



GOVERNMENT  
OF KENYA



# UPPER TANA NATURAL RESOURCES MANAGEMENT PROJECT

(UTaNRMP)

## STRATEGIC ENVIRONMENTAL ASSESSMENT FINAL REPORT

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## **ACRONYMS**

AWPB	Annual Work Plans and Budgets
CAP	Community Action Plan
CBD	Convention on Biological Diversity
CCBA	Climate, Community and Biodiversity Alliance
CDM	Clean Development Mechanism
CEC	County Environment Committee
CEO	County Environment Officer
CIG	Common Interest Group
CFA	Community Forest Association
CNRM	Community Natural Resources Management
CPC	County Project Coordinator
CPCC	County Project Coordinating Committee
CPFT	County Project Facilitation Team
DEC	District Environment Committee
DEO	District Environment Officer
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESM&MP	Environmental and Social Management and Monitoring Plan
FDA	Focal Development Area
FDAC	Focal Development Area Committee
GBM	Green Belt Movement
GEF	Global Environmental Facility
GoK	Government of Kenya
GWC	Green Water Credits
IAS	Impact Assessment Study
IFAD	International Fund for Agricultural Development
IGA	Income Generating Activity
IPM	Integrated Pest Management
KAPAP	Kenya Agricultural Productivity and Agri-Business Project
KAPP	Kenya Agricultural Productivity Program

KFS	Kenya Forestry Service
KWS	Kenya Wildlife Service
MKEPP	Mount Kenya East Pilot Project for Natural Resource Management
MMP	Mitigation Management Plan
MWI	Ministry of Water and Irrigation
NBSAP	National Biodiversity Strategy and Action Plan
NEMA	National Environmental Management Authority
NRM	Natural Resource Management
PAPF	Protected Areas Planning Framework
PCT	Project Coordination Team
PELIS	Plantation Establishment Livelihood Improvement Scheme
PES	Payment for Environmental Services
PFM	Participatory Forest Management
PIM	Project Implementation Manual
PMU	Project Management Unit
PRESA	Pro-poor Rewards for Environmental Services
RES	Rewards for Environmental Services
SAN	Sustainable Agricultural Network
SCMP	Sub-Catchment Management Plan
SEA	Strategic Environmental Assessment
SOE	State of Environment
SWC	Soil and Water Conservation
TIST	The International Small Group & Tree Planting Program
TIVET	Technical, Industrial, Vocational and Entrepreneurship Training
UNDP	United Nations Development Programme
USD	United States Dollars
UTaNRMP	Upper Tana Catchment Natural Resources Management Project
WRMA	Water Resources Management Authority
WRUA	Water Resource Users Association
WSTF	Water Services Trust Fund

## NON-TECHNICAL SUMMARY

This is a report on the Strategic Environmental Assessment (SEA) of the UpperTana Natural Resources Management Project (UTaNRMP) undertaken between February and May 2012. NEMA reviewed the document and gave their comprehensive comments through a peer review meeting held on 13<sup>th</sup> August 2013. Thereafter a validation workshop was held on 10<sup>th</sup> April 2014.

**Objectives of the SEA :** The objectives of the SEA included; to identify environmental impacts and opportunities of mitigation measures into programme design during the formulation stage of programmes, and in the process influence IFAD and donor support to UTaNRMP development efforts towards environmental sustainability and climate smart development; ensure the full consideration of alternative programme/project options including the do nothing option, at an early stage when there is still greater flexibility; ensure the cumulative, indirect or secondary impacts of diverse multiple activities are considered, including their unintended consequences; ensure environmental principles such as sustainability, polluter pays and the precautionary principle are integrated into the development, appraisal, and selection of programme options; and provide an early opportunity to check whether or not the proposed programme is compatible with existing related policies, legislation, plans and programs.

**Methodology:** To fulfil both IFAD and NEMA requirements, an Environmental and Social Impact Assessment (ESIA) was undertaken before the commencement of the SEA. The ESIA study informed the SEA process and the Environmental and Social Management Plan (ESMP) in the ESIA expanded in the latter process to formulate an Environmental and Social Management Framework (ESMF) for the various interventions. In undertaking the SEA, focus was on identifying potential environmental, social and economic impacts of the proposed programme, the significance of these impacts, and coming up with possible mitigation and enhancement measures for adverse and positive impacts respectively.

Generally, the assignment followed the National Guidelines for Strategic Environmental Assessment (February, 2011) in Kenya. A Scoping report was submitted to NEMA on 20<sup>th</sup> January 2012 and approved on 5<sup>th</sup> March 2012. Community and institutional consultation forums were adequately distributed across the project area. Gender representation especially in the community consultation forums was deliberately sought.

**The Project:** Since 2004, the Government of Kenya (GoK) and IFAD have financed the Mount Kenya East Pilot Project (MKEPP), which has linked sustainable use of natural resources, especially water and forests, with enhancement of rural livelihoods. At the request of the Government, IFAD and the GoK designed a new project, the Upper

Tana Catchment Natural Resources Management Project (UTaNRMP), as a follow-on and up-scaling project to the pilot project.

The new project is expected to eventually cover all 24 of the river basins (and their tributaries) that drain into the Tana River and will be operational in the six counties of Murang’a, Nyeri, Kirinyaga, Embu, Tharaka-Nithi and Meru, as well as identified hotspots and protected areas. The Tana River basin is the largest and most important basin in Kenya. Its catchment covers some 95,950 km<sup>2</sup> (approximately 17% of Kenya’s land mass), and the flow of the Tana River basin constitutes 27% of the total mean discharge measured along rivers in the country’s major drainage basins. The basin has both the largest existing generated hydro-power and the greatest remaining hydro-power potential and presently accounts for approximately 61% of the total power supply in the country.

UTaNRMP builds on and scales up the proven interventions of the pilot project MKEPP, which recorded largely positive social and environmental impacts. In designing the UTaNRMP, however, a number of social and environmental factors were taken into consideration, in order to ensure that the technologies, strategies, and types of interventions selected are those with the highest environmental and social benefits. These include targeting, sustainability and use of indigenous knowledge.

The goal of the new project is to “contribute to reduction of rural poverty in the Upper Tana river catchment”. Its two development objectives reflect the poverty-environment nexus in the project area: (1) increased sustainable food production and incomes for poor rural households living in the project area and (2) sustainable management of natural resources for provision of environmental services. The thrust of the project is empowering communities in the project area undertake community natural resources management.

The UTaNRMP will undertake a phased approach in its interventions in the 24 river basins included in the project area, targeting 12 priority river basins in the initial phase based on a ranking of the river basins according to established environmental and social criteria. The five criteria used by the design team for this ranking are rivers that are over-utilised with high levels of water use inefficiencies, rivers with significant pockets of environmental degradation, rivers with the greatest risk of natural resources degradation, rivers cutting across several agro-ecological zones and rivers having a large section of needy population. Consequently, the following rivers and were identified;

MKEPP River Basins (5)	Ena, Kapingazi/Rupingazi, Kathita, Kithinu/Mutonga, Tungu
High Priority River Basins for UTaNRMP (12)	Maragua, Murubara, Nairobi, Ragati, Rujiweru, Rupingazi, Saba Saba, Thanagatha, Thanantu, Thiba, Thika/Sasumua, Thingithu

Other River Basins	Amboni, Iraru, Kayahwe, Lower Chania, Mara, Mariara, Mathioya, Muringato, Nyamindi, Ruguti, Rwamuthambi, Sagana, Ura
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The project targets around 200,000 poor rural households whose livelihoods revolve around the use of the natural resources of the river basin. These include smallholder crop and livestock farmers, agro-pastoralists and pastoralists, fishers, rural traders, and community groups involved in Natural Resource Management (NRM) and income generating activities. Special focus will be on women and youth as well as other vulnerable groups within the above categories. The project will also provide indirect benefits to the non-target groups in the Upper Tana catchment through services and enterprises linked with the project activities, as well as to populations outside the catchment who rely on water and hydro-electricity from the river system. The project will also target other community areas like riverbanks, schools, hilltops, and roadsides.

**Project components:** The project will be structured along the same lines as MKEPP with four components, each of which will generate its own outcome:

Component	Outcome
a) Community Empowerment	<ul style="list-style-type: none"> <li>Rural communities empowered for sustainable management of natural resources</li> </ul>
b) Sustainable Rural Livelihoods	<ul style="list-style-type: none"> <li>Natural resource-based rural livelihoods sustainably improved</li> </ul>
c) Sustainable Water and Natural Resource Management	<ul style="list-style-type: none"> <li>Land, water and forest resources sustainably managed for the benefit of the local people and the wider community</li> </ul>
d) Project Management and Coordination	<ul style="list-style-type: none"> <li>Project effectively and efficiently managed</li> </ul>

**Poverty:** The six counties are home to a cross-section of poor and less poor populations. Poverty manifests itself in various forms including, inadequate food supplies, poor access to health and education services, inadequate potable water, lack of good and proper clothing, inaccessibility to proper education and landlessness, underdeveloped infrastructure etc.

The main causes of poverty have a strong linkage to the environment. Changes in environmental conditions have led to reduced agricultural production. Notably agriculture supports a majority of the population in the catchment. This has in turn led to reduced incomes and as well as uncertain food security. Some of the areas where poverty is more pronounced are the arid and semi arid areas within the

counties. On the other hand high levels of poverty have also had a toll on the environment. A large section of the population lives from hand to mouth. They are not able to invest time and resources in environmental conservation unless with support. This has inevitably led to cycle of poverty that leads to further environmental degradation. Analysis from the district development plans shows that poverty in the counties ranges from about 24.7 to about 40 percent<sup>3</sup>.

**Environmental and Social Challenges:** Other than poverty, the main environmental and social challenges in the Upper Tana catchment, and which UTaNRMP seeks to tackle include:

- Catchment degradation arising from the various unsustainable land use practices that include deforestation and encroachment for farming /grazing/settlement on fragile areas especially wetlands, riparian reserves and steep slopes/hill tops leading to soil erosion, low agricultural productivity and water pollution. Other practices include,
- Charcoal burning in arid and semi arid areas for sustenance as means to escape prolonged droughts leading to land degradation,
- Un sustainable grazing practices that lead to land degradation thus hindering natural regeneration potential in forests and rangeland areas either protected or private and
- Un sustainable sand mining and quarrying that have lead to land degradation.
- Rising demand for wood products especially wood fuel, timber and poles against declining sources.
- Declining water sources arising from un sustainable land use practices that have exacerbated excessive run off leading to declining ground water recharge.
- Climate change has lead to increasing rainfall unreliability, frequent / re occurring droughts that have lead to declining land productivity.
- Declining bio diversity arising from poaching / illegal exploitation in protected areas.
- Reduction in conservation and farming areas through invasion by certain invasive species e.g. striga weed on farms and lantana in wildlife and forest areas.
- Forest and range fires induced through careless /poor farming activities that involve burning of vegetation.
- Human wildlife conflict mainly in form of crop and infrastructure destruction as well as loss of live and injuries.
- Un sustainable solid waste management in urban centers in the region.

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<sup>3</sup>These figures are an average of poverty rates in districts within each county.

**Policy framework:** To successfully design and undertake, UTaNRMP, the programme must be in line with the country's legislative and regulatory framework. Further, UTaNRMP must fit within the government's and area development plans and goals. Some of the laws and policies relevant to this project include; the Kenya constitution 2010, Kenya Vision 2010, The Environmental Management and Coordination Act, 1999, The Water Act, 2002, The Agriculture Act (Chapter 318), The Irrigation Act (CAP 347), The Lakes and River Act, Cap 409, Laws of Kenya. Policies include among others: National Poverty Reduction Strategy/ Economic Recovery Strategy for Wealth and Employment Creation, Millennium Development Goals (MDGs), National Climate Change Response Strategy, Agriculture Sector Development Strategy (ASDS), New Irrigation Policy, Water Policy, Draft Wildlife Policy, Kenya Fisheries Policy, Forest Policy, Wetlands Policy, National Poverty Eradication Plan, Sessional papers no. 7 & 8 on development, Social welfare policy, National Community Development Plan, National Policy on Gender and Development and Sessional Paper No. 2 of 2006 on Gender and Equality. In addition to complying with the GoK policy and legal framework described above, the UTaNRMP also considered applicable IFAD procedures, policies and strategies including IFADs Strategic Framework (2011-15), Country Strategic Opportunities Programme (COSOP –[2007-012]), Environment and Social Assessment Procedures (2009), the Environment and Natural Resource Management Policy (2011) and the Climate Change Strategy (2010). Multilateral environmental agreements that Kenya is party to were also considered.

**Potential Impacts :** The environmental and social impacts arising from MKEPP as seen through Impact Assessments and Environmental Audits were largely positive and the same is expected of the UTaNRMP project. There will also be a much larger number of indirect beneficiaries who will enjoy the improved environmental conditions in the project area, community empowerment, and various forms of training and capacity building. Indirect beneficiaries also include downstream water users outside the Upper Tana catchment, like those in Nairobi City.

**Positive impacts:** It is generally expected that the project will lead to positive impacts including Improved environment, Improved water resources management, enhanced conservation of forests, soils, and other natural resources, climate change mitigation and adaptation, reduced human-wildlife conflicts, Improved security and social order: Tied to the electric fence, will be improved, Improved incomes and livelihoods and Maintenance of biodiversity among others.

**Potential negative impacts and their mitigation:** The positive impacts notwithstanding, a number of potential negative impacts were also raised which will require mitigation:

- **Changes in vegetation mix:** mitigated by limiting of areas to be cleared, and by restoration of cleared areas through re-vegetation;
- **Soil erosion:** mitigated through various project activities like on-farm soil conservation structures, roadside harvesting of water for farms; rehabilitation of degraded areas, afforestation, on-farm trees planting, and school greening programmes;
- **Restriction of wildlife movement:** mitigated by working with KWS, incorporating issues of wildlife corridors, and boosting wildlife habitat through rehabilitation;
- **Transfer of human wildlife conflicts:** mitigated by working in collaboration with KWS and Rhino Ark who target to fence round Mt. Kenya;
- **Cumulative impacts:** the thrust will be to reduce adverse impacts at each individual project intervention level through screening, capacity building of institutions and communities, and through the implementation of framework EMPs proposed;

**Alternatives:** UTaNRMP is a scaling up of MKEPP, and the project is largely based on what worked well in MKEPP, with appropriate modifications based on lessons learned. MKEPP, being a pilot, was the stage where various alternatives were actually tested and considered. To meet these indicators, several alternatives were considered including geographical targeting - targeting critical river basins, hotspots and forest areas; prioritization of river basins - initially work in 12 river basins which were selected based on five criteria; for sustainability and ownership, the project chose to engage and work with local communities to implement project interventions; for irrigation projects, rather than expand existing irrigation systems or areas, the project specifically targeted improving water use efficiency where the irrigation is already taking place; technology chosen was most environmentally friendly available; human-wildlife conflicts - project analyzed several methods including translocation of problem animals, use of game moats, control shooting, scaring and compensation for loss of property, among others and chose the electric fence as most suitable; and “No action” alternative – it was found this would maintain the *status quo* of the situation in the Upper Tana catchment, making the no project alternative both expensive and unacceptable to the local communities - for these reasons, this alternative was rejected in favor of the current project design.

**Linkages with On-going Projects:** UTaNRMP has opportunities to link up with several projects in the area. Other than MKEPP which is the main link, other projects include MKEPP-GEF; the Natural Resources Management Project; the Green Revolution in Africa (AGRA) supported PROFIT organization which undertakes payment for environmental services; KWS, KFS, Rhino Ark, Bill Woodley Trust for wildlife barriers; The International Small Group & Tree Planting Program (TIST); Green Belt Movement; Rain Forest Alliance; and Kenya Agricultural Productivity and Agribusiness Project (KAPAP).

**Recommendations:** Other than the recommended mitigation measures, the SEA also recommends that following:

- I. UTaNRMP takes up the issues of wetlands conservation
- II. UTaNRMP continue the policy of preparing State of Environment Reports for new Focal Development Areas
- III. UTaNRMP continue fencing from where the MKEPP- GEF fence ended and also collaborate with the Rhino Ark Project which aims to fence off the whole of the Mt. Kenya
- IV. UTaNRMP should investigate promoting additional energy-efficient and alternative energy interventions
- V. With regards to capacity building, UTaNRMP should also consider the following: integrated pest management (IPM); provide technical capacity building, including basic safety gear and equipment, for forest fire prevention and control; provide technical capacity building for CFAs in developing and implementing Participatory Forest Management (PFM) Plans; and provide capacity for water harvesting.
- VI. UTaNRMP should identify and implement climate-smart interventions appropriate to the project area including awareness creation, water harvesting and storage, promoting drought tolerant and orphan crops, and promoting intensive livestock production techniques.
- VII. Payment for Environmental Services (PES): though UTaNRMP does not have this component, it should explore linkages with both PROFIT and TIST to assist farmers benefit from this aspect.
- VIII. UTaNRMP should continue undertaking Plantation Establishment and Livelihood Improvement Scheme (PELIS) with regards to forests rehabilitation as it has proved successful under MKEPP
- IX. UTaNRMP should support initiatives to gazette communally-owned areas for ease of their rehabilitation and management.
- X. After the screening process proposed, separate EIAs may require to be undertaken for:
  - Domestic water projects;
  - Improvement of irrigation projects;
  - Large scale afforestation;

**Environmental and Social Management Framework:** To fulfil both IFAD and NEMA requirements, an Environmental and Social Impact Assessment (ESIA) was undertaken before the commencement of the SEA. The ESIA study informed the SEA process and the Environmental and Social Management Plan (ESMP) in the ESIA expanded in the latter process to formulate an Environmental and Social Management Framework (ESMF) for the various interventions. This was mainly

because the programmatic nature of the UTaNRMP means that the exact number and location of the specific sub-projects to be financed by the project have yet to be determined. As with the ESMP developed in the ESIA, the ESMF contains:

1. Environmental and Social Screening and Assessment Procedures;
2. Framework Environmental Management Plans which are an expansion of the Mitigation Management Plan (MMP) developed in the ESIA; and
3. Monitoring Plan (MP)

# **I. INTRODUCTION**

## **1.1 Strategic Environmental Assessment (SEA)**

The National Environmental Management Authority (NEMA) defines Strategic Environmental Assessment (SEA) as a range of analytical and participatory approaches that aim to integrate environmental consideration into policies, plans and programmes and evaluate the inter-linkages with economic and social considerations<sup>1</sup>. SEA is also described as a participatory approach for up-streaming environmental and social issues to influence development planning, decision making, and implementation processes at the strategic level<sup>2</sup>.

