♦ inadequate farming skills	Introduce land use intensification	♦ Promote use of manure and organic fertilisers ♦ Promote fallowing and crop rotation. ♦ Provide sustained extension services ♦ Develop and implement technology dissemination mechanisms (e.g. demonstration sites, technology packages, evaluation of dissemination practices, training of trainers program, development of a training facility).	Extension officers Villagers
	♦ Flat cultivation	Introduce soil conservation measures	♦ Introduce ridge and contour farming ♦ Develop farming practices guidelines for the upper catchment characteristics for easy use by villagers.	Extension officers Villagers Ministry of agriculture
	♦ Vinyungu cultivation in the valley bottoms and valley slopes	Improve management measures for vinyungu cultivation	♦ Facilitate a dialogue for villagers to abide to the By-laws. ♦ Establish a buffer zone along river valleys.	RBWO Village government District councils villagers
	♦ Limited non-farm livelihood activities	Improve livestock keeping and introduce non-farming activities	♦ Introduce non-farm activities such as trading, business undertaking and processes sing of food crops and fruits. ♦ Improve the livestock husbandry within the carrying capacity of the area. ♦ Promote SACCOS	Extension officers District land office Village government
	♦ Limited accessibility to markets and other facilities	Improvement of transport networks and facilities	♦ Develop an integrated annual action plans for road improvement. ♦ Mobilise villagers to participate in road improvement.	Catchment management committee Village governments District councils

III	♦ Flat cultivation and soil erosion ♦ Inadequate farming skills	Encourage sustainable land use practices	♦ Introduce ridge and contour farming. ♦ Create buffer zones along river valleys. ♦ Encourage and enhance agroforestry. ♦ Develop farming practice guidelines for the middle catchment area for easy use by villagers. ♦ Develop and implement technology dissemination mechanisms (e.g. demonstration sites, technology packages, evaluation of dissemination practices, training of trainers program, development of a training facility).	Extension officers RBWO Ministry of agriculture
	♦ Limited accessibility to markets and linkage to nearby villages and other facilities	Improvement of transportation	♦ Develop an integrated annual action plans for road improvement. ♦ Mobilise villagers to participate in road improvement.	Catchment management Committee District councils Village governments
	♦ Limited non-farming activities	Promote Non-farming activities	♦ Introduce non-farm activities such as trading, business undertaking and processing of food crops and fruits. ♦ Introduce zero grazing livestock keeping. ♦ Promote SACCOS	Extension officers villagers
	♦ Non-participatory management of natural resources	Enhance participation of villagers in managing natural resources	♦ Promote the formation and facilitate the operation of village groups. ♦ Provide awareness training on the need for conservation of river valleys and slops. ♦ Engage these village groups in decision making processes regarding the management of natural resources.	Village government Villagers Catchment management committee LKEMP
IV	♦ Lack of protective measures for the Kihansi Reservoir	Protect areas bordering Kihansi reservoir.	♦ Introduce contour farming and ridge cultivation. ♦ Create a buffer zone and plant trees along river valleys. ♦ Create a buffer zone between Kihansi Reservoir and Ukami village	Extension officers RBWO TANESCO Village government

	♦ Limited accessibility to markets and linkage to nearby villages and other facilities	Improve transport facilities and network	♦ Develop an integrated annual action plans for road improvement. ♦ Mobilise villagers to participate in road improvement. ♦ Develop and implement technology dissemination mechanisms (e.g. demonstration sites, technology packages, evaluation of dissemination practices, training of trainers program, development of a training facility).	Catchment management committee Village governments Villagers
	♦ Lack of incentive for practicing sustainable soil and water conservation	Provide incentives to practice appropriate soil and water conservation measures	♦ Provide annual awards ♦ Provide incentives such as electricity, social facilities and utilities. ♦ LKHP support the road improvement initiatives as an incentive to the villagers. ♦ Promote SACCOS	LKEMP TANESCO Catchment Management Committee villagers
V	♦ Loss of forest cover ♦ Loss of habitats	Enhance integrated forest management approach.	♦ Establish interagency coordination mechanism. ♦ Facilitate village groups representatives and other stakeholders to actively participate in the management of forest resources	Catchment Management Committee Village Groups Ministry of natural resources EAM management