The principles upon which SEA is based include:-

- I. sustainable development and sustainable use of natural resources;
- II. enhanced protection and conservation of biodiversity and physical surroundings;
- III. inter-linkage of human settlement and cultural issues;
- IV. integration of socio-economic and environmental factors;
- V. be interactive and include public and stakeholder engagement;
- VI. focus on broader environmental and social issues rather than on site-specific impacts in order to resolve issues that cannot be addressed at the project level; and
- VII. Identification and comparison of alternative scenarios.

## **1.2 Objectives of the SEA**

The objectives of the SEA were to:

- (i) Identify key linkages between rural poverty and the environment;
- (ii) Provide key environmental and social opportunities and recommendations to influence IFAD support to UTaNRMP development efforts towards environmental sustainability and climate smart development;
- (iii) Ensure the full consideration of alternative programme/project options including the do nothing option, at an early stage when there is still greater flexibility;
- (iv) Identify environmental impacts and opportunities of mitigation measures into programme designs during the formulation stage of

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<sup>1</sup>NEMA, 2011 - National Guidelines for SEA in Kenya

<sup>2</sup>Jean Roger Mercier, 2004.

- programmes, and in the process enhance environmental management plans;
- (v) Ensure the cumulative, indirect or secondary impacts of diverse multiple activities are considered, including their unintended consequences;
  - (vi) Obviate the needless reassessment of issues and impacts at project level where such issues could have been more effectively dealt with at a strategic level, and offer time and cost savings;
  - (vii) Ensure environmental principles such as sustainability, polluter pays and the precautionary principle are integrated into the development, appraisal, and selection of programme options; and
  - (viii) Provide an early opportunity to check whether or not a proposal complies with national and international environmental policy and consequent legislative obligations;

The expected results are:

- (i) An assessment of the environmental (and socio-economic) issues particularly in the agricultural sector;
- (ii) The identification of links with the other sector policies, strategies and plans;
- (iii) The provision of recommendations including opportunities for environmental and climate change integration in the UTaNRMP; and
- (iv) Recommendations to improve the effectiveness of future SEA exercises under IFAD.

### **1.3 Methodology for the Study**

The SEA was guided by the National Guidelines for SEA in Kenya (Feb, 2011) and the Environmental Assessment Procedures from IFAD. The SEA process also used an integrated approach and considered international prescriptions, national laws and best practises. It further took cognizance of the realities of the institutional setup in the country.

In undertaking the SEA, the main focus was on identifying potential environmental, social and economic impacts of the proposed programme, the significance of these impacts, and coming up with possible mitigation and enhancement measures for adverse and positive impacts respectively. Cumulative impacts were also considered.

### 1.3.1 Screening

Screening was undertaken to determine whether the proposed UTaNRMP required an Environmental and Social Impact Assessment (ESIA), or a SEA. After consultations with the National Environment Management Authority, both in the provincial and national levels, it was determined that a SEA would be required due to the various sub-activities, and geographical coverage of the project. Indeed, for NEMA, the UTaNRMP was to be considered a Programme.

An Environmental and Social Impact Assessment (ESIA) was however also undertaken for IFAD purposes. This preceded the SEA and thus informed the process.

### 1.3.2 Scoping

Scoping is one of the initial stages of undertaking a SEA and principally determines the focus, extent, content, approach, and criteria of the SEA.

Key issues determined by the scoping exercise include:-

- Objectives of the SEA study
- Decision criteria as well as suitable indicators of desired outcomes;
- Alternatives to be considered;
- Spatial and temporal dimensions of the study;
- Criteria for the assessment;
- Significant issues to be studied
- Relevant stakeholders to be consulted;
- Methods of data analysis in the SEA study
- Sources of relevant data as well as amount of information available;
- Justification of the scoping methodology
- Impacts excluded and justification thereof; and
- Expertise undertaking the SEA.

The Scoping report was submitted to NEMA on 20th January 2012 and approved on 5<sup>th</sup> March 2012.

### 1.3.3 The SEA Study

**Discussions with the Client:** The SEA team maintained close consultative discussions with the client, IFAD, as well as the Mount Kenya East Pilot Project for Natural Resource Management (MKEPP) Project Management Unit, (PMU) during the SEA exercise. For instance, identification of venues for institutional as well as community

consultations was done in consultation with MKEPP who have a vast previous experience of the project area. Such identification of venues also aimed to mobilise a wide cross section of stakeholders as possible, as well as take cognisance of different socio-economic differences among the target groups. Gender representation was deliberately ensured, while efforts were also made to ensure that community members attending the consultation meetings were truly representative of the community, while avoiding possible incidences of ‘elite capture’.

**Identification of Data Sources:** Sources of Data, both primary and secondary were identified at the scoping stage of the study. The data identification process primarily established information requirements and where such information would be sourced from.

**Table 1.1: Data Sources**

<b>Objectives/Task</b>	<b>Information Required</b>	<b>Information sources</b>
1. Identification of linkages between rural poverty and the environment	<ul style="list-style-type: none"> <li>Poverty impacts on environment</li> <li>Environmental impacts on poverty</li> <li>Issues on the cycle of poverty</li> </ul>	<ul style="list-style-type: none"> <li>Literature review</li> <li>Discussions with communities and stakeholders</li> </ul>
2. Identification of environmental and social opportunities and recommendations	<ul style="list-style-type: none"> <li>Environmental and social challenges and opportunities</li> <li>Mitigation and enhancement measures</li> <li>Best practices in environmental, climate smart and social issues</li> </ul>	<ul style="list-style-type: none"> <li>Literature review</li> <li>Discussions with communities and stakeholders</li> <li>Expert judgment</li> </ul>
3. Identification of project alternatives	<ul style="list-style-type: none"> <li>Best practices</li> <li>Potential Impacts and their mitigation</li> </ul>	<ul style="list-style-type: none"> <li>Literature review</li> <li>Discussions with communities and stakeholders</li> </ul>
4. Identification of environmental impacts and opportunities including cumulative, indirect or secondary impacts	<ul style="list-style-type: none"> <li>Baseline information</li> <li>Proposed activities under project</li> <li>Potential impacts from project</li> <li>Cumulative impacts</li> <li>Unintended impacts</li> <li>Mitigation measures for impacts</li> </ul>	<ul style="list-style-type: none"> <li>Literature review</li> <li>Discussions with communities and stakeholders</li> </ul>
5. Opportunities of mitigation and enhancement of EMP	<ul style="list-style-type: none"> <li>Analysis on issues and impacts</li> </ul>	<ul style="list-style-type: none"> <li>Expert judgment</li> <li>Discussions</li> </ul>
6. Incorporation of environmental principles	<ul style="list-style-type: none"> <li>Principles of sustainability, polluter pays and the precautionary principle among others;</li> <li>Climate smart options</li> <li>International best practices</li> </ul>	<ul style="list-style-type: none"> <li>Literature review</li> </ul>
7. Compliance with national and international environmental policy and legislation	<ul style="list-style-type: none"> <li>National policies;</li> <li>National legislation and regulations</li> <li>Multilateral environmental agreements</li> </ul>	<ul style="list-style-type: none"> <li>Literature review</li> <li>Consultations with government and other institutions</li> </ul>
8. Assessment of environmental and social issues	<ul style="list-style-type: none"> <li>Analysis on issues and impacts</li> </ul>	<ul style="list-style-type: none"> <li>Data analysis</li> </ul>
9. Linkage with other policies and sectors	<ul style="list-style-type: none"> <li>Programme linkages with government and other institutions</li> </ul>	<ul style="list-style-type: none"> <li>Consultations with government and other institutions</li> <li>Project documents</li> </ul>
10. Integration of climate smart issues	<ul style="list-style-type: none"> <li>Best practices</li> <li>Climate change challenges</li> </ul>	<ul style="list-style-type: none"> <li>Consultations with government and other institutions</li> <li>Literature review</li> </ul>

**Identification of stakeholders:** Effective and sustained public engagement is vital for the SEA process. The main stakeholders and the information to be sourced from them were also identified in the scoping stage of the study. These were then involved in the stakeholder workshops undertaken as part of institutional and community consultations. In this regard, one Institutional and four community consultative workshops were held between 1<sup>st</sup> and 7<sup>th</sup> March 2012 in Nanyuki, Embu, Nkubu (2 meetings), and Nyeri. The list of institutional participants is attached as Appendix 2

Community Stakeholders workshops included Community Forests Associations (CFAs), Water Resources Users Associations (WRUAs), Fishery Groups, Irrigation Schemes, Goat Breeders Associations, Tea and Coffee factories, Women Groups, Groups representing the Physically challenged, and Youth groups. The list of community workshop participants is attached as Appendix 3.

**Literature review:** Literature was one of the key data sources identified. Key documents reviewed included:

- National Guidelines for Strategic Environmental Assessment in Kenya (Feb. 2011)
- Environmental and Social Impact Assessment Report for UTaNRMP
- Project Design Report and Annexes (2011)
- Working Paper on Sustainable Natural Resource Management (2011)
- IFAD Environment and Social Assessment Procedures (2009)
- IFAD Climate Change Strategy (2010)
- IFAD Environment and Natural Resource Management Policy (2011)
- IMI climate change checklist
- Millennium Development Goals (2005)
- Kenya Country Programme Evaluation (2011)
- Kenya Laws, Regulations and Policies:
- UNDP Climate Change Country Profile
- An Assessment of the Response to the 2008-2009 Drought in Kenya
- Stockholm Environmental Institute, Project Report, 2009: Economics of climate change in Kenya;
- Maitima J. M. et al, (2009): Adapting East African ecosystems and productive systems to climate change An ecosystems approach towards costing of climate change adaptations in East Africa Report for the Economics of Climate Change Adaptations in Africa.

**Collection of baseline data:**the SEA exercise collected comprehensive baseline data and undertook a situational analysis of the project area. The data looked at the whole ecological structure and functions with a view of making it sustainable. Social issues, especially those affecting livelihoods were also covered in the baseline data collection.

**Analysis of Alternatives:**the SEA study identified project alternatives as part of the planning stage. Alternatives included strategies, types of interventions, technologies, alignments, and project activities. The choices of alternatives were also informed by the lesson learnt from the pilot phase of the project (Mt. Kenya East Pilot Project (MKEPP) for Natural Resources Management). The 'no-project' option was also considered.

**Identification of Impacts and their Mitigation/Enhancement:**the SEA focused on significant impacts, both positive and negative, with a view of mitigating the adverse and enhancing the good. The significant impacts determined optimum choices and those that were not acceptable.

**Criteria for the Assessment and Methods of Data Analysis:** the main criteria used for the assessment was the significance of potentially negative impacts and coming up with mitigative measures for adverse impacts and enhancement strategies for opportunities. The thrust was to come up with win-win situations. The assessment mainly used expert judgement, stakeholder inputs and NEMA's requirements in undertaking the assessment.

**Recommendations:** The SEA process has come up with recommendations to the UTaNRMP for incorporation in the Management Plan. This includes a framework for use of the plans made.

**Developing an Environmental and Social Management Framework (ESMF) and Monitoring Plan (MP):**An Environmental and Social Impact Assessment (ESIA) was undertaken before the commencement of the SEA. The ESIA study informed the SEA process and the Environmental and Social Management Plan (ESMP) in the ESIA expanded in the latter process to formulate an Environmental and Social Management Framework (ESMF) for the various interventions. The ESMP and ESMF both contain Environmental and Social Screening and Assessment Procedures, and a Monitoring Plan (MP). Mitigation Plans are included in the ESMF for the various interventions. The ESMP and ESMF for the ESIA and SEA respectively are designed to ensure that the any potential adverse environmental or social impacts are identified and that appropriate prevention and/or mitigation measures will be properly undertaken during implementation of the UTaNRMP.Both are in line with each other, with the ESMF being an expansion of the ESMP. Recommendations have also been incorporated in the ESMF.

## **2. PROPOSED PROJECT/PROGRAMME**

### **2.1 Background**

Since 2004, the Government of Kenya (GoK) and IFAD have financed the Mount Kenya East Pilot Project (MKEPP), which has linked sustainable use of natural resources, especially water and forests, with enhancement of rural livelihoods. The project focused on environmental conservation in five selected river basins and strengthened governance at the local level for better management of natural resources. Associated with the MKEPP-IFAD loan, was a GEF grant that also aimed at enhancing environmental conservation and strengthening the local governance capacity around the Mt. Kenya Forest Reserve and National Park.

MKEPP implemented activities targeting about 580,000 people in the five river basins, while the GEF-funded activities, implemented within the Mt. Kenya forest ecosystem that comprises the National Park and surrounding Forest Reserve, targeted about 800,000 people living within 10 km of the forest reserve boundary.

Two other IFAD grant-funded activities have been implemented in parallel with MKEPP: the Pro-Poor Rewards for Environmental Services in Africa (PRESA), and Green Water Credits (GWC). PRESA has been exploring opportunities to develop systems of payments or rewards for provision of ecosystem services (PES/RES), whilst GWC has focused on identifying soil and water management interventions suitable for adoption by smallholders in the Upper Tana catchment, and the technical, institutional and financial support required for implementation.

MKEPP has targeted farmlands along the five river basins on the eastern side of the Mt. Kenya ecosystem and thus has left out large areas between the rivers and their tributaries, resulting in reduced synergy between the activities of the loan and the GEF grant. The mid-term review of MKEPP conducted in 2009 concluded that project performance was satisfactory and recommended that the GoK seek additional funding to reach more of the critical water catchments in the Mt. Kenya region and to expand project coverage to other parts of the Upper Tana catchment. This forms the basis for the request by the GoK for the up-scaling of MKEPP.

The experiences of MKEPP and the knowledge generated under the GWC initiative have been particularly valuable in informing the design of UTaNRMP. The new project will also build on the implementation capacity already developed under the pilot MKEPP, and also address the major design and implementation gaps identified in MKEPP/MKEPP-GEF, including:

- (i) Inadequate coverage of the Tana basin on the western and southern sides of Mt. Kenya, and the Aberdares;

- (ii) Concentration of the GEF grant activities in the protected area, leaving out the farmland area;
- (iii) Concentration of the GEF grant on environmental conservation at the expense of rural livelihoods; and
- (iv) Under-costing of some of the activities, e.g. construction of wildlife barriers.

## **2.2 Rationale of Project**

The Tana is the most important river basin in Kenya, its flow constituting 27% of the total discharge of the country's rivers. The Upper Tana catchment includes 25% of Kenya's gazetted forests and has experienced considerable land degradation and a drastic reduction of surface water availability during the dry season, and poor water quality during the wet season due to high silt loads. These same factors contribute to the persistently high levels of rural poverty; and also has serious consequences for power supply (the Tana River contributes 70% of the power supply in Kenya), the supply of water to Nairobi, and the availability of water for irrigation, livestock raising, fisheries and domestic purposes. The Upper Tana area is also densely populated, with large concentrations of poor and very poor people, particularly in the mid-altitude zone. Landholdings are small and diminishing as population grows, crop yields are low and declining due to fertility depletion and erosion, and rural households are poorly linked to markets and services.

The rationale for UTaNRMP is based on the nexus between rural poverty and ecosystem health in a densely populated and environmentally fragile watershed of critical national and global significance. The high prevalence of rural poverty contributes to environmental degradation which in turn reduces sustainable livelihood opportunities; as well as creating negative environmental externalities including forest degradation, human-wildlife conflict, and reduced availability and quality of water to downstream users.

Fortunately however, there are a number of opportunities for improving rural livelihoods in ways that are also beneficial for the natural environment. Essentially the project will work with the custodians of natural resources in the Upper Tana providing them with a number of direct and indirect incentives to do things that are good for the environment, good for them, and from which other parties will also derive benefit.

## **2.3 Objectives of the UTaNRMP**

The goal of the project is to **“contribute to reduction of rural poverty in the Upper Tana river catchment”**. This goal will be pursued via two development objectives which reflect the poverty-environment nexus:

- 1) increased sustainable food production and incomes for poor rural households living in the project area; and
- 2) Sustainable management of natural resources for provision of environmental services.

The thrust of the project is to empower the people to undertake community natural resources management.

## **2.4 Alternative Options and Strategies**

UTaNRMP builds on, and scales up the proven interventions of the pilot project MKEPP, which recorded largely positive social and environmental impacts. In designing the UTaNRMP, however, a number of social and environmental factors were taken into consideration, in order to ensure that the technologies, strategies, and types of interventions selected are those with the highest environmental and social benefits. Among these factors are the following:

- **Targeting:** The project developers realized that the whole Upper Tana catchment is a fairly large area and that the interventions proposed could thus be spread too thin. For that reason it targeted critical river basins and forest areas as the priorities for intervention. Furthermore, the project will use an ecosystem approach rather than an administrative one and will target 5 km stretches on each side of critical rivers. It will also target known environmental hot spots in the whole Upper Tana.
- **Sustainability:** For sustainability and ownership, the project chose to work with local communities to implement project interventions. As noted above, it has gone even further in working with community groups, namely CFAs, WRUAs, and FDACs. The project will work with recognized environmental management tools developed by the communities themselves, such as Sub-catchment Management Plans developed by WRUAs and Forest Management Plans developed by CFAs.
- **Use of indigenous knowledge:** The project proposes to use local indigenous knowledge as much as possible. This is one reason why the project will use plans developed locally by the communities themselves; they have identified their own solutions to the challenges they face. The project will also use local knowledge with regard to tree planting (e.g. species), termite control (e.g. using ash and local insecticides) and cultivation of indigenous food crops.

## 2.5 Areas and Sectors Affected by UTaNRMP

The project area will be the Upper Tana catchment which covers an area of 17,420 km<sup>2</sup> and includes 24 river basins (five of which are included in MKEPP) that drain into the Tana River. The area covers the six counties of Murang'a, Nyeri, Kirinyaga, Embu, Tharaka-Nithi and Meru and is home to 4.5 million people.

The area also forms a catchment that provides water for about half the population, and most of the country's hydroelectric power. The area includes the Mount Kenya and Aberdares National parks and surrounding forest reserves. The area is under heavy and growing population pressure with an average of about 250 inhabitants per km<sup>2</sup>.