Specific activities in each sub-planning area will be refined for Draft Final report

SECTION 8. IMPLEMENTATION AND MONITORING

8.1 Approach

The Consultant expects that the LWCP's effective implementation will promote and result in a placement of measures that will reduce, halt, or reverse biotic impoverishment of the catchment. The capacity to put in place such measures is very much dependent on:

- The time available to effect the response;
- The availability of resources sufficient to support implementation of activities recommended by the LWCP; and
- The quantity and quality of information available.

8.2 Principles to Enhance Implementation

LWCP is a catchment management plan which in a coordinated manner addresses problems of water quality, water quantity, soil erosion, vegetation cover and community amenity in the project area. The following points should be considered:

- Indigenous people should be involved from the outset in the management of catchments on their traditional lands. LWCP will only be successful if it is fully supported by district and village governments.
- Allocating the responsibilities for various actions / programs to different stakeholders will result in continued inefficiencies, un-coordination of management activities and duplication of efforts. It is essential that this plan (LWCP) is implemented by a single management body or group to ensure coordination is achieved.
- The Consultant recommends that implementation of the LWCP should be started with comparatively simple ideas for community use, and later progress towards the more complex should this be needed.
- Agreeing with the assumption by CMPII²⁶, soil conservation measures and other environmental activities are more successful when implemented with the farmers' good will, rather than by prohibitive approaches which reduce motivation.
- District Councils have the key responsibility to manage catchments and waterways in an effective and integrated manner to maximise the benefits to local communities and to continue meeting legislative requirements and regional commitments.
- Commitment and coordination by different actors and stakeholders

²⁶ Kihansi CMP – Phase 2: Implementation of the Catchment Management Plan, Final Report – Agricultural Activities, February 2002

- Incentive packages as tool for implementation and compliance
- Flexibility and adaptability to changing situations and conditions

8.3 Implementation Tools

a. Guidelines by LKEMP

- i. LKEMP- District and Community Grants - Handbook of Guidelines for Preparation and Implementation of Sub-projects, 2005.

It is envisaged that the LWCP implementation would largely operate under the existing decentralised structure of local government, based on sector conditional grant mechanism (Local Government Finance – Block Grants – Regulations, 2000).

To achieve the objectives of the community grants, LKEMP has prepared this handbook of Guidelines for Preparation and Implementation of Sub-projects to facilitate smooth implementation of sub-projects. The Guidelines provide the step by step instructions on how to identify target communities, eligible sub-projects, applying for grants, planning for implementation, implementation, monitoring and evaluation to empower the stakeholder districts and beneficiaries with the management of their resources and at the same time ensure accountability of the grants provided by the LKEMP²⁷.

Community Grant is a process by which LKEMP provides funds to communities through District Councils so that they can manage the implementation of sub-projects that they prioritise for themselves. The community takes responsibility for supervising project related works, banking transactions and disbursements, procuring materials, hiring contractors and consultants, employing skilled and unskilled labour and reporting on the utilization of the financial resources provided by LKEMP.

The Community Grant will focus on communities in areas that are in the Landscape-wide Conservation Plan focal area and identified as eligible for grants. In addition the conservation areas defined in the Updated Environmental Management Plan for LKHP may also be included, for example Mlimba, Chisano, Udagaji, and Kalengakeru. In addition to the above list of geographical areas, other eligibility considerations for the grant support include the district councils in form of capacity building for sub-project execution.

The agreements are made between the District Council and LKEMP. The District Council act on behalf of the community. There will also be an agreement between LKEMP and the District Councils involved in the implementation of the sub projects. Communities are given an option of receiving funds directly from LKEMP.

In addition, LKEMP will provide districts with capacity building grants. The main part of the district grants will aim to support districts with capacity in identification, implementation and monitoring community sub-projects; this may include incremental operating costs, procurement of goods, services and training. Part of the grant will also be used to provide equipment or funding initiatives that are cross-cutting through several communities, for example training of councils' staff, construction of bridges, etc.

²⁷ LKEMP- District and Community Grants - Handbook of Guidelines for Preparation and Implementation of Sub-projects, MN Informatics, 2005.

- Must be consistent with the implementation objectives of the Landscape Wide Conservation Plan.
- In each sub-project proposal specific natural resources/environmental management objectives must be identified from among the objectives of the Landscape Wide Conservation Plan; and must be accompanied by a work-plan with specific milestones and indicators on how the community will meet these objectives.
- The LKEMP District Grants will provide capacity building support at the district council level and below to ensure that the districts are fully involved in the implementation of the Landscape Wide Conservation Plan objectives and can identify actions that can be taken for issues cross-cutting the districts.

ii. LKEMP District and Community Grants, Financial Management and Procurement Procedures, 2005

The procedures manual is a detailed document that describes the financial management system used by the districts and communities participating in the LKEMP project²⁸.

This manual is in the form of a series of Standard Practice Instructions designed to describe financial accounting system, procedures and policies governing the grants provided under LKEMP:

- Describes the accounting procedures to be operated
- Explains the main accounting principles to be adopted
- Outlines responsibilities for various operational aspects of the accounting system
- Provides a source of reference for the people involved
- Provides internal training to existing and newly appointed or recruited staff.
- In addition the manual addresses the following important aspects:
 - o Planning and budgeting
 - o Cash receipts and payments
 - o Procurement and stores
 - o Financial management reports

Although the report describes (in page 4) the project area for LWCP as Kilombero, Mufindi and Kilolo, it should be noted that LWCP does not cover Kilombero.

²⁸ Lower Kihansi Environmental Management Project, District and Community Grants, Financial Management and Procurement Procedures, MN informatics, 2005, pp5

b. Village By-laws

One of the tools that is important for implementation process are the village By-laws. These provide for management procedures to soil and water conservation and cultivation practices. Refer to section 4 for details on By-laws.

c. Other Tools

Other tools which are relevant in the implementation on this LWCP include the Village Land Act and Participatory land use management guidelines.

8.4 Resources for Implementation

8.4.1 Human resources

The effective implementation of this landscape wide conservation plan calls for capacity building of the key actors at village, catchment and district levels. While at district level technical personnel will be required, at village and subcatchment level capacity building to put in place effective participation mechanisms will be required. Specific consideration should be focused on agricultural extension services, agroforestry, community development service, livestock, water and sanitation, health and education. In addition capacity building in terms of exercising governance principles is also necessary.

8.4.2 Financial Resources

Funding projects should be sustained for assured continuation of projects. The possible sources of funding are: EAMCEF, UNDP, CEPF and Local governments.

8.4.3 Institutional Resources

Key institutions important for the implementation are: NEMC, Catchment management committee, Village governments and its respective committees, Religious committees Organised Village groups, District councils

8.5 Implementation Process

The implementation of this Plan will take several stages. First is the approval of the LWCP by LKEMP. Second is the dissemination and mobilisation of resources which will be done by the LKEMP. The third level has got a number of components. These include preparation of Village Land Use plans and Sub-projects, Formation of Village Groups for various activities, Formation of Catchment Management Team and Preparation of Catchment Projects. These will be implemented by respective actors. For example, Village Land Use Plans will be prepared by the Village Planning Committee while Catchment Projects will be prepared by the Catchment Management Committee. The fourth stage is the funding of proposed projects and plans. The last stage is plan review. While amendment to this plan will be carried out continuously, a comprehensive review will be done after five years (Figure 8.1)

a. Plan Approval

In this process, plan approval refers to the approval and acceptance of plan by the client; this will be facilitated by the stakeholders meeting involving all key players in the upstream Kihansi Catchment.