The UTaNRMP will undertake a phased approach in its interventions in the 24 river basins included in the project area, targeting 12 priority river basins in the initial phase based on a ranking of the river basins according to established environmental and social criteria. The five criteria used by the design team for this ranking are as follows:

- rivers that are over-utilized with high levels of water use inefficiencies
- rivers with significant pockets of environmental degradation
- rivers with the greatest risk of natural resources degradation
- rivers cutting across several agro-ecological zones and
- Rivers having a large section of needy population.

Using these criteria the project design team identified the 12 priority river basins to be targeted first, within which the project will select Focal Development Areas (FDAs), again based on degradation of natural resources, poverty levels and other social indicators.

MKEPP River Basins (5)	Ena, Kapingazi/Rupingazi, Kathita, Kithinu/Mutonga, Tungu
High Priority River Basins for UTaNRMP (12)	Maragua, Murubara, Nairobi, Ragati, Rujiweru, Rupingazi, Saba Saba, Thanagatha, Thanantu, Thiba, Thika/Sasumua, Thingithu
Other River Basins	Amboni, Iraru, Kayahwe, Lower Chania, Mara, Mariara, Mathioya, Muringato, Nyamindi, Ruguti, Rwamuthambi, Sagana, Ura

The project targets around 200,000 poor rural households whose livelihoods revolve around the use of the natural resources of the river basin. These include smallholder crop and livestock farmers, agro-pastoralists and pastoralists, fishers, rural traders, and community groups involved in Natural Resource Management (NRM) and income generating activities. The project will also have a special focus on community natural

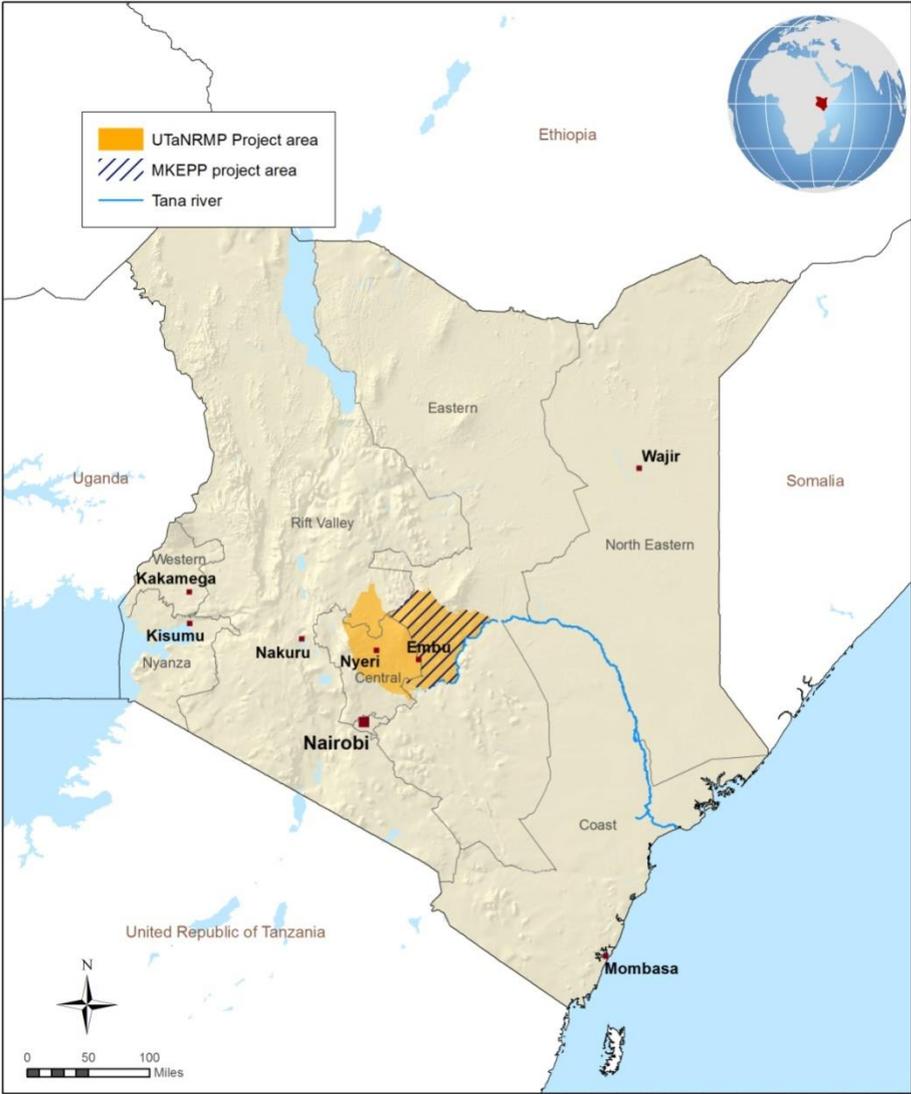
resources management, including common community areas like roads, riverbanks, schools, wetlands, hilltops and forests.

Special focus will be on women and youth as well as other vulnerable groups within the above categories. The project will also provide indirect benefits to the non-target groups in the Upper Tana catchment through services and enterprises linked with the project activities, as well as to populations outside the catchment who rely on water and hydro-electricity from the river system.

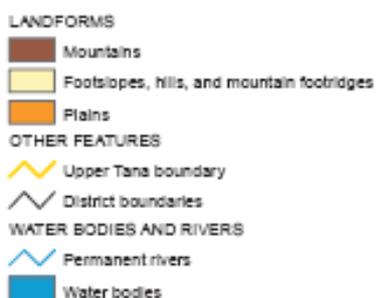
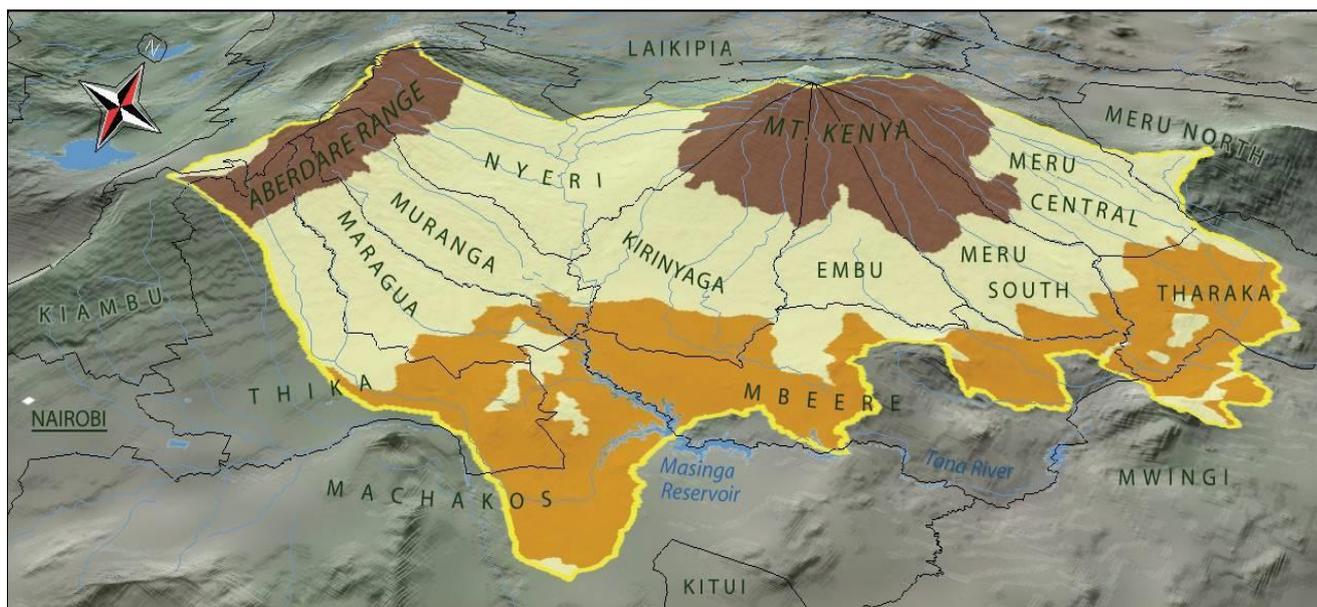
**Kenya**

Upper Tana Catchment Natural Resources Management Project - UTaNRMP

Design report



 The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.  
IFAD Map compiled by IFAD



## 2.6 Proposed Components under UTaNRMP

The project will be structured along the same lines as MKEPP and will primarily focus on community natural resources management. The project will have four components, each of which will generate its own outcome:

Component	Outcome
e) Community Empowerment	<ul style="list-style-type: none"> <li>• Rural communities empowered for sustainable management of natural resources</li> </ul>
f) Sustainable Rural Livelihoods	<ul style="list-style-type: none"> <li>• Natural resource-based rural livelihoods sustainably improved</li> </ul>
g) Sustainable Water and Natural Resource Management	<ul style="list-style-type: none"> <li>• Land, water and forest resources sustainably managed for the benefit of the local people and the wider community</li> </ul>
h) Project Management and Coordination	<ul style="list-style-type: none"> <li>• Project effectively and efficiently managed</li> </ul>

### 2.6.1 Community Empowerment (USD 6.0 million)

This component is designed to empower communities to sustainably manage natural resources, and to make possible and sustainable, the concept of Community Natural Resources Management (CNRM). It aims at engaging communities to build their capacity to develop plans aimed at improving NRM while also improving their livelihoods. Community engagement will be adopted as the entry point for up-scaling MKEPP and will take place at several levels:

(1) **Water Resource Users Associations (WRUAs):** At the river basin level the WRUAs will be established and/or assisted to develop their Sub-Catchment Management Plans (SCMPs) through a participatory process involving all communities dependent on the natural resources of the catchment.

(2) **Focal Development Areas (FDAs):** FDAs are groups of about 800-1,200 households living on a strip about 5km on either side of a river. MKEPP has been working with FDAs to undergo participatory planning and develop Community Action Plans (CAPs) to implement priority income-generating and NRM activities through small Common Interest Groups (CIGs) of 20-30 members.

(3) **Community Forest Associations (CFAs):** Communities living along the margins of the forest reserves will be engaged through CFAs. The CFAs will be empowered through the development of participatory forest management plans, which will include initiatives for forest protection, rehabilitation of degraded areas, reduction of human-wildlife conflict and alternative income generating activities.

Activities in this sub-component will include:-

- 1) Sensitisation and awareness raising to stimulate interest and awareness about the importance of sustainable rural livelihoods and NRM which will involve:-
  - training and sensitisation of staff at county and sub-county level;
  - public meetings (*barazas*) to raise interest and awareness;
  - mass media campaigns using printed material and community radio broadcasts;
  - school programmes (e.g. the school greening programme); and
  - Competitions and awards for good environmental stewardship.
- 2) Establishment and strengthening of key community structures e.g. County Environment Committees (CECs); WRUAs; FDA Committees (FDACs); and CFAs by developing the skills to undertake participatory planning and project implementation procedures.

- 3) Development of CAPs at FDA and CFA levels using participatory rural appraisal (PRA) tools used under MKEPP for Livelihood Improvement and Sustainable NRM. CAPs reflect community felt needs and priorities and will form the basis for preparation of the Annual Work Plans and Budgets (AWPB) for implementation of the identified priorities.

### **2.6.2 Sustainable Rural Livelihoods (USD 26 million)**

This component is designed to improve the incomes and living standards of the target group using interventions that are beneficial to the management of the natural resource base. This will be undertaken through:-

- 1) Adaptive research and demonstrations to address some of the technical and knowledge constraints to improved livelihoods in the Upper Tana catchment and to further broaden the range of interventions available to resolving key agricultural productivity issues. It will consist of:-
  - On-farm trials and demonstrations at selected sites in each of the main agro-ecological zones;
  - Soil fertility enhancement to help farmers address the nutritional constraints to crop yields and investigate soil fertility enhancement options;
  - Seed multiplication and distribution for improved crop varieties, particularly legumes and forages which will help to improve soil fertility and prevent erosion.

This sub-component will be closely undertaken with the Kenya Agricultural Research Institute (KARI) on improved crop varieties and soil management techniques.

- 2) Adoption of Income-Generating Activities (IGAs) which will have been identified through the CAPs. IGAs will be implemented by small CIGs of 20-30 members. Only enterprises assessed as having neutral or beneficial environmental impacts will be supported. The overriding principle is that the IGAs should be both beneficial to the individuals and the wider community, especially downstream water users. Adoption of IGAs will be encouraged by providing matching grants to CIGs based on the experiences with such grants under MKEPP and utilising the procedures developed by NRMP.

### **2.6.3 Sustainable Water and Natural Resource Management (USD 29 million)**

This component is designed to improve the sustainable utilisation of water and other natural resources, using methods successfully piloted by MKEPP and NRMP, including

Soil and Water Conservation (SWC) and agro-forestry practices beneficial to both farmers and downstream stakeholders. Priority will be given to activities that reward those who implement them and create benefits for the natural environment and the wider community, particularly downstream water users. This will involve:-

1) Sustainable management of water resources through:-

- Support for implementation of sub-catchment management plans by WRUAs and making them eligible for funding by Water Services Trust Fund (WSTF)
- Community water development and management which will focus on improving access to the water resources for domestic uses through interventions identified as priorities in the SCMPs and CAPs e.g. rainwater harvesting and storage, rehabilitation of boreholes and wells, hand pumps, and rehabilitation of springs. It will also include sensitisation and awareness raising on the importance of safe domestic water and sanitation. Specific interventions may include.
- Water-saving irrigation technologies by improving irrigation efficiency by use of controlled intake structures, pipes and lined canals to reduce losses in water conveyance systems, and use of water efficient irrigation technologies, such as drippers and micro-sprinklers;
- Remedial works at environmental hotspots like point sources of pollution e.g. road embankments, borrow pits, quarries, denuded hilltops, coffee processing plants, eroding riverbanks, wetlands, springs and urban waste disposal facilities.

2) Sustainable management of forest and agricultural ecosystems by providing support to community groups to improve their management of agricultural and forest lands. This will include:-

- Rehabilitation of degraded forest reserves through capacity building of community groups in participatory forest management, seedlings production, enrichment planting of degraded forests, and the school greening programme;
- Efficient use of fuel wood by offsetting pressure on forests by supporting use of energy saving cook stoves and charcoal kilns through matching grants, together with training in the manufacture and use of such equipment;
- Reducing human-wildlife conflict by electric wildlife-proof fencing (70 KMs) to exclude wildlife from the agricultural lands. This has the added advantage of also excluding livestock from the forests
- Soil and water conservation on farm lands through on-farm demonstrations, field days, farmer-to-farmer extension and the provision of matching grants.

### **2.6.3 Project Management and Coordination (USD 29 million)**

UTaNRMP will be coordinated and implemented through existing institutions according to their mandated responsibilities under the new constitution. The lead agency will be the ministry responsible for water resources management (currently MWI).

Project Management will involve day-to-day management and Knowledge Management and Learning which will encompass information management, M&E, innovation, learning and adaptation, and communication at various levels. The project M&E system will be based on the existing MKEPP system, with modifications to improve impact-level monitoring and to capture data from a substantially up-scaled project.

## **2.7 Implementation Plan and Timelines**

The project will be implemented over eight years spanning the 2012-13 to 2019-20 fiscal years. To the extent possible, implementation arrangements will follow those successfully employed by MKEPP, taking into consideration the significant up-scaling from the pilot project, and the institutional and administrative structures which will evolve under the new constitution.

Screening procedures, mitigation and enhancement measures, the ESMF, monitoring plan and recommendations from both the SEA and ESIA will be mainstreamed into the project implementation via the Project Implementation Manual (PIM).

There will be a gradual up-scaling of activities from the five river basins and WRUAs supported under MKEPP to the 24 under UTaNRMP. During the first four years support would be confined to the existing five MKEPP WRUAs plus the 12 high priority river basins already identified. A decision will be taken during the mid-term review on whether to expand to the full 24 river basins. The number of FDA's participating is estimated to be ten per WRUA, and engagement of CFAs will be phased up from 15 in year 1 to all 33 from year 3 onwards. Grants to WRUAs will also be increased gradually according to the capacity to process applications and supervise implementation of grant-funded activities. Matching grants to CIGs for income-generating and soil and water conservation activities will begin in year 2 and be scaled up thereafter.

<b>No of WRUAs participating</b>	<b>Project Years</b>							
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
MKEPP WRUAs	5	5	5	5	5	5	5	5
New WRUAs	12	12	12	12	19	19	19	19
Total WRUAs	17	17	17	17	24	24	24	24
<b>No of community groups participating</b>								
Focal Development Areas	170	170	170	170	240	240	240	240
Community Forest Associations	15	25	33	33	33	33	33	33
<b>Number of grants provided to:</b>								
WRUAs	11	17	17	17	21	24	24	-
CIGs for Income Generating Activities	-	370	390	410	410	550	550	550
CIGs for Soil and Water Conservation	-	170	170	170	240	240	240	220

The project will use communities as the entry point through engaging local institutions such as the WRUAs, CFAs, and FDACs in participatory planning procedures to develop and implement plans for sustainable NRM.

The basic approaches to be adopted for the implementation of UTaNRMP are:

- Community driven development
- An ecosystem approach for NRM interventions which may cross administrative boundaries.
- An inclusive gender equity and mainstreaming approach that will ensure equitable participation by women, youth and vulnerable groups
- Public-private partnerships that encourage the use of private sector service providers wherever they have a comparative advantage over public sector agencies

The project will incorporate a number of inclusive targeting mechanisms to ensure that the targeted households participate in the planned activities, without necessarily excluding those who are better off. Mechanisms include: (i) geographic targeting measures (including both social and bio-physical criteria); (ii) enabling measures; (iii) empowering and capacity building measures; (iv) self-targeting measures; and (v) direct targeting of specific groups.

### 3. DESCRIPTION OF BASELINE ENVIRONMENT OF THE UPPER TANA AREA

#### 3.1 Population and Settlement

The Upper Tana Natural Resource Management Project (UTaNRMP) covers 6 counties namely Murang'a, Nyeri, Kirinyaga, Embu Tharaka, and Meru. The total population in the six counties according to the 2009 Kenya Population Census results was 4,411,036 people (KNBS, 2010). The project area has an average 250 people per square kilometre. This however ranges from 196 people per square kilometre in Meru County to 368 people per square kilometre in Murang'a County. The national average population density is estimated at 66 people per square kilometre. This is shown in the table below.