b. Dissemination and mobilization

Prior to project's implementation there is a need for disseminating the plan to all key stakeholders through seminars workshops, leaflets and public meetings. Parallel with the dissemination of plan is resource mobilisation including funding, human resources and identification of key institutions that would be actively involved in the implementation of the plan.

c. Village land use plans and projects

In order to implement the LWCP plans and projects both at village and catchment level will have to be prepared. These include village land use plans, employing participatory land use planning guidelines, village sub projects like livelihood improvement, sustainable environmental management projects. These should be implemented taking advantage of the catchment grants provided by LKEMP.

d. Village groups formation

Consistence with village land use plans and village sub projects, information of village groups such as water user groups (WUG), landcare group (LCG), bush regeneration group BRG), etc, should be part of the implementation process. These groups should include representatives from smallholders, large companies and farms, government and TANESCO, a representative from RBWO can also attend to provide technical advice to the WUG.

At catchment level projects focussing on improvement of livelihood and sustainable environmental management should be formulated.

e. Interim Catchment Management Committee

During the period that the legal permanent Catchment Committee is being instituted, an interim catchment management committee should be formed to address the immediate issues of the catchment area. For example, road improvement, dispensaries and other social services.

f. Catchment Management Committee

The Catchment Management Committee should draw members from villages, the two district councils of Kilolo and Mufindi and other key stakeholders. The main functions of the committee are to oversee planning and implementation of the LWCP, to make sure the

sustainability of the LWCP and ensure coordinated and integrated planning by various players in the project area.

The executers of the above process are listed in Table 8.1.

Table 8.1 Key Actors in the Execution of Implementation Process

Planned activity	Key Actor
LWCP approval	LKEMP / NEMC
Dissemination and mobilization of LWCP	LKEMP
Preparation of village land use plans and projects	District land office and the village government
Village groups formation	District councils RBWO WWF
Appointment of Interim Catchment Management Committee	District councils NEMC RBWO
Appointment of permanent and legal Catchment Management Committee	Land Commissioner Village government District authorities

The following Figure 8.1, illustrates the implementation process up to the to first review period which is proposed to be five years.