**Table 3.1: Population in the Project Area**

County	Male Pop	Female Pop	Total Pop	Density sq km
Murang'a	457,864	484,717	942,581	368
Kirinyaga	260,630	276,424	537,054	357
Nyeri	339,725	353,833	693,558	208
Embu	254,303	261,909	516,212	183
Tharaka	178,451	186,879	365,330	138
Meru	670,656	685,645	1,356,301	196
<b>Total</b>	<b>2,161,629</b>	<b>2,249,407</b>	<b>4,411,036</b>	<b>National Average 66</b>

*Source: Developed from 2009 Kenya Population Census Report*

The above figures on population densities are averages. Within the counties there are areas that may feature denser populations. In Imenti North, Meru County for example, the population density is highest in Mirigamieru West, at 1,932 people per km<sup>2</sup>. This trend is common in most other counties as shown in the table below. Similarly, pockets of low population densities are also visible even in the high density regions of the Counties. This is for example seen in Timau, Imenti North, Mutuati in Igembe and Kieni in Nyeri County. The forest areas have the least population density of 2 people per km<sup>2</sup> in Mt Kenya and 0.06 people per km<sup>2</sup> in Aberdare Forest. Overall, the lower parts of Tharaka Nithi County and Mbeere in Embu County have the least population densities. Population densities range from 1,932 in Imenti North, Meru County to 35 in parts of Tharaka Nithi County.

**Table 3.2 Highlights on population Density across the counties**

<b>County</b>	<b>Ranking</b>	<b>Density (persons/km<sup>2</sup>)</b>
<b>Embu</b>	Highest (Central)	866
	Lowest	130
	County	183
<b>Kirinyaga</b>	Highest	720
	Lowest	265
	County	357
<b>Nyeri</b>	Highest-(Tetu East)	650
	Lowest (Kieni West)	116
	County	208
<b>Murang'a</b>	Highest: (Kandara)	737
	Lowest: (Makuyu)	319
	County	368
<b>Tharaka Nithi</b>	Highest (Muthambi)	435
	Lowest (Tharaka North)	35
	County	138
<b>Meru</b>	Highest (Mirigamieru West)	1,932
	Lowest (Timau)	98
	District	280

**Source:** District Development Plans 2008-2012

Settlement patterns in the catchment are determined by climatic conditions, infrastructure, food availability and proximity to urban centres. Consultations with stakeholders' revealed that most people have settled in the upper zones where agricultural potential is high. But it also corresponds to natural resource endowment. This pattern is mainly due to ecological factors which influence settlement in the upper zones near mountains where the land is fertile and receives sufficient rainfall. The type of farming also influences settlement patterns with the upper zone attracting a higher percentage of population, where they grow cash crops. This is because traditionally, residents have higher preference for cash crops compared to food crops. Other areas where the concentration of people was high includes areas along the major roads.

Comparatively, population density is low in the semi-arid areas such as Kiritiri and Makima divisions of Embu County and Tharaka North in Tharaka Nithi County where the density is as low as 35 people per km<sup>2</sup>. In these areas people mainly settle along the major permanent water sources, such as rivers, furrows and dams where irrigation, farming and fishing are carried out. Water sources therefore influence settlement patterns in the arid and semi arid lands especially in Embu county and Tharaka Nithi County.

Another reason for clustered settlement is the growth of towns. Higher population densities are common in urban areas compared to the rural areas. Nevertheless, the total urban population in the catchment is estimated at 668,838 people while the rural population is estimated at 2,562,704 people. Due to socio-economic influences,

the population of town dwellers continues to increase with areas close to the towns opening up new settlements. More people tend to migrating into the urban areas in search of economic opportunities. Urban areas are also relatively well served with infrastructure and basic services.

The catchment contains large protected areas where settlements are not permitted. These include the forested areas and the national parks. Other areas with minimum settlement are the large scale farms notably Kakuzi, Delmonte and other individual large scale farms in Nyeri and Murang'a Counties. In Kirinyaga, there is Ngariama ranch, and Solio ranch in Nyeri which are also fast growing areas owing to the Government program of re-settling the landless. Similarly in Kirinyaga around the Mwea rice fields, settlement is clustered with much of the land being used for irrigation. Population across the catchment, much of which is agriculturally viable, has increased pressure on land. This has further led to subdivision of land into units that are not viable economically. Strategies to intensify farming and develop alternative sources of income to ease pressure on land are therefore required.

In terms of the ethnic representation of the population across the catchment, about three main ethnic groups dominate in each of the counties. However, it must be recognised that other ethnic groups from across the country have a significant representation across all the six counties, though intermarriages, individual business people, public and private sector workers and students. Many more people from other parts of the country and the world visit the catchment area on a daily basis for various purposes including business and leisure.

### **3.2 Poverty**

The project area is home to a cross-section of poor and less poor populations. Poverty, defined here as people who live below one US dollar a day, manifests itself in various forms including, inadequate food supplies, poor access to health, education and infrastructural services, inadequate potable water, lack of good and proper clothing, inaccessibility to proper sanitation and landlessness, underdeveloped infrastructure etc.

The main causes of poverty have a strong linkage to the environment. Change in environmental conditions has led to reduced agricultural production which supports a majority of the population in the catchment. This has in turn led to reduced incomes and as well as un-certainties in food security. Some of the areas where poverty is more pronounced are the arid and semi-arid areas of the catchment.

On the flip side, poverty equally impacted on the environment. A large section of the population lives from hand to mouth, and below a dollar a day. As such, investments in terms of time and resources towards environmental conservation is secondary, unless when supported. This has led to an unceasing cycle of poverty that immensely

results into serious environmental degradation. Analysis from various reports on the counties shows that poverty across the counties ranges from about 24.7 to about 40 percent. As mentioned earlier, poverty is more pronounced in the arid and semi arid lands. This is shown in table 3.3 below.

**Table 3.3: Poverty Rates<sup>1</sup>**

<b>County Name</b>	<b>Poverty Rate</b>
Murang'a	29.9
Nyeri	32.7
Kirinyaga	25.2
Embu	42.0
Tharaka	48.7
Meru	28.3

*Source: Adapted from Commission of Revenue Allocation 2012.*

Other key factors that have contributed to the above poverty levels include poor physical infrastructure that increases the cost of transportation and marketing of agricultural produce, reduced cash and food crop production, poor farming methods, and low returns from main cash crops and products such as coffee, tea and milk among others. Reduced government subsidies to the agricultural sector since the structural adjustment programmes of the 1980s, rise in international crude oil prices and unfavourable balance of trade have, partly, progressively increased the cost of farm inputs, which has negatively affected agricultural production. Further, the absence of industries resultant markets for law products and avenues for employment creation have rendered many young people jobless. They and their families often lack the means to provide for the very basic of needs, thus fuelling the chronic poverty cycle.

The above situation has further been aggravated and compounded by increased subdivision of land into numerous un-economical units that cannot support meaningful production. Across the county, culture requires that young people inherit land from their forefathers, who had also received the land from their forefathers. This is culturally synonymous to maturity and independence from the wings of the parents. The demand for land by young people from their parents is high. This has therefore led to massive land subdivision, sometimes to units that cannot support meaningful production. Pressure resulting from settlements on such small parcels of land has been detrimental to the environment, food and livelihoods security.

Like other parts of the country, youth in the catchment have few opportunities to engage with the labour market. This has also greatly propelled the cycle of poverty.

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<sup>1</sup> Poverty rates used are borrowed from the Commission for Revenue Allocation (2012), and are based on the Kenya Integrated Household Baseline Survey, KIHBS (2007)

The few youths who are lucky to join the labour market do so either unskilled or ill equipped. They therefore only fit in low skill jobs where they are underpaid and overworked. Stakeholders consulted lamented the lack of opportunities for skills learning. Many young people drop from school mid-way while others fail to transit to higher levels of learning. Yet, opportunities for learning within the Technical, Industrial Vocational and Entrepreneurship Training (TIVET) institutions are limited and poorly understood. Youth shy away from them due to costs, while others see TIVET training as belonging to those who failed their formal examinations.

A sizeable number of young people in the catchment are involved in growing *miraa* (khat) especially in Mbeere and Meru counties. While the activity is said to generate relatively good incomes to the youth, it has also been blamed for creating a group of young people that won't do anything else other than chew khat and drink alcohol. Buyers pay cash for the plant, thus many young people involved in the trade have relative liquidity on them to consume alcohol every day. The activity has lured young people from school, others have deserted their families, and many have turned into perpetual drunkards. This poses significant challenges to the welfare of the young people and the future generation. If unchecked, it may lead to a generation loss in the khat growing areas. In addition, Miraa growing especially in Mbeere County is dependent on water. There are numerous abstractions from rivers and shallow wells whose cumulative effect will significantly affect the natural resources.

Poverty in the catchment also has a gender dimension. Women in the six counties are the majority of the agricultural producers. They till, plant, manage and harvest the farm produce. Yet, majority of them do not own the land they produce on. Further, they lack control over what the produce and harvest. Produce therefore belongs to their men spouses, who also have overall authority over the land. This scenario is more common in the highlands where farmers depend largely on sale of coffee and tea. When tea bonuses are paid for instance, some men desert their families and migrate to urban areas where they misuse the money only to retreat back to their homes when they run out of cash.

Without support from their spouses, women have limited avenues for economic empowerment. Their domestic chores restrict them around the family land which they do not control. Requirements for collateral, which they don't own, in order to access credit is a big hindrance to women entrepreneurs. Consultation with stakeholders noted that the main resource for women is in local self-help and welfare groups formed to primarily address the welfare needs of the members. Potential of these self-help groups is limited. Only a few women are able to form larger Community Based Organisation (CBOs) that have capacity to access and utilize financial support services such as the women enterprise fund. Women generally lack the time and capacity to engage within larger CBOs. These factors in one way or another immensely affect economic development and ability to reduce poverty.

Female and child headed households were reported by stakeholders that were interviewed in the course of this survey. These are mainly women who have been widowed by the death of their spouses, single mothers and women that have separated from their spouses. Cultural practices for many years did not recognize hand inheritance by women. Divorced women therefore would not access land unless through purchase. Some widows are disinherited by the inlaws, while single mothers similarly did not have a right to inherit land. This leads to many women who have no or minimal access to land rights, which then increases their vulnerability and that of their children. This may change gradually with the enactment of the new constitution which provides for equal land rights on inheritance for all children.

The counties were also reported to have many people including children living with different forms of disability the most common being physical. In general, these people suffer inadequate facilities in the community. They are therefore likely to miss out on many opportunities unless deliberate efforts are made to ensure their inclusion.

Finally, poverty is also viewed as a major cause and consequence of HIV/AIDS. Poverty generally increases vulnerability of people with HIV/AIDS. The situation is further aggravated by the fact that HIV/AIDS mostly affects people in the productive age group.

### **3.3 Social Relations**

As mentioned earlier in this report, the catchment is home to people from different ethnic groups and cultures. Even though, there are dominant groups in each of the counties. For instance Muranga and Nyeri are predominantly settled by the Kikuyu community. But there are people settled in these counties from other parts of the country while many others visit the counties every other day. The same applies to all other counties. In general the catchment is peaceful, and people live in harmony. But like other parts of the country people, communities settled in the arid and semi arid lands of the county generally feel disadvantaged compared to those in the upper zones with more rains and better agricultural potential.

Inter-ethnic conflicts in the catchment not common. Consultations with community stakeholders however noted that isolated incidences of conflicts were reported. These largely revolved around water and natural resources. The most serious of such conflicts were reported along Tharaka and Tigania Border. This at times, may lead to armed fighting. However, differences are often resolved through community dialogue with the help of the provincial administration. Stakeholders also noted that conflict over water especially between upstream and downstream users were common in all counties. The Mwea irrigation scheme is one of the hot spots for water related

conflicts. This has nevertheless been managed through water rationing. Other areas with reported incidences of water related differences include the ASAL lands of Muranga, Embu, Kirinyaga, Tharaka and Meru counties. These are likely to grow in number and frequency as water resource continues to reduce.

Land rights are a common cause of violence across the catchment. Delay in succession of ancestral land following the death of registered owners is usually a common cause of conflict among people. This is mainly at the family level but it does not affect the overall access to land by the family members. The catchment also features several incidences of human and wildlife conflict especially around the forested areas that are yet to be fenced. Similar cases are reported in Mbeere Embu county where crocodiles attack people around the water dams. Largely compensation of crops damaged, people hurt or killed by wild animals has always been a contentious issue.

Lack or shortage of job opportunities for the youth has been blamed for the increased propensity among youth to engage in criminal activities and other antisocial behaviours. Like other parts of the county, many young people in the catchment are engaged in uncontrolled alcohol consumption and drug abuse. Women have on a number of occasions been featured on the mainstream media accusing their men of neglect and excess consumption of alcohol. This situation has a direct negative impact on production. General increase in insecurity was also reported. This was largely blamed on rising population of jobless youth.

### **3.4 Other Significant Social Issues**

The project area has a moderately developed infrastructure, with sections of relatively well developed infrastructure and others where this is less developed. The highlands for instance have sections of the roads that are good and passable all year round but most are impassable especially when wet. This cuts across all the counties. The arid and semi arid areas of Mbeere in Embu county, Tharaka Nithi and Tigania in Meru County are vast and road infrastructure generally poor. These areas also experience poor accessibility to health facilities, schools and markets. Often people in these areas have to walk longer distances, sometimes several kilometres to access basic services including clean water.

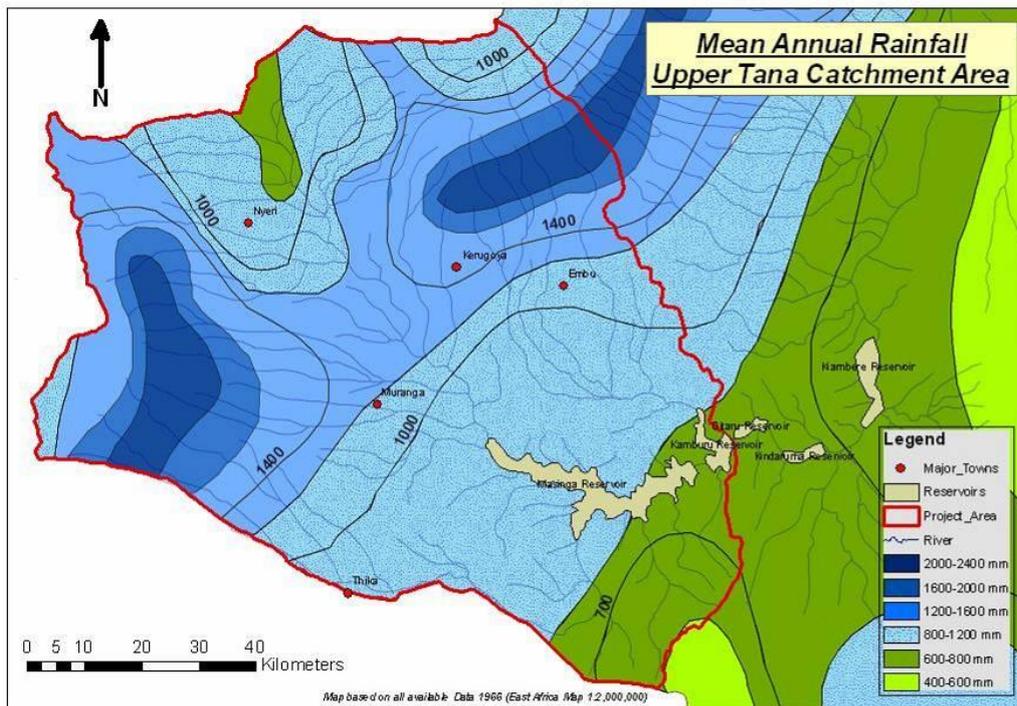
Pit latrines are dominant in the project area. Waste disposal is therefore at no or minimal cost to a majority of the rural farmers except for those that may be based in urban centres within the various towns.

### 3.5 Climate

The climatic conditions for the upper Tana Catchment vary widely, and as in the larger Kenya, respond to the Inter-Tropical Convergence Zone, but considerably influenced by the relief of Mt. Kenya and the Aberdare Ranges.

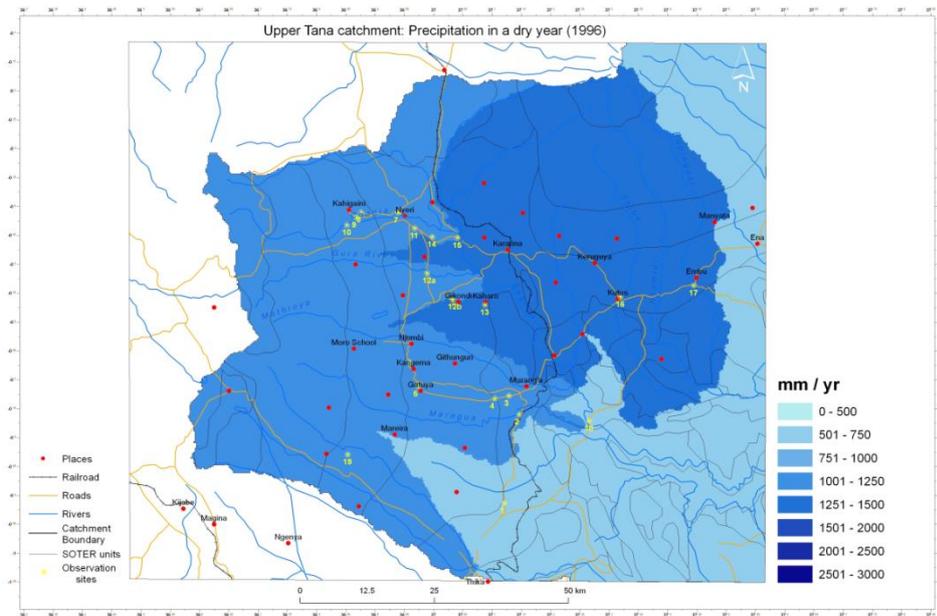
The rainfall regime is bimodal with the long rains coming between March and June and short ones between October and December. With the Upper Tana Catchment straddling between 5 agro-climatic zones, the average annual rainfall ranges from as low as 410mm in the lower area and 2700mm in Mt. Kenya and the Aberdare ranges.

Rainfall increases with altitude and the dry seasons are more marked in the southern and eastern parts of the catchment. Apart from the medium and high potential areas where the rainfall is well distributed throughout the year, annual variations in the low rainfall regime areas are relatively large and the rainfall is quite erratic. In the upper parts of the upper Tana catchment close to the Aberdare along Murang'a(North & South) and parts of Nyeri, besides the two seasons, there is short season of light drizzles occurring between July and October.



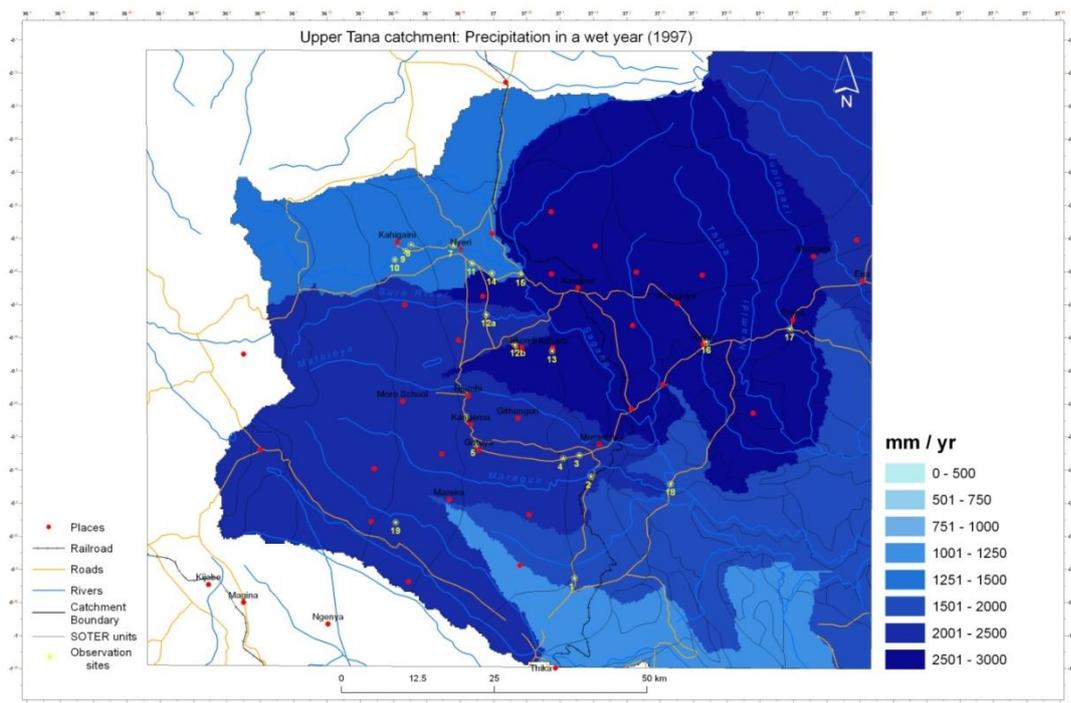
Source: ADEC, 2011

**Figure 3.1: Mean Annual Rainfall in Upper Tana Catchment**



Source: GWC, 2008

**Figure 3.2: Precipitation in a Dry Year**



Source: GWC, 2008

**Figure 3.3: Precipitation in a Wet Year**

The average annual potential evaporation within the Upper Tana Catchment ranges between 1200mm per year in the Mountain regions rising to 2300mm in the lower

reaches of the catchment. Temperatures vary with altitude with the eastern lower altitude areas having a mean annual temperature range of between 26°C and 30°C. Mt. Kenya and the Aberdare ranges have between 14°C and 18°C. In the high potential area, minimum temperature can be as low as 6°C. Temperatures are moderate in medium potential areas. In most parts of the sub catchment, July and August are the coldest months of the year while the hottest months are March and October. For the entire Tana Catchment, average annual relative humidity ranges from about 70% in the morning hours to about 45% in the afternoons.

The impact of climate change in the basin is already being felt, and this poses serious threats to the sustainability of the project. Climate change also has high economic costs especially as it manifests itself through floods and droughts. The two most important climate stressors are changes in rainfall and temperature. As rainfall and atmospheric temperatures change, land use potential and productivity will change mainly in response to changes in primary productivity.

Climate change affects biophysical systems with resultant variability in precipitation which alters water budgets and affects the amounts and quality of water available for growth and support of life. Increasing temperatures reduce the ability of ecosystems to retain water for growth. Soils also degrade as they lose water and microbial biodiversity.

Climate variability has significant economic costs mainly because it manifests itself in the extreme weather conditions of floods and droughts which cause major macro-economic costs and reductions in economic growth. For example, the 1998-2000 drought was estimated to have economic costs of \$2.8 billion from the loss of crops and livestock, forest fires, damage to fisheries, reduced hydro-power generation, reduced industrial production and reduced water supply. On the other hand, the 1997/98 floods affected almost 1 million people and were estimated to have total economic costs of \$0.8 to \$1.2 billion arising from damage to infrastructure (roads buildings and communications), public health effects (including fatalities) and loss of crops.

Aggregate models indicate additional net economic costs (on top of existing climate variability) could be equivalent to a loss of almost 3% of GDP each year by 2030 in Kenya (Stockholm Environment Institute).

All the climate models show that rainfall regimes will change but these vary with season and region. Most models project rainfall will increase on average, though some models project rainfall reductions in some months for some areas. Many models indicate an intensification of heavy rainfall in the wet seasons, particularly in some regions and thus greater flood risks. Droughts are likely to continue but the

projections are more varied - some models project an intensification of these events, particularly in some regions, though other models indicate reductions in severity.

Adaptation has potentially very large benefits in reducing present and future damages but it has a cost. In its absence, studies indicate a potentially large increase in the rural health burden of malaria in Kenya especially in the highlands where the disease is currently restricted by temperature. The Stockholm Environment Institute study applied a new malaria risk model, based on altitude, which indicates that climate change could increase the rural population at risk for malaria by between 36% to 89% by the 2050s affecting an extra 2.9 to 6.9 million people.

For agriculture, modest impacts are predicted in the medium term (with some regions even experiencing increased agricultural yields). However, under other scenarios and other models there are high economic costs projected. Moreover, a range of additional factors are also important, which are not included in these assessments, including extreme events, pests and diseases.

A water planning model for the Tana River basin indicates that the economic impact of climate change (without adaptation) for this one river basin ranges from a benefit of \$2 million to a cost of \$66 million for hydropower, irrigation and drinking water across the range of projections.

Climate change will also add stresses on ecosystems and add pressures on them with regards to delivering ecosystem services like provision of food, nutrient recycling, regulatory services including flood protection and recreational and cultural services.

Forest fires would increase in places where summers become warmer and drier. Prolonged periods of summer drought would transform areas already sensitive to fire into regions of sustained fire hazard. Mt. Kenya

### **3.6 Agro-ecological Zones**

There are six main agro-ecological zones which across the Upper Tana Catchment. These include:

LH1 Lower Highland Zone: Tea – Dairy zone with permanent cropping possibilities, with good yield potential for peas, cabbage, lettuce, carrots, leek, kales. The zone is also good for passion fruits, maize, pyrethrum and plums. Spraying against diseases is important. Too much wet conditions can cause crops to rot.

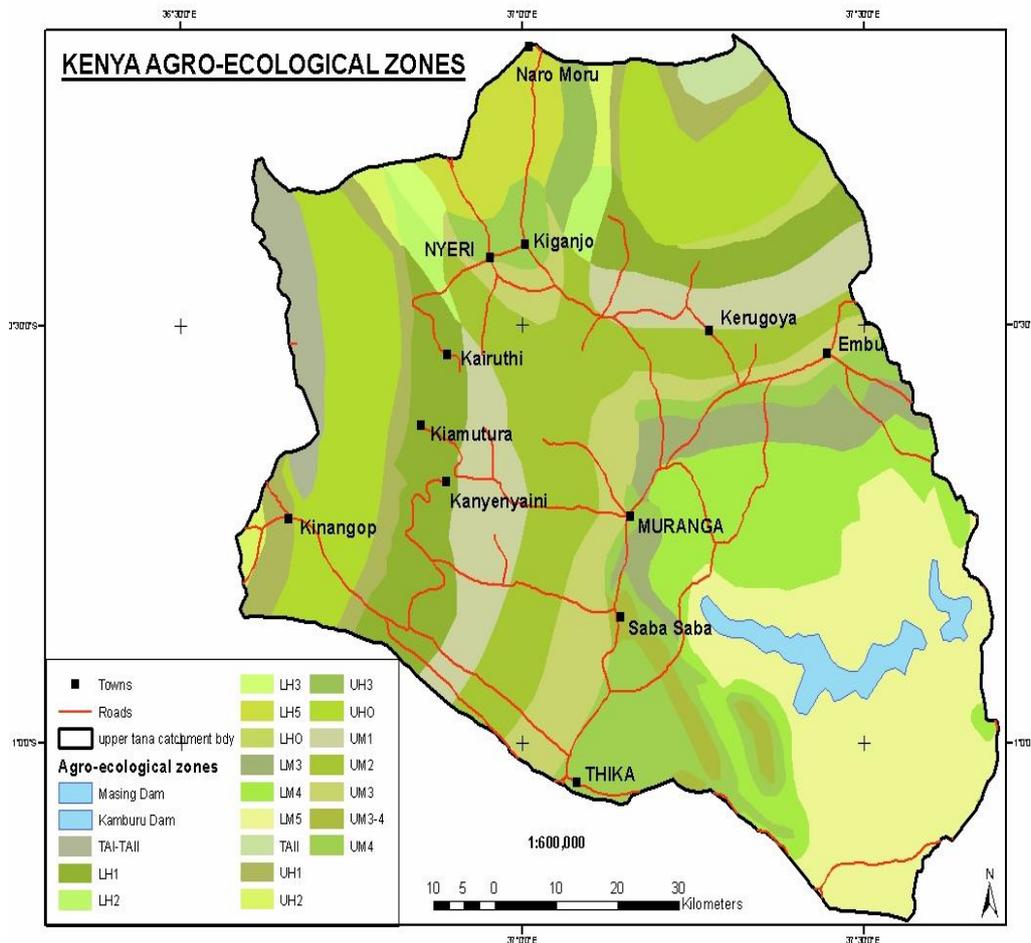
UM1 Upper Midland Zone: The UM1 is a Coffee – Tea zone with permanent cropping possibilities; very good yield potential for lima beans, cabbages and kales;

also supports the growing of bananas, mountain paw paw, avocados, arrow roots and zero grazing.

UM2 Main Coffee Zone: Very good yield potential, can also support the growing of fruits, potatoes, and also zero grazing.

UM3 Marginal Coffee Zone: This can also be called Coffee – Maize Zone. The zone supports the growing of early maturing crops like Katumani maize, beans and sunflower. There is a small transitional area before reaching UM4.

UM4 Sunflower – Maize Zone or Upper sisal zone: This zone has a short to medium and a short cropping season. Full potential could be attained through contour ridging. The zone can support dry land crops such as composite maize, sorghum, tobacco, sisal (Makuyu/Yatta area).



**Figure 3.4: Agro-ecological zones**

LM Lower Midland Zones: These are zones categorized as cotton zones. They are characterized by short to medium and short cropping seasons. LM3 has two short cropping seasons while LM4 is categorized as marginal cotton zone. These are the areas found mainly in Makuyu/Kambiti, Masinga/Yatta, Mbeere and some parts of Mwea. The area is very good with irrigation. In the absence of irrigation systems, dry crops such as millets, cassava, sweet potatoes, mwezi moja beans, sisal, jastrophia, aloe vera and castor are the option crops. The area also supports local livestock breads, bees and the local chicken.

### 3.7 Drainage and Hydrology

The Tana River basin is the largest and most important basin in Kenya. Its catchment covers some 95,950 km<sup>2</sup> (approximately 17% of Kenya’s land mass), and the flow of the Tana River basin constitutes 27% of the total mean discharge measured along rivers in the country’s major drainage basins. It is notable that the flow is found on a single river as compared to several rivers in other major drainage areas.

**Table 3.4: Contribution of the Main River Basins to National Water Discharge**

Drainage Basin	Flow (m <sup>3</sup> /sec)	% Contribution	No. of Rivers
Drainage Area 1—Lake Victoria	379	44%	8 Rivers
Drainage Area 2—Rift Valley	185	22%	14 Rivers
Drainage Area 3—Athi River	37	4%	4 Rivers
Drainage Area 4—Tana River	233	27%	1 River
Drainage Area 5—Ewaso Ng’iro North	22	3%	1 River

Source: ADEC, 2008.

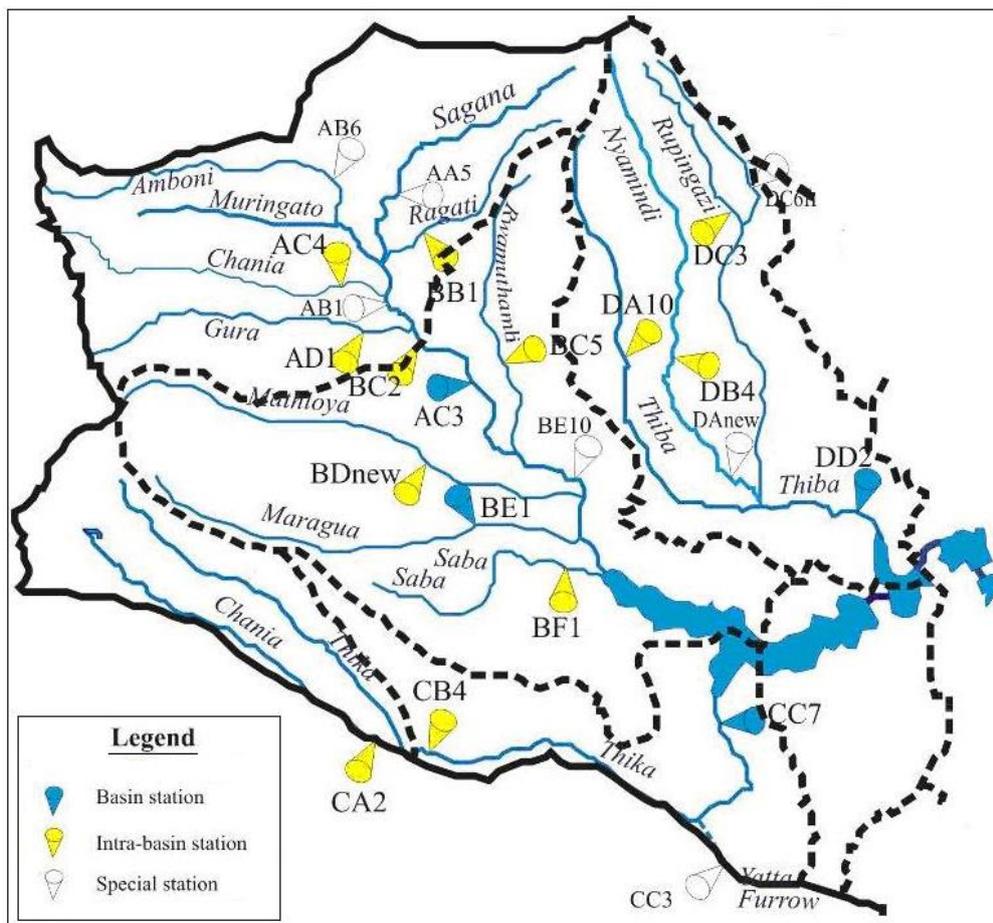
In terms of hydro-power production, the Tana River basin has both the largest existing generated hydro-power and the greatest remaining hydro-power potential. The Tana basin has a total installed capacity of 496 MW and 2,070 GWh of average annual energy, with a potential remaining un-installed capacity of up to 583 MW. In relative terms, the Tana basin presently accounts for approximately 61% of the total power supply in the country; in terms of hydro-power production only, the Tana basin contributes about 82% of the installed capacity, while the basin holds 43% of the remaining uninstalled hydro-power capacity. Within the country’s river basins, the hydro-potential is presently best exploited in the Tana basin.

The upper Tana Catchment has all its perennial rivers emanating from the Aberdares and Mt. Kenya. The Mt. Kenya sub-catchment drains the Mt. Kenya side of the upper Tana catchment. The main rivers in this sub catchment include the Rupingazi, Nyamindi, Thiba, Rwamuthambi, Ragati, Sagana, Thego and Nairobi which have tributaries within their systems. These rivers flow through the forests, tea and coffee

zones, joining the other rivers downstream. The Mt. Kenya sub catchment comprises Kirinyaga county, and parts of Nyeri, Mbeere and Embu counties.

The Aberdares sub-catchment drains the Aberdare side of the Upper Tana Catchment. The rivers in this sub catchment include the Chania, Thika, Sabasaba, Maragua, Mathioya, Gura and Amboni. These rivers have a network of tributaries which join them as they flow downstream. The rivers flow through deep valleys as they cut through the forests, tea and coffee zones. The Aberdares sub catchment comprise the whole of Murang'a county; a small part of Kiambu, Nyandarua and Thika counties, and almost the whole of Nyeri district, although there is small portion of Nyeri county around Kiganjo that falls within the Mt Kenya region.

The rivers flow from the forest zone, through tea zone into coffee zone. The rivers get bigger as they flow because other small rivers and streams join the main ones. Recharging of the rivers by groundwater where the aquifers cut to the surface is very common. The Upper Tana Catchment is divided into seventeen (17) sub-basins, which are grouped in six (6) management units, as depicted in the figure and table below.



**Figure 3.5: Sub-basins in the Upper Tana Catchment**

The drainage of the main rivers and their tributaries is determined by three factors as follows:

- ◆ The slopes and shape of the tertiary volcanic;
- ◆ The directions of the slopes of the Aberdare range and Mt. Kenya; and
- ◆ The structure of the Basement System.

The section of Mt. Kenya covered by the upper Tana Catchment, like the rest of the mountain, has largely radial drainage pattern predominating the upper and middle until the streams open out in the flatter sections of the Basement System floor.

The Aberdare ranges supply the largest part of the Upper Tana catchment area. Several perennial rivers in the upper zone of the mountain range flow in moderate valleys to the southern end to very deep valleys in the North-west. These led to deeply incised V-shaped valleys to flatter areas towards the basement system.