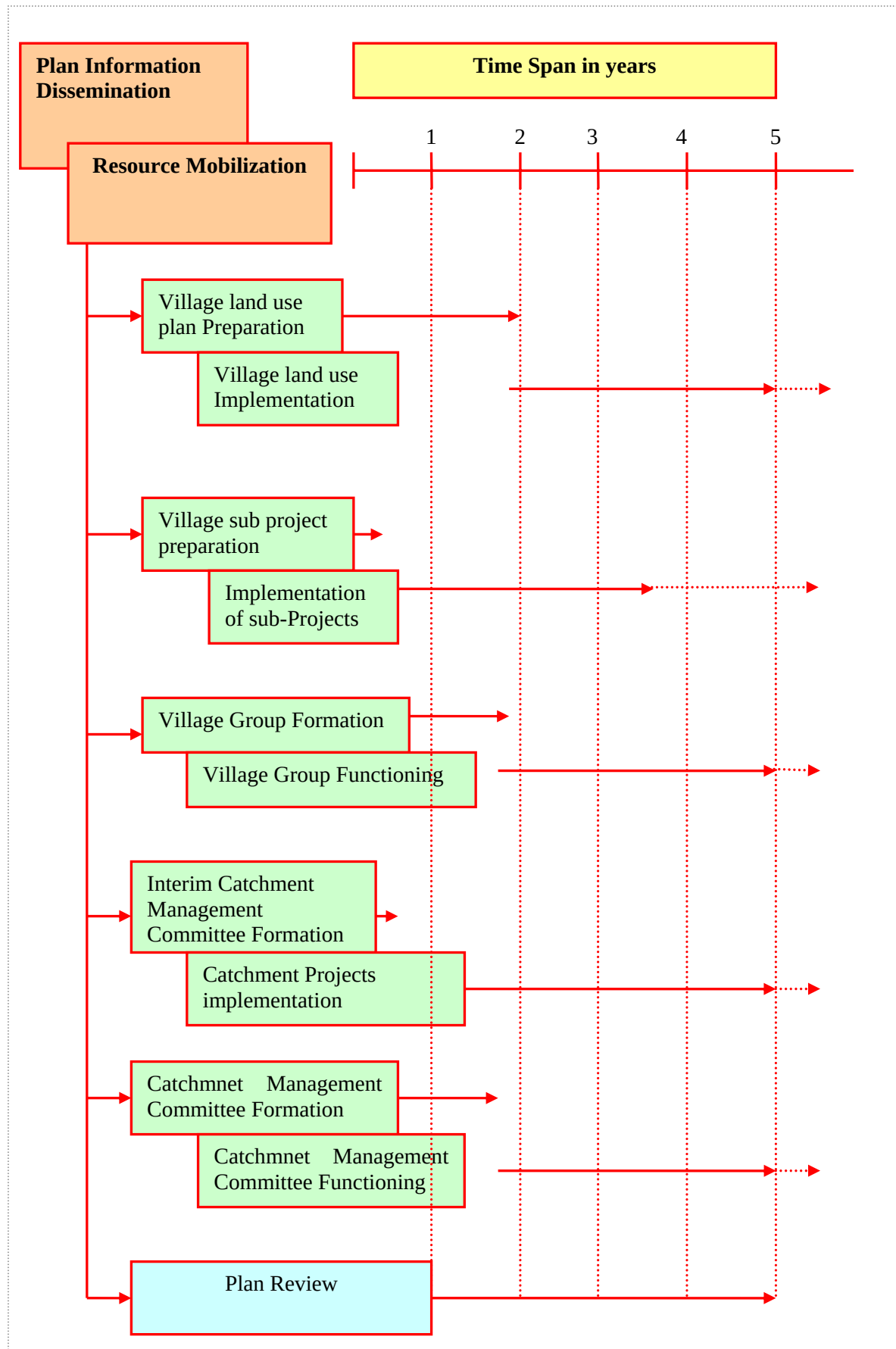


Figure 8.1 LWCP Implementation Process

8.6 Role of Stakeholders in LWCP Implementation

Institutional arrangements for the LWCP include a central role for District Councils, Ministry of Natural Resources and Tourism (especially Forestry and Beekeeping Division), Ministry of Lands and Human Settlement Development, Ministry of Water and Livestock Development, Rufiji Basin Water Office and Board and the Ministry of Agriculture and Food Security.

Where as TANESCO, Wildlife Division, NEMC and the Division of Environment play a prominent role.

The role of the stakeholders is to work together to produce tangible improvements in the quality of the environment and livelihood of the local communities within the catchment area. LWCP will be implemented at two levels:

- Village level, by individuals /groups acting at village level / village council
- At catchment by the Catchment Management Committee acting as a central coordinating mechanism at catchment level.

Stakeholders at village level include:

- Individual farmers / inhabitants
- Landcare groups (LCG)
- Water user groups (WUG)
- Bush regeneration groups (BRG)
- Village environmental groups
- Village Council with the overall authority

Stakeholders at catchment level include: District councils, catchment management committee, TANESCO, NEMC, RWBO and other ministries.