Among the streams and rivers originating from Mt. Kenya and draining into the Tana River (i.e. within the sub-section of drainage area 4), four main sub-basins can be distinguished (from north to south) as follows:-

**Table 3.5: Sub-basins in Upper Tana**

*Sub-basin 4A* Amboni, Muringato, Chania, Gura and Gikira all which rise from the Aberdares join Nairobi, Thegu, and Rongai rivers all which rise from Mt. Kenya *within this Sub-basin*. Hence, this sub-basin is also partly fed by Mt. Kenya and partly by the Aberdares similar to sub-basin 4B.

*Sub-basin 4B:* Rwamuthambi which originates in Mt. Kenya while Sabasaba, Maragua, South and North Mathioya drain into the Sagana *at this sub-basin*. Hence, this sub-basin is partly fed by Mt. Kenya and partly by the Aberdares.

*Sub-basin 4C:* Chania (*Thika side*) and Karimenu both rising from the southern slopes of the aberdares are tributaries to the main Thika (*rising also from the aberdares*) to later flow into the lower limb of Masinga Dam *as Thika River*.

*Sub-basin 4D:* Thiba River with its tributaries Murubara, Nyamindi and Rupingazi

The main rivers like Sagana, Thiba and Rupingazi (*Mt. Kenya*), Maragua, Mathioya (south/north) and Thika (*Aberdares*) and the main tributaries to these rivers such as Rongai, Nairobi and Thegu (*Sagana tributaries*); Kiringa, (*Thiba and Mukengeria*)

*Tributaries*); Karimenu and Chania (*Thika Tributaries*) originate from the forest zone. Most of these tributaries join the main rivers outside the forest zone, even below the coffee zone. However, both rivers and tributaries receive additional water inflow from smaller streams originating from the tea and the coffee zones. The water from all the rivers sources is reported to be diminishing over the years.

Although river flow data is limited, available evidence seems to suggest that quantities of surface water flowing out of the forest into the tea zones is rather constant. Therefore, reduced surface water availability observed downstream the mountain, seems to be mainly the result of:-

- (a) reduced inflow from sources outside the forest area; and
- (b) increased abstraction.

**Table 3.6 Rivers in the Upper Tana Catchment – Zones and Counties they flow Through**

Sub-Catchment	Rivers/Sub-basins	Length (Km)	Area (Km <sup>2</sup> )	Counties	Zones
Aberdares	Chania	73	537	Kiambu	Forest, Tea, Coffee, Cotton
	Thika	60	313	Kiambu	Forest, Tea, Coffee, Cotton, ASAL
	Sabasaba	58	374	Murang'a	Forest, Tea, Coffee, Cotton, ASAL
	Maragua	69		Murang'a	Forest, Tea, Coffee, Cotton, ASAL
	Mathioya	70	547	Murang'a	Forest, Tea, Coffee, Cotton, ASAL
	Gura	58		Nyeri	Forest, Tea, Coffee
	Chania (Nyeri)	53	429	Nyeri	Forest, Tea, Coffee
	Amboni	59	684	Nyeri	Forest, Tea, Coffee, Cotton
Mt. Kenya	Rupingazi	78	354	Embu	Forest, Tea, Coffee, Cotton
	Nyamindi	78	453	Kirinyaga	Forest, Tea, Coffee, Cotton
	Thiba	78	715	Kirinyaga	Forest, Tea, Coffee, Cotton, ASAL
	Rwamuthambi	36		Kirinyaga	Forest, Tea, Coffee
	Ragati	55		Nyeri	Forest, Tea, Coffee
	Sagana	46		Nyeri	Forest, Tea, Coffee
	Nairobi	53		Nyeri	Forest, Tea, Coffee
	Mathauta			Machakos	Cotton, ASAL

### 3.8 Wetlands

There are several known wetlands in the project area, though none of them falls under the Ramsar Convention as they are mainly small in size, with only a few which are 10 km<sup>2</sup> or above. Wetlands are important for ground water recharge, regulating water flow, for temporary storage and later release of water to water courses, and as sinks for wastes and pollutants, thus serving a cleansing role. Wetlands in the area are however under heavy threat, mainly through conversion to agricultural use. The main wetlands identified through the community consultations include:-

**Table 3.7: Wetlands in Upper Tana**

County	Name of Wetland	Area/Location
Meru	Limbo	Lower Imenti Forest
	Irimba Ria Aara	Kiguana, Tigania East
	Mporoko	Mikinduri, Tigania Central
	Konju	Mikinduri, Tigania Central
	Baimau	Mikinduri, Tigania Central Kagaene,
	Mbeu	Tigania West
	Konjuu	Tigania East
	Ndii	Tigania East
	Laramunyi	Tigania East
	Mporoko	Egembe North
	Nkugwe Wetlands	Igoji, Imenti South
	Kathigiri wetland	Igoji, Imenti South
	Mpuke Rwanyange	Thuura, Imenti North
	Ruriene/Kianywitari/thaura	Thuura, Imenti North
	Mpuke (Soweto)	Rwanyange, Imenti North Gaitu,
	Rurie	Meru Central
	Kioru	Ciaki, North Imenti
	Monyu Nkiriri	Mariene, Imenti Central
	Keero	Kithirune – Imenti Central
	Mariangiri	Kathwene
	Kianthumbi-Kagurune	Katheri, Abothuguchi
	Muguku	Gaaia,Igoki Location
	Gitune	Kiva sub location, Meru Central
	Munyari	Kiagu sub location, Meru Central
	Rurii swamp	Ruiga, Meru Central
	Nkobo	Muithi Location, Imenti North
	Irimbene Swamp	Kiayo
Njuguru Swamp	Kamweti location	
Kariru swamp	Miyeme igoji	
Nkoune	Imenti North	
Nkunga	Buuri	
Rwanyange	Imenti North	
Tharaka	Kibotore	Kaare location
	Mwegea	Thuita location

	<p>Gitunja Nguru Mukothina Thamole Kathuki Kanjogu Kiovu Kanduni Kiambugi Muriru Nkenye Iriani Manyanga Tumbura Mukui Iriani Gantobo Thande Swamp Polepole Gituri Nkou Mutunkunji Iriani Gituambugi Ngunduri Thugage Murimi Kiguku Thigaa Gwakamaru Keria Iruma Muriru Banduru Ndaithu Mutuiacinunia</p>	<p>Muthambi location Tunyai location Mukothina location Murugi location Mwoge location Rubati location Rubati location Muthambi location Chogoria location Chogoria location Chuka Town Chuka Town Gatue – Tharaka Chogoria Kiriguni Ngumbini Kaanwa Chogoria forest Kieganguru Turima – Tharaka Chuka Kiangondu Karingani Kiangondu Thita Thita Thita Karamani Thigaa Magutuni Nkumbo Chogoria Kabete Kirege Gitareni Kithanga</p>
Kirinyaga	<p>Gikumbo Karia-ga Gacormo Rukenya swamp Karia swamp Karia swamp Karia swamp</p>	<p>Kangaita Kangaita forest  Gatugura Castle forest Kiandari</p>
Nyeri	<p>Thuti Swamps Kandune Swamps in Kabaru Rongai Swamps Njengu swamps Kianjogu swamps Mumwe Karia-ka-Ngware</p>	<p>Othaya Kabaru Kambura-ini location Kimathi Mathira Mahiga, Othaya Wanjerere</p>

	Karia ka Ngware Kianjuri Kinungu, Itoga, Ragati Area Chele Chinga dam Mahuhi River Makurata Ngutui Swamp Kahuhi swamps Thingini swamps Gakanga (Itandara) Miagayuini (Tetu) Kanjora Kiunyu Dam Kagioini Hombe dam Nguniu dam Kangati Kainit dam	Wanyerere Kararumo forest Kararumo forest Ichaga location, Mathira East Mathira East near Karatina Chele Forest Othaya Upper Iraini location, Ragati Ndathi Kimahuri in Kabaruu Forest Kahuhi river  Tetu Tetu, shopping centre Kangora Sub Location, Tetu Giakanja, Tetu Chegenge, Tetu Hombe Forest Hombe Forest Kiamariga, Nyeri
Murang'a	Rubiru spring Kiyau wetland Mutoho Kwa Ndumia Githambo Githmu Itomboya Kandara Motoho Kianduru Athaara Rubiru springs	Muiruri Near Kari on Githumu Road Near Socfinaf on Gatanga road Ngararia/Kahaini Kandara Muranga South Muranga South Thika East

### 3.9 Physiology

The Aberdares form a volcanic mountain range stretching 160km and rising to about 4,000m. The mountain range is heavily dissected and characterized by steep slopes roughly above the 2200m contour. Notable slopes are also observed in the transition between the volcanic and basement rock systems. Other topographical features include foot ridges, plateaus and valleys.

The foot ridges occur due to the down cutting of rivers such as Thika, Maragua, Mathioya and Gura. These ridges rise to considerable heights of 30—120m above the surrounding land. In the upper reaches of the Aberdares, some of the U-shaped valleys have widths of up to 1km and drop for more than 300m below the

surrounding high grounds. These features provide good opportunities for construction of water storage reservoirs.

Mt. Kenya is a solitary mountain of volcanic origin rising to a summit of about 5200m (Batian peak). The ecosystem represents one of the most important pristine mountain ecosystems in the world and the most impressive landscapes in East Africa due to its mountain peaks with rugged glacier-clad summits and diverse forests. Mt. Kenya was formed as a result of volcanic activity and it has a base diameter of approximately 120km.

The Mount is the country's highest mountain and second highest in Africa with its icy summit reaching at the two highest peaks Batian (5,199 m) and Nelion (5,188 m). It is broadly cone-shaped with deeply incised valleys radiating from the peaks, which are largely attributed to glacial erosion. There are about 20 glacial tarns (small lakes) of varying sizes and numerous glacial moraine features between altitudes 3,950m and 4,800m above sea level.

### **3.10 Soils and Geology**

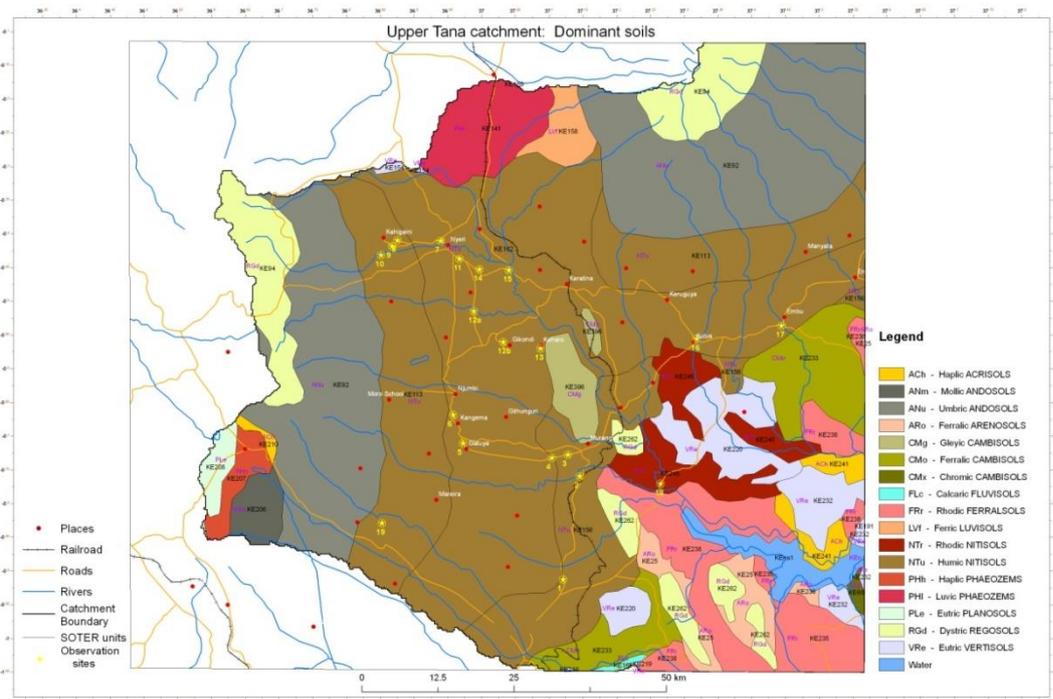
The soils of the Mt. Kenya and the Aberdare regions are classified into four broad groups. (Speck, 1978, Sombroek et al, 1982):

In the highest part of Mt. Kenya (> 4000m), the soils are shallow and consist of very stony dark loams with high organic matter and low bulk density. They include Leptosols, Regosols and the soils of valley bottom, Greysols.

The soils of the upper slopes between 2,400 and 4000m, have dark surface horizons, are rich in organic matter, have low bulk density and are mainly formed from young pyroclastic rocks. These soils include Regosols, Histosols and Andosols.

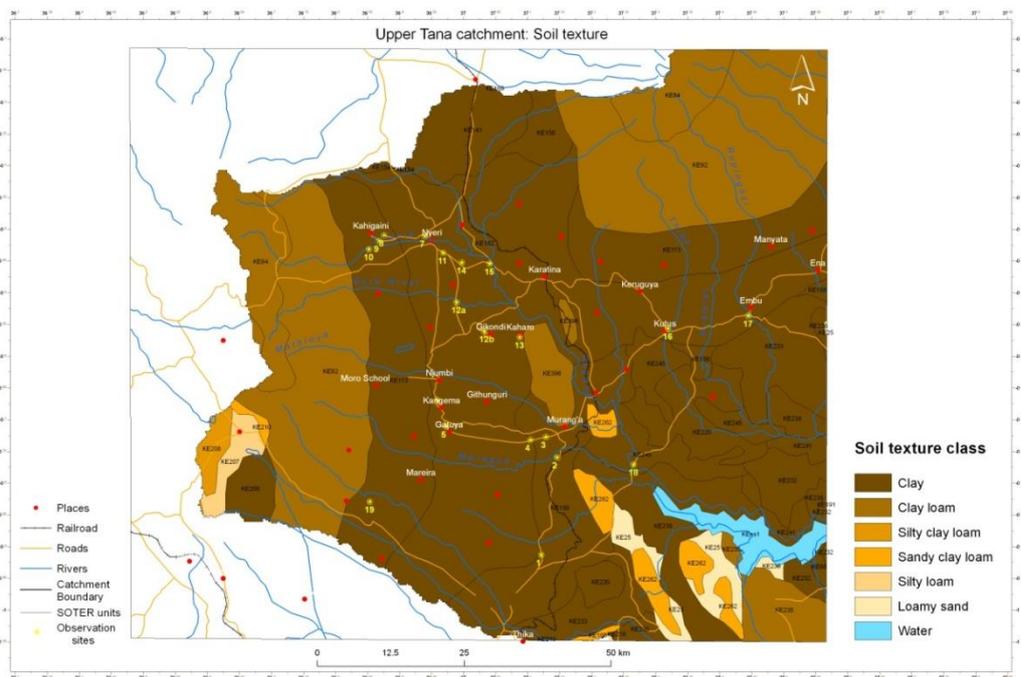
The soil characteristics of the lower slopes (generally below 2,600m) are influenced by the amount of rainfall received in those areas. Soils in the forested mountain areas with high rainfall amounts are intensively red with considerable amounts of clay. The main soil groups are Nitisols, Cambisols and Andosols.

The lower zones of both mountains are mainly basement rocks with some of the areas covered by sediments from the upper zones. The basement system on the Aberdares is exposed up to higher altitudes (*c.a.* 1500masl) than on Mt. Kenya (*c.a.* 1200masl).



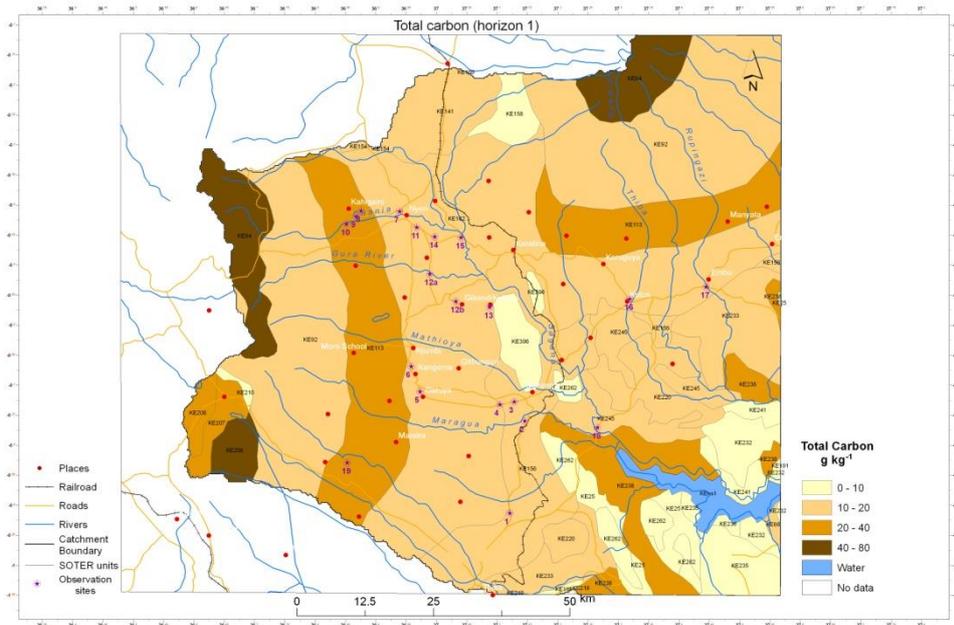
Source: GWC, 2008

**Figure 3.6: Dominant soils**



Source: GWC, 2008

**Figure 3.7: Soil texture**



Source: GWC, 2008

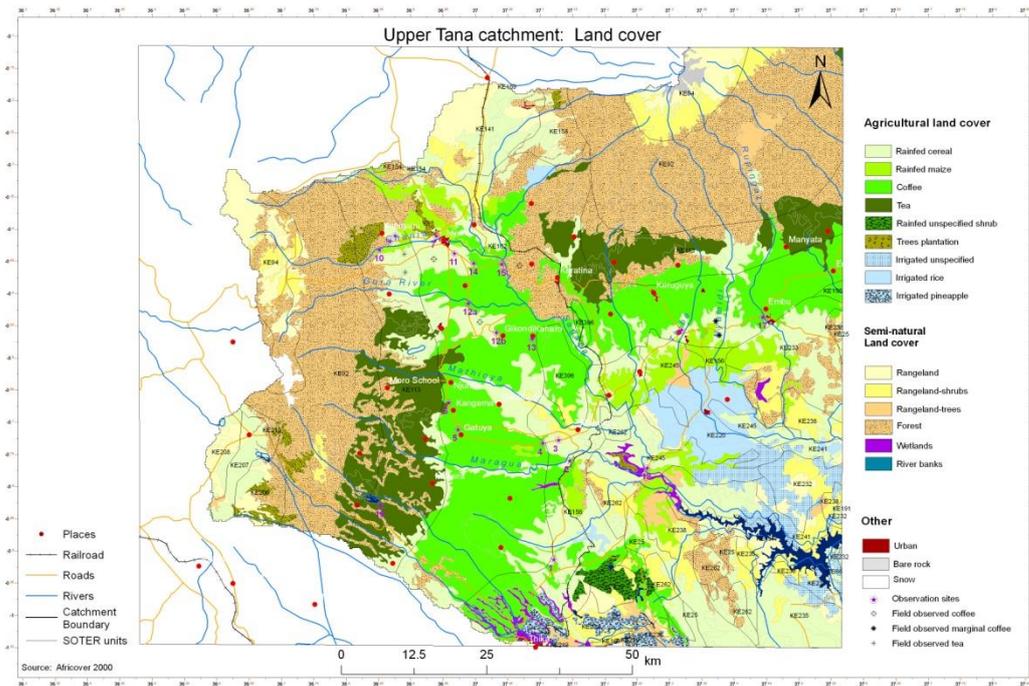
**Figure 3.8: Soil texture**

### 3.11 Vegetation Cover

The vegetation cover in the Upper Tana is as shown in Figures 3.9 and 3.10. For discussion purposes, we have however divided them into the Aberdares and Mt. Kenya sub-catchments.