At catchment level, as proposed in the Plan, Catchment management committee is responsible. This committee will consist of members from both districts of Kilolo and Mufindi and also members from ministries of natural resources, water, agriculture and energy. The committee has many opportunities to influence the impact of human activity on catchment. Examples are through statutory planning (such as Local Environmental Plans), flood mitigation works and placing regulations on new developments. Below are some examples of how local councils through the Catchment Management Committee will participate in CM Planning and implementation:

- Coordinating the activities of the villages in the districts
- Coordinating the activities of the 2 districts
- Liaise with LKEMP office
- Controlling erosion and sediment in the catchment, by developing erosion and sediment control policy, a code of practice, and standard conditions to help farmers reduce erosion from agricultural activities.
- Improving water quality by developing a buffer zone along the water courses and tree planting along watercourses.

- monitoring of environmental impacts
- review the LWCP biannually
- Formulate specific monitoring indicators
- Maintain an up to date data base

The key stakeholders are listed in Table 8.2. An attempt has been made to identify the specific roles for the stakeholders, however the exact roles and input by each will be defined at the stakeholders meeting.

Table 8.2 Key Stakeholders

Stakeholders Role with respect to	Planning	Funding	Provide Resources	Implementation	Monitoring	Evaluating	Enforcement	Policy
Vice President's Office / Division of Environment	Approve LWCP	Allocate fund				Evaluate	Enforce	To endorse By-laws
National Environment Management Council	Approve LWCP	Allocate funds	Resources	Implementation	Monitor	Evaluate		To endorse By-laws
Wildlife Division of MNRT			Resources					
IUCN Tanzania					Monitor			
Non-Governmental Organizations	Participatory Planning			Implementation	Monitor	Evaluate		
Local Communities	Participatory Planning			Implementation				
District Councils for Mufindi and Kilolo	Participatory Planning	Allocate funds	Resources	Implementation	Monitor	Evaluate	Enforce	
Local Governments	Participatory Planning			Implementation			Enforce	
TANESCO		Allocate funds			Monitor			
RBWO	Participatory Planning			I	Monitor	Evaluate		
Ministry of Natural Resources			Resources	Implementation	Monitor	Evaluate	Enforce	
Ministry of Agriculture				Implementation			Enforce	
Ministry of Water	Participatory Planning			Implementation			Enforce	
Ministry of Energy		Allocate funds						
Ministry of PORALG								
Ministry of Health		Funds	Resources				Enforce	

Ministry of Education		Funds	Resources					
Donors		Allocate funds						

8.7 Monitoring

As mentioned, two types of monitoring are envisioned by the plan. The first pertains to implementation monitoring. Implementation monitoring itself can be subdivided: the level of LWCP oversight appropriate authorities will monitor the level to which proposed plan activities are being implemented. Within the LWCP monitoring of implementation will consist of a more detailed set of measures (such as number of persons trained in soil conservation techniques) for specific activities that receive support and are being implemented on the ground.

The second type of monitoring can be referred to as impact monitoring where the focus is on the development results that follow from the outcomes of project activities creating sufficient drive to have made a real difference. (higher income, healthier families, increased forest cover, etc)

The following discussion indicates some of the principles and structures that will be put into place or utilized to accomplish the LWCP performance monitoring objectives.

8.7.1 Catchment Management Committee

The Catchment Management Committee is a representative committee that will play a key role in monitoring all plans and projects within the catchment area. However there is a need to establish an Executive Committee that will play a role of day to day operations of the LWCP. The executive committee will facilitate the collection of data and prepare progress reports that will be presented in the biannual meetings.