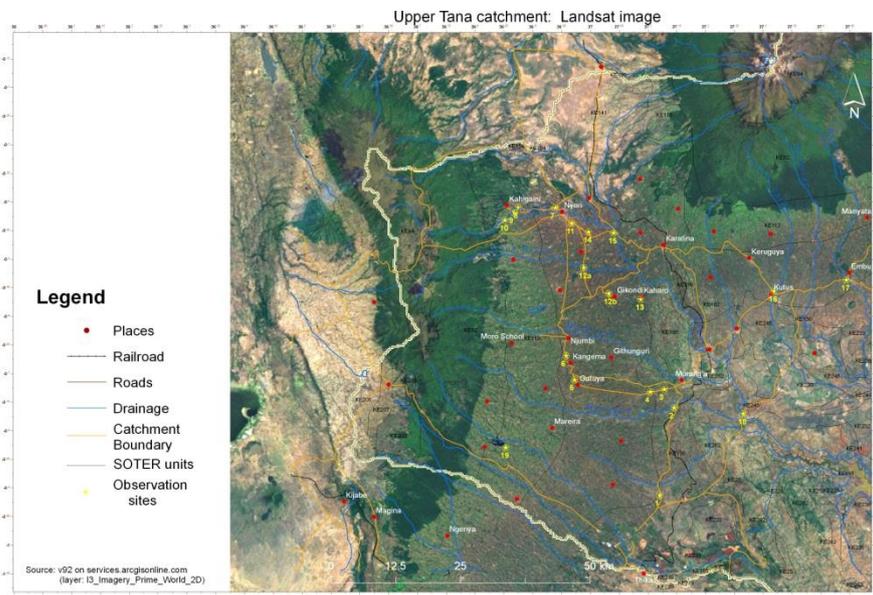
Vegetation in the Aberdares sub- catchment can be divided into three categories:

1. The Aberdare conservation area including the National Park;
2. The middle zones consisting of farming areas; and
3. The lower drier ASAL zones



Source: GWC, 2008

**Figure 3.9: Land cover**



Source: GWC, 2008

**Figure 3.10: Landsat Image**

In the conservation area, vegetation is determined by rainfall distribution and temperature. The vegetation has been divided into four categories as one ascends, namely: - wetter evergreen forests; drier evergreen forests; Juniperus / Podocarpus /

Olive forests; and low altitude shrubs. The conservation area vegetation can be divided depending on altitude as follows:

**Table 3.8: Vegetation Zones of the Aberdares Ecosystem**

Vegetation Belt	Zone	Elevation (meters)	Elevation (feet)
Montane Forest	Montane Rain-forest	1,600-2,400	5,200-7,800
	Bamboo (east slopes)	2,300-3,150	7,500-10,300
	Bamboo (west slopes)	2,600-3,300	8,500-10,700
	Hagenia-Hypericum	2,800-3,400	9,200-11,000
Ericaceous	Moorland	2,850-3,560	9,200-11,600
	Ericaceous-shrub	2,850-3,660	9,200-11,900
Alpine	Alpine	>3,650	>11,900

Source: Schmitt, 1991.

KIFCON (1994) assessed vegetation cover for the three forest reserves in the Aberdares Conservation Area (i.e. the Aberdares, Kipipiri and Kikuyu Escarpment Forest Reserves and excluded the Aberdares National Park). The areas covered by different vegetation types were as follows:-

**Table 3.9: Vegetation Types in Aberdares**

Vegetation Type	Coverage (km <sup>2</sup> )	Coverage (%)
Closed Natural Forest	459	33
Montane Forest / Bamboo Mix	282	19
Bamboo	196	13
Exotic tree plantations.	166	11
Forest / Scrub Mix	110	8
Moorland	49	3
Grassland	33	2
Scrub/Grassland Mix	27	2
Cultivated Land	65	4
Other (camps, infrastructures, stations, roads, etc.)	15	1
Total	1,460	100

Source: KIFCON (1994).

The most extensive vegetation type in the Aberdares Conservation Area (ca. 2,185 km<sup>2</sup>) is bamboo (ca. 556 km<sup>2</sup>, 25% coverage), followed by “wetter evergreen forest” (ca. 398 km<sup>2</sup>, 18% coverage). Of the tree-dominated habitats, “drier evergreen forest” (ca. 12 km<sup>2</sup>, <1% coverage) and Hagenia woodland (ca. 76 km<sup>2</sup>, 3% coverage) are most poorly presented. In contrast, most of the Hagenia woodlands lie well within the National Park and are well protected.

The Aberdares National Park has been fenced but some areas still lie outside the fence. Those within the fence are better protected. The areas inside the fence have been designated for indigenous forests, while those outside for plantations.

**Table 3.10: Vegetation covered by Fence**

Vegetation Type	Inside coverage (km <sup>2</sup> )	%	Outside fence coverage (km <sup>2</sup> )	%	Total coverage (km <sup>2</sup> )	%
Bamboo	515	30	41	9	556	25
Wetter evergreen forest	350	20	48	11	398	18
Plantation or encroachment	89	5	235	52	324	15
Moorland	211	12	0	0	211	10
High altitude shrub	190	11	<1	<1	190	9
Juniperus /podo/olive forest	163	10	33	7	196	9
Low altitude shrub	126	7	14	3	140	6
Hagenia abyssinica	76	4	0	0	76	3
Bush	12	1	70	15	82	4
Drier evergreen forest	0	0	12	3	12	<1
<b>Total</b>	<b>1,732</b>	<b>100</b>	<b>453</b>	<b>100</b>	<b>2,185</b>	<b>100</b>

Of the ca. 2,185 km<sup>2</sup> Aberdares Conservation Area, about 1,861 km<sup>2</sup> (85%) is natural vegetation and approximately 324 km<sup>2</sup> (15%) is plantation or encroached upon. All the Aberdares National Park (ca. 774 km<sup>2</sup>) is within the fence but only about 958 km<sup>2</sup> (68%) of the three Aberdares forest reserves are within the fence, while 453 km<sup>2</sup> (32%) lie outside.

The 10 most common species of trees in the three forest reserves of the Aberdares Conservation Area was determined by KIFCON (1994). The five most abundant species of trees are *Nuxia congesta*, *Juniperus procera*, *Olea europaea*, *Podocarpus latifolius*, and *Neboutonia macrocalyx*. This list is identical to that of Ngoru (1998) who also conducted vegetation transects near the perimeter of the Aberdares Conservation Area.

There are at least 774 species, subspecies and varieties of vascular plants within the Aberdares National Park. These belong to 4213 genera and 128 families (Schmitt, 1991). The vegetation of the alpine and ericaceous belts of the National Park consists almost exclusively of species, which are endemic, or near –endemic to the Afromontane and Afroalpine Regions (i.e. to the high mountains of East Africa), (Hedberg, 1986). The level of endemism drops rapidly as the elevation declines. Plants of endemism drops rapidly as the elevation declines. Plants endemic to the Aberdares include *Anemone thomsonii* var. *friesiorum*, *Helichrysum Gloria-die* ssp. *Sattimae* and *senecio keniensis* ssp. *Brassiciformis* (Hedberg, 1957).

The middle zones consist of agro forestry areas mainly planted with *Grevillea*, *Eucalyptus*, and fruit trees especially mangoes, pawpaw and avocado. The lower drier zones consist of fruit trees, mainly mangoes, and some of the indigenous trees like *Ficus sycomorra* (*mikuyu*), and *Cordia africana* which have been left intact or which have regenerated. Other trees include *Commiphora spp.*, *Combretum molle*, *Acacia spp.*, and *Cassia spp.*

Vegetation cover in the Mt. Kenya Sub-catchment can be divided into four zones:

1. The Forest Zone;
2. The Tea Zones;
3. The Coffee Zone; and
4. The Lower Zones

The Forest zone consists of the Mt. Kenya National Park and Forest Reserve, which is a protected area. The Mount Kenya ecosystem constitutes an important reservoir for biodiversity. Beenjete (1991) and Bussman (1994) identified 880 plant species, subspecies and varieties belonging to 479 genera in 146 families below the 3200m altitude. There are at least 11 strictly endemic species of higher plants and more than 150 species that are near endemic.

Vegetation zones and species distribution are distinguished according to the different climatic zones and altitudes, most obviously through variation in vegetation structure, cover and composition.

The vegetation of Mt. Kenya ecosystem tends to vary with altitude. The following vegetation zones are apparent from the high altitudes to lower altitudes (Njue, 2000):

- **Nival Zone:** This is the central rocky peak area which lies above 4500 m. Mosses and Lichens are the predominant species. Larger plants such as *Alchemilla argrohylla*, *Helichrysum citrispinum* and *Helichrysum* are common.
- **Afro-Alpine Zone:** This belt, between 3,500m and 4,500m, is characterized by specialized afro-alpine species that have developed adaptations to withstand extreme conditions. The dominant vegetation is moorland with tussock grasses. Common plants include the giant groundsels (*Senecio keniodendron* and *S. Aberdarica*), Cabbage groundsel (*S. brassica*), the Giant Lobelias (*Lobelia telekii* and *L. aberdarica*) by tussock grass, lobelia and giant groundsel (Beck et al., 1988).
- **High Altitude Heath:** This lies between 3000m and 3500m. It is also referred to as Ericaceous belt and is mainly covered with giant heath, African sage (*Artemisia afra*) and several Gentians (*Swertia spp.*).

- **Upper Forest:** Lies above the Bamboo zone and characterized by smaller trees in glades, such as the East African Rosewood (*Hagenia abyssinica*) and St. John's Wort (*Hypericum spp*). Trees are covered with Mosses and Lichens (*Usnea spp*).
- **Bamboo-Podo Forest Zone:** This zone is dominated by *Arundinaria alpina*, and extends from 2500m to 3200m ASL. *Podocarpus latifolias* are spread throughout the Bamboo. *Sambucus Africana* grows on openings during transition phase of collapsed Bamboo stems. The bamboo zone is absent in the Northern side due to drier conditions. This is a favoured habitat for mammals.
- **Montane (Mixed) Forest:** This zone starts at 2400m down to 2000m and is dominated by *Podocarpus latifolios* mixed with *Muxia congesta* at the upper altitudes.

Forest types that occur at lower altitudes include:

- **Moist *Ocotea* forests;** (*Ocotea usambarensis*) occur on 27,000 ha between 1500m and 2400m on the southern and south-eastern slopes and are the largest surviving blocks of this type though selective logging and clearing at its lower margins have disturbed and removed large tracts of the forest.
- ***Newtonia* forest** in the lower Imenti forest east of Meru and on the eastern slopes at lower altitudes is rare in Kenya and occurs on about 3500 ha as impoverished remnants in the ecosystem.
- ***Croton sylvaticus-Premna* forest** occurs on about 1600 ha in the upper Imenti forest near Meru at altitudes 1500-1800m.
- ***Croton-Brachylaena-Calodendrum* forest** also occurs near Meru at altitudes 1450-1850m. This forest type is rare and 3000 ha of its total area of 6200ha is found in Mt. Kenya ecosystem.

#### **Plantation Forest Zone:**

At 2200m and 2400m ASL before community interface zone, fast growing exotic commercial forest trees were introduced way back in the early 60s with the main purpose of supplying commercial forest products to the forest industries located within the adjacent communities. Main commercial tree species planted include Cypress, Pines, and Eucalyptus among others.

**Table 3.11: Distribution of vegetation types in Mt Kenya forest.**

District	Indigenous Forest (ha)	Plantation (ha)	Bushland (ha)	Grassland (ha)	Bamboo (ha)	Moorland (ha)	Total
Nyeri	33,658.46	9,936.93	2,725.80	5,775.79	12,141.24	169.4	64,407.62
Embu	7,748.7	474.0	256.7	2,497.4	6,837.0	444.8	18,258.60
Meru Central	55,790.0	5,521.0	7,129.0	12,340.0	4,070.0	0.0	84,850.00
Kirinyaga	13,245.6	1,247.7	5,350.0	398.0	10,120.0	4.1	30,365.40
Meru South	28,873.0	230.2	2,300.0	570.0	5,800.0	1,600.0	39,373.20
TOTAL	176,115.8	18,183.1	17,761.5	21,217.4	38,968.2	4,871.6	277,117.60

Source: Primary data compilation from forest stations around Mt. Kenya by District Forest Officers (DFO)

The indigenous closed canopy forests are further classified within the ecosystem into five classifications depending on their location, altitude and species composition as follows:

**Table 3.12: The Major Forest Types around Mt. Kenya.**

Major Forest Type	Location	Altitude in m asl	Area (ha)
Newtonia Forest	East	1200-1800	3,500
Croton-Brachylaena-Calodendrum Forest	North East/South west	1450-1850	3,000
Croton sylvaticus-Premna Forest	North (upper Imenti forest)	1500-1800	1,600
Juniperus-Olea Forest	West/North West	1800-2300	7,300
Ocotea forest	East/South	1900-2400	27,000
Mixed podocarpus latifolius Forest	West/East	2400-2800	68,000
Juniperus-Nuxia-Podocarpus falcatus forest	West	1950-2250	3,500
Bamboo zone	South West	2400-3000	80,000

Source: Beentje, 1991

In the tea and marginal coffee zones, there are remnants of natural vegetation along the riverine corridors and some indigenous trees are found in the farmlands. The tree mix consists of both indigenous and fast growing exotic species. The resultant tree vegetation arising due to human activities is woodland of mixed indigenous and exotic trees. Trees are planted around homesteads and along farm boundaries. Farm forestry has been an important livelihood activity due to the ban

on logging in Mount Kenya region since the year 2000. The woodland community is composed of several indigenous trees including *Croton macrostachus*, *Croton megalocarpus*, *Bridelia micrantha*, *Erythrina abyssinica*, *Cussonia holstii*, *Markhamia lutea* and *Ekebergia capensis*. In this zone there is also a large percentage of introduced species of which the most dominant is the *Grevillea robusta*. Other exotic species include *Cupressus lusitanica*, *Eucalyptussaligna*, *Eucalyptus camaldulensis*, *Cassia siamea* and *Leucaena leucocephala*.

Further down, where the rainfall ranges between 900 and 1200mm, with a prolonged dry season, the characteristic vegetation is Combretumwoodland, *Terminalia brownii* interspersed with cultivated areas. The dominant grass is *Themeda triandra*.

### **3.12 Cultural Sites**

There are several sites of cultural and religious significance in the Upper Tana area. Some forests have been gazetted and thus cultural sites inside forests are protected. Others are only culturally recognised and locally protected by the local community. During the community stakeholders' workshops, some of these sites were identified and include:-

- Mt Kenya Forest
- Gituure sacred site (Ruiga)
- Rwerea sacred site (Njuri Ncheke Tigania East)
- Mukutula shrine (Igembe North)
- Kunga lake
- King Mururu
- Lake Thai
- Chehe – Shrine
- Kimathi – memorial site
- Othaya – state mau mau
- Kahurura – mau mau caves
- Naromoru forest – Mau mau caves
- Kabaage – Mau mau cave
- Baden power – scouting
- Hindu prayers site in cheche forest
- Mau mau hideout in cheche forest
- Colonial court in Ruringu
- Caves Ragati, Kiadogoro
- Gitiye
- Kijege hill
- Nthunthuri

### **3.13 Socio-economic Activities in Upper Tana**

The catchment falls within the Kenya highlands with high potential for agricultural activities. With young volcanic soils lying on rainy harvesting slopes and suitable altitudes, the project area is able to support a thriving agriculture sector. To majority of the people in the project area, land is the greatest source of livelihood. With the exception of a few large plantations in parts of some counties, average farm holdings are small with many households occupying less than one acre of land. This is common for example in the high potential areas of Muranga, Nyeri, Kirinyaga, Embu, and Meru.

It is estimated that more than 80 percent of the people in the catchment area depend of agriculture. Both cash crops and food crops are grown. Key cash crops include Coffee and Tea in the highlands of Muranga, Kirinyaga, Embu, Nyeri, and Meru and Rice in Mwea, Kirinyaga. Others include Miraa in Mbeere in Embu County and Tigania in Meru county, cereals, fruits such as mangoes in Muranga county and bananas in Meru County. Numerous food crops are also produced in these areas. Additionally, many respondents are involved in livestock rearing particularly in the low potential areas of Mbeere, Tharaka and Tigania. The main livestock types kept include dairy cattle, beef cattle, goats, dairy goats, sheep and poultry. This is due partially to the availability of ready market for milk. Fish rearing is not a major economic activity in the catchment but is currently growing especially after being introduced under the economic stimulus package.