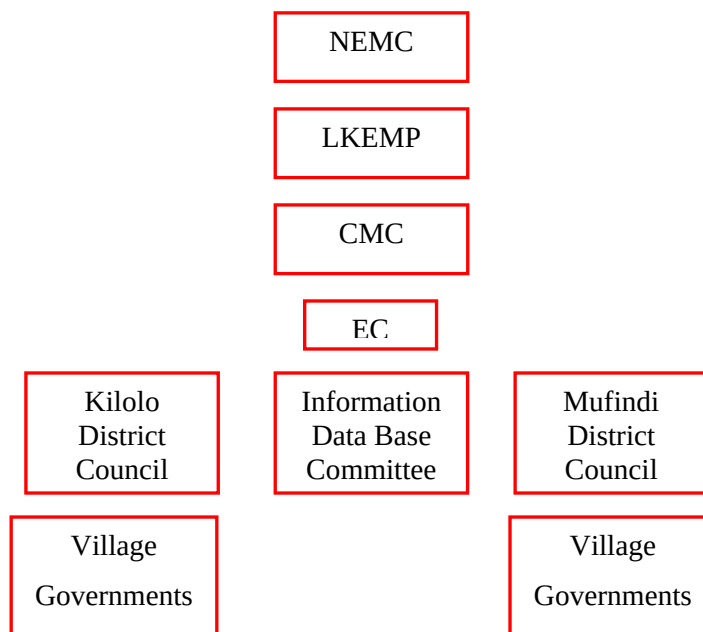
8.7.2 Data Base

In order to ensure effective monitoring there is a need for continuous update of data bases. These will facilitate to track changes and provide an input in preparation of progress reports and biannual meetings. This therefore calls for the establishment of information data base unit or subcommittee under Catchment Management Committee that will be responsible for collecting and updating the data with respect to environment, socio-economic and institutional aspects of the projects.

8.7.3 Structure of the key Monitoring Actors

The key actors who will be involved in the monitoring of the LWCP are the NEMC who will have the overall responsibility on matters related to environment and also play a key role as advisory to other key stakeholders. Other actors include the LKEMP, CMC, Kilolo and Mufindi district councils and the village governments. Figure 8.2 below shows the hierarchy in monitoring the implementation process of LWCP.

Figure 8.2 Organisation Structure for LWCP Monitoring



8.7.4 Monitoring Indicators

Monitoring can be established in two simultaneous processes:

- a. Plan implementation monitoring
- b. The impact of the LWCP monitoring

Implementation monitoring involves progressive assessment on the level of implementation of planned proposals. Impact monitoring refers to assessing whether the different plans under LWCP have impact on the catchment. In other words monitoring the status of the catchment in terms of environment, socio economic conditions after the implementation of the project proposals. It is imperative therefore to develop indicators for both plan implementation and impact monitoring. Table 8.3 Presents the LWCP monitoring indicators.

Table 8.3 Monitoring Indicators

Monitoring Indicators	
Plan Implementation Monitoring	Impact Monitoring
	a. environment
1. Degree of dissemination	1. Level of soil erosion
2. Extent of resource mobilization	2. Level of sediment load in water
3. Number of village land use plans prepared and approved	3. Changes in vegetation cover
4. Number of village sub –projects formulated and funded	4. Level of soil and conservation measures

5. Formation of active village groups	5. Population of key indicator taxa: both plants and wild animal species
6. Formation of active interim catchment management committee	6. Quality and quantity of water
7. Formation of effective permanent Catchment Management Committee	b. livelihood
	1. Level of average household income
	2. Average yield per unit area
	3. Number and extent of non-farm income generating activities per HH
	4. Access to health, education, and financial credit facilities
	5. Level of mobility
	6. Extent Crop diversification
	c. Institutional
	1. Effective participatory land use and resource management
	2. Land use and resource management strategies
	3. Effective coordinated integrated management of the LWCP
	5. Compliance to By-laws and institutions
	6. effective practice of governance principles (transparency, accountability)

8.7.5 Meetings and Progress Reports

In order to have effective monitoring mechanisms the catchment management committee should meet twice in a year to track progress of projects within the catchment area. It is suggested that the committee meets biannually. Progress reports will have to be prepared and presented during committee meetings.

8.8 Plan review

The time horizon for this plan is 10 years. It is in itself flexible to allow continuous changes and amendments (during monitoring) in accordance to changing circumstances; however it is suggested that major plan review be undertaken after every five years. Monitoring and progress reports should constitute inputs to the major plan review. A team of experts will have to see if the planning goals and objectives still appropriate.