As noted above, farming system in the catchment features a mix of cash and food crop production and livestock production. Afforestation and agro forestry is also part of the farming system. The system is determined by climate, altitude, soil types, soil fertility and the social and economic subsystems. To a large extent, farmers grow crop species that maximize profits. Coffee, for example, is being substituted with horticultural crops while dairy farming is gaining ground in many parts of the catchment. Notably dairy farming pays farmers more frequently.

Farming is generally rudimentary with very few incidences of mechanised farming especially in the tea and coffee zones, farming is carried out by the use of hand held tools such as hand hoe, (chop-down-and-pull), fork jembes and pangas. The same technology is used in the growing of fruits and vegetables. This is dictated by the miniature size of the farm holdings. Harvesting of crops is not mechanized and so manual harvesting is dominant. In the drier areas of Kambiti, Makuyu, and Mbeere

oxen are used to plough the land as holdings are larger. Weeding of gardens is sometimes achieved through the use of oxen ploughs and the use of family labour and occasionally the use of hired labour. The major tools that are used similarly include hand hoe, fork jembes and pangas.

In the livestock sector, dairy cattle are zero grazed, fed with farm produced feeds combined with industrial feeds. Milking is largely accomplished through the use of manual labour. Milking through the use of machines is limited to large but few farms. Other livestock enterprises such as sheep and goat, poultry keeping, rabbits, also rely exclusively on manual labour, local feeds and industrial supplements.

### **3.14 Environmental and Social Challenges in the Upper Tana**

**1. Poverty:** Poverty among the people resident in the survey areas continues to be a teething challenge. Many people have little or nothing to invest in environmental conservation. Human activity is thus detrimental to the environment. People, for instance, cut down trees for timber and wood fuel but fail to plant others. Low and erratic rainfall patterns forces people to farm closer to rivers; increased population has led to increased land subdivision into economically non-viable pieces. This means that food security is threatened, while opportunities for meaningful economic engagement for the population especially the youth are limited.

Poverty also means that the capital inputs that people would ideally put into crop and dairy farming are also highly limited. This implies reduction in the amount of food produced and consequently low incomes. Poverty will therefore continue to have a causal relationship with environmental degradation. Poor households have little or no resources to invest in environmental conservation. Their activities on the other had had significant impacts on the environment. Such activities include poor cultivation methods and cultivation in restricted lands etc. Poverty remains one of the key environmental and social changes

Poverty also has a strong bearing on HIV/AIDS. It is indeed viewed both as a course and consequence of HIV/AIDS. Poverty generally increases vulnerability of people with HIV/AIDS. Further, management of HIV/AIDs and its opportunistic infections greatly drains the resources and assets of affected households, leaving the surviving members in poverty. HIV/AIDS mainly affects the productive age group in the society. This possesses serious threats to improved means of livelihood across the six counties.

**2. Catchment Degradation:** Deforestation and subsequent conversion of land into human settlements and arable farming in support of the growing population have led to unexpectedly high levels catchment degradation. Moreover, former wetlands, floodplains and riparian areas have been converted into small holder agricultural land throughout the Upper Tana Catchment. Because of unchecked degradation of the catchment, virtually all the rivers in the project area have recorded a sustained reduction in the low flow regimes. This has been coupled with a marked increase in the flood flows. Catchment degradation has been excision of government forests to expand agriculture, human encroachment of government forest and livestock incursions into the forest, charcoal burning, and forest fires. Key areas of the catchment affected are the Mt. Kenya forest and the Aberdare ranges, including the protected areas. Other areas are trust lands, and hill top areas.

**3. Low Tree Cover:** Other than the forests, tree cover in the community areas is fairly good, with trees planted on farm, mainly along the boundaries. However, when sustainable supply compared to demand is taken into account, there is still need for many trees to be planted in the Upper Tana catchment.

Energy accounts for an average of 90% of biomass needs. Considering the energy survey, the Upper Tana had supply deficits. In the Upper Tana catchment, the wood for energy supply deficit is about 2 million tones. To close this deficit with a sustainable wood source requires 100 million trees planted in the next ten years. When other wood needs are factored in, the trees need for planting in the next ten years is about 12 million each year for the next ten years.

The catchment also has huge tree demand from the tea factories. A Kilogram of made tea requires 1.6 KGs of wood. Unfortunately, most of the Kenya Tea Development Agency (KTDA) factories do not have their own plantation, meaning that their wood is sourced from the local communities. This has led to a large number of persons planting with no regard to Kenya forest service guidelines on Eucalyptus, especially the eucalyptus, because of the good prices offered by KTDA. Some farmers even cut down indigenous trees and fruit trees, for sale to the tea factories. On the other hand, due to issues of shade on tea plantations, most of the tea growing farmers have significantly less trees on their farm compared to the other farmers.

**4. Human Encroachment:** Most of the areas around the forest zones are densely populated and anthropogenic activities encroach on the forest area. Further, due to the high population density, the land holding around the forest areas is fairly low. The problem of encroachment is further aggravated by the fertility associated with forest areas.

**5. Invasive species:** Some degraded sites in the forest areas have experienced invasive plant species, among them *Caesalpinia decapetala* (Mauritius thorn), *Datura dothistroma* (Jimsonweed), *Solanum incanum* (Sodom's apple), Curse of India (*Lantana camara*) and *Resinus communis* (castor plant). *Fraxinus pennsylvanica* (Mexican Green Ash) displays opportunistic characteristics by naturally spreading their cover beyond firebreak lines they were initially designated for. Invasive plants are perceived to inhibit recovery of degraded or backlog forest sites. Other invasives that may occur in the lower elevations include: *Tithonia diversifolia*; *Acacia mearnsii*; *Acacia melanoxylon*; *Senna spectabilis*; *S. eptemtrionalis*; *Anredera cordifolia*; *Passiflora subpeltata*; *Caesalpinia decapetala*; *Thevetia peruviana*; *Datura suaveolens*; *Cestrum spp.*; and *Solanum mauritianum*. Other species of concern would be introduced species *Cotoneaster* and *Pyracantha spp.* in the high ling areas.

**6. Charcoal Production:**This is used as an economic-coping mechanisms especially during the dry seasons. This is mainly undertaken in the farmlands and in some hilltops and bushlands under the counties.

**7. Overgrazing and illegal grazing:** Illegal grazing especially in the plantation areas has greatly affected re-afforestation programs due to the destruction of young trees by livestock creating conflicts between the Kenya Forest Service and communities. Free grazing of animals is also closely linked with other illegal activities.

**8. Periodic Forest Fires:**Un-prescribed or wild fires can alter structural and species diversity including proliferation of invasive species. Wildfires have been recurring sesonaly from 1990 to date. Most fires are caused through arson and honey gathering; other important causes are lightning, illegal grazing, shamba (farm) clearing, burning cigarettes and charcoal burning.

**9. Soil erosion and sedimentation of water bodies:**With the intensification of agriculture including farming on steep slopes and up to the river banks, there is excessive soil erosion and sedimentation of rivers and other water bodies including the hydro-electric dams. Extensive soil erosion in large parts of the catchment due to the effect of rain on bare soil surfaces has been relevant. The top soil which supports the vegetation cover is the first victim of soil erosion. At farm level, considerable erosion from farms has been due to splash erosion and subsequent transport of the soil particles along unprotected channels. Despite several years of efforts to construct soil conservation structures, farms still represent a major source of silt for the catchment.

**Table 3.13: Distribution of silt load by source of silt and zone**

Source of sediments	Main issue	Percentage silt contribution by zone (whole catchment)					Estimated silt by zone (tons/yr)-whole catchment				
		Forest zone	Tea zone	Coffee zone	Lower zone	ASAL zone	Forest zone	Tea zone	Coffee zone	Lower zone	ASAL zone
		1,925 km <sup>2</sup>	1,367 km <sup>2</sup>	2,545 km <sup>2</sup>	1,012 km <sup>2</sup>	2,574 km <sup>2</sup>					
1. Roads	Uncontrolled run-off along roads, loosened earthworks and culvert discharge into unprotected lands	2%	8%	30%	10%	50%	6,387	25,550	95,811	31,937	159,685
2. River banks	Collapsing of unprotected and encroached river banks	1%	10%	35%	15%	39%	1,988	19,882	69,586	29,823	77,539
3. Farms	Inadequate soil conservation measures, especially due to low economic prospects on subsistence farms.	0%	5%	35%	15%	45%	0	19,162	134,136	57,487	172,460
4. Forests and degraded catchments	Inadequate soil conservation measures, especially due to low economic prospects on subsistence farms.	11%	11%	13%	10%	55%	10,935	10,935	12,923	9,941	54,675
5. Unprotected areas around impervious surfaces	Rainwater run-off from urban centres, institutions and homesteads without rainwater harvesting structures or soil and water conservation systems.	0%	10%	35%	20%	35%	0	21,277	74,469	42,553	74,469
6. Footpaths and Tracks	Downhill alignment of footpaths on farm boundaries, which have increased due to excessive land sub-division.	0%	10%	30%	18%	42%	0	4,966	14,898	8,939	20,857
7. Quarry sites	Loosened soils, high run-off from exposed quarried rock surfaces and sand mines.	0%	5%	40%	10%	45%	0	711	5,685	1,421	6,396
TOTAL	COMBINATION OF ISSUES	14%	59%	218%	98%	311%	19,310	102,482	407,508	182,101	566,080
	Rank	5	4	2	3	1	1,277,481				

Source: ADEC, 2009

Roads without adequate diversion channels for runoff have been sources of considerable silt loads. Especially notable is the effect of run-off along roads, either along the roads or at designated discharge points such as culverts. The main problem has been the lack of adequate water retention structures off the roads. The same has been noted of footpaths and tracks in the catchment area, some of which form large gullies. Large impervious surfaces in urban areas and large roof areas in rural areas also lead to the yield of large amounts of silt particularly due to accelerated run-offs that they generate.

Collapsing river banks especially in the coffee and lower areas are common and contribute considerable amounts of silt. Most remarkable are areas of the Saba-saba catchment and the lower parts of the Thiba River system. Active and disused quarry sites contribute considerable amounts of silt, but are limited to localized sites.

**11. Competition on Water-Use:**The Upper Tana catchment has been experiencing a drastic reduction of surface water availability especially during the dry season, which is a manifestation of high runoff rates and decreasing groundwater recharge. The catchment generally receives high precipitation in the upper recharge area but floods

account for over 70% of the total flow, so most of this water is not available for use. The current patterns of river flow and water management leave very little scope for further development of surface water resources for economic activities. Further, the Upper Tana Catchment has a lot of competing demands in terms of domestic, irrigation, fishing, horticulture, rice schemes and hydro-power. The catchment supplies water to Nairobi city, and there are other major consumers like Delmonte and Kakuzi companies, and towns like Thika, Nyeri, and Karatina.

**12. Wetlands and Springs:** In the Upper Tana Catchment most springs are generally located at the fringe of forest areas and isolated hills. Most wetlands, floodplains and riparian areas have been converted into small holder agricultural land throughout the catchment. Wetlands and springs are facing the following challenges:

- ◆ Wetlands demarcated as private land;
- ◆ Drainage of wetlands for rice growing and horticulture;
- ◆ The youth/population pressure;
- ◆ Lack of awareness of importance of wetlands;
- ◆ Lack of effective enforcement of the law;
- ◆ Planting of unfriendly trees (e.g. eucalyptus) in or near the wetlands;
- ◆ Pollution of ground water and surface water through pesticides and fertilizers; and
- ◆ Settlements in or around wetlands and sanitation facilities polluting the water.

**13. Climate Change:** The reality of climate change is now real and is already being experienced in the country. Kenya's National Climate Change Response Strategy (2010) indicates that climate change "is already unmistakable and intensifying at an alarming rate as is evident from countrywide temperature increases and rainfall irregularity and intensification". The Response Strategy concludes that "changing temperature and rainfall patterns have profound impacts on Kenya's socio-economic sectors", key among them are agriculture, rangelands, wildlife, forestry and water resources.

During the consultative meeting, communities gave first hand experiences of how they have been experiencing climate change and how they have been adapting. Key issues identified as a result of climate change include erratic and unreliable rainfall; reduced river flows, especially low flows; unpredictable floods in the form of flash floods; frequent prolonged droughts; emergence of new livestock and human pests and diseases e.g. highland malaria; increased temperatures; disappearance of species e.g. of trout fish; environmental degradation; and migration of people due to environmental degradation.

Communities have been adapting to the challenge by diversification of land use and income generating activities; early planting; crop and livestock diversification ; soil fertility improvement and management ; planting of drought tolerant crops; water harvesting and storage dams, roof water harvesting; appropriate technology selection and implementations- drip irrigation; use of green houses; biotechnology;

Communities have further been involved in amelioration of climate change through catchment rehabilitation through trees planting, re-forestation and forests protection. Other activities for coping include river bank protection, rehabilitation of wetlands, and construction of dams and gabions.

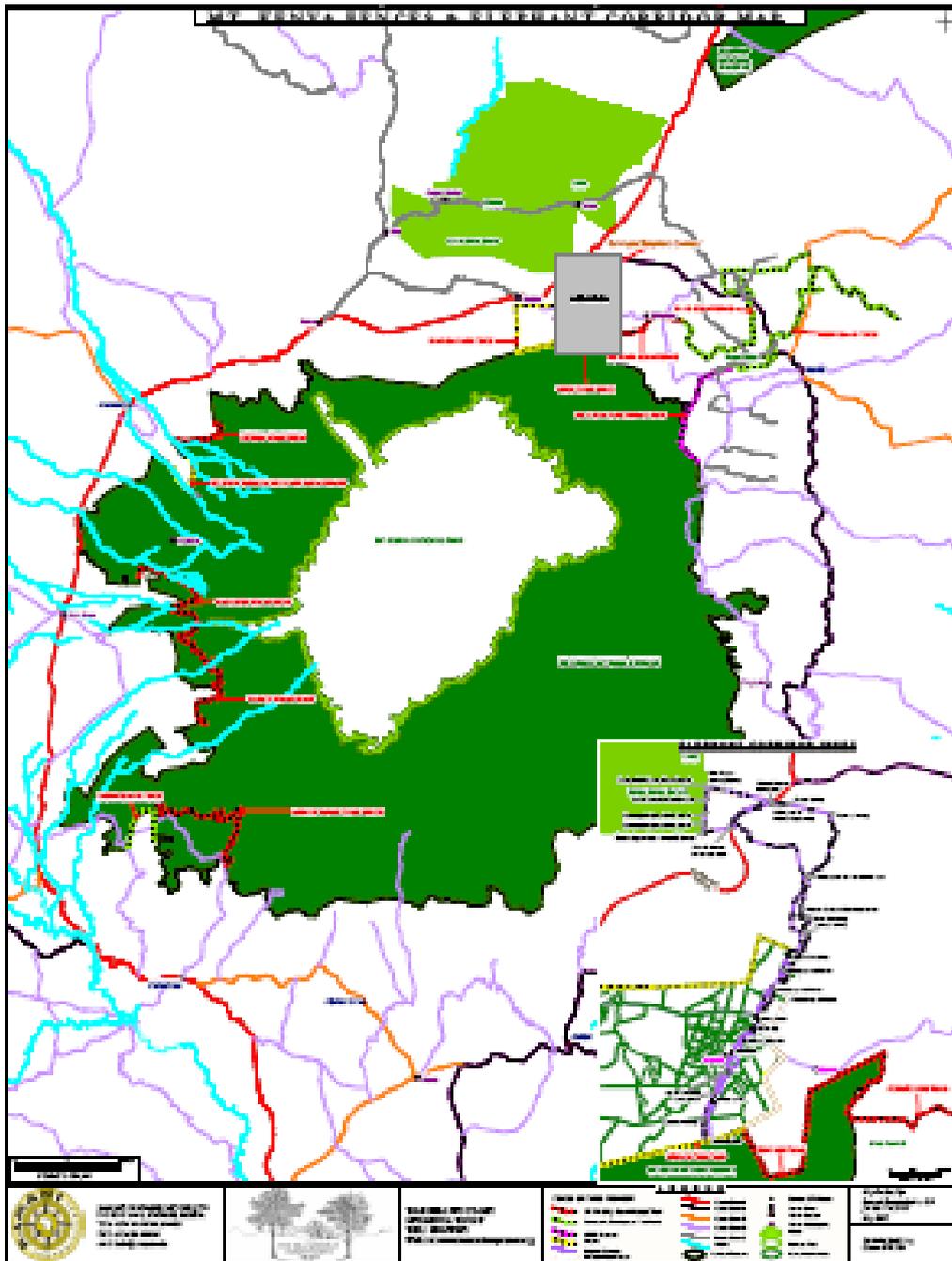
**14. Human-Wildlife Conflicts:** Conflicts take different forms with the most common being the consumption and destruction of crops, both food and cash-crops, by animals; death or injury to humans, and wildlife; destruction of woodlots and tree plantations; trampling of tea bushes; damage on local infrastructure especially water systems; and general disruption of the social order. Conflict also takes the form of spread of diseases, especially East Coast Fever through wildlife-livestock interaction.

Disruption of the social order transforms the communities and their livelihoods in the short term. Children do not go to school, people sleep during the day and stay awake at night, and normal agricultural production which is the mainstay of the local economies grows to a halt. Problem animals are mainly elephants, monkeys, baboons, buffaloes, hyenas, leopards, and wild pigs.

Key areas of conflict identified include:-

- Kamweti
- Kithoka
- Nchiru
- Kibara nyeki
- Timau
- Ntirimiti
- Naara
- Katheni
- Kina
- Ntumbuvi
- Ngari-ndari
- Chogoria
- Kiamuriuki
- Gitogoto
- Njuri
- Kiangondu





*Figure 3.11: Wildlife Fences and areas of Human- Wildlife Conflicts*

## 4. RELEVANT POLICY AND LEGISLATIVE FRAMEWORKS

To successfully design and undertake, UTaNRMP, the programme must be in line with the countries legislative and regulatory framework. Further, UTaNRMP must fit within the government's and area development plans and goals.

### 4.1 National Plans and Policies

*Table 4.1: Summary Table on UTANRMP with Kenyan Policies*

Policies and Plans	UTaNRMP objectives and activities consistency and compatibility
1. New Constitution, 2010	UTaNRMP is clearly in line with the constitution, as it focuses on sustainable use of natural resources, building of the capacity of local people to manage their natural resources, to rehabilitate and conserve forests and degraded areas, and to improve tree cover on farm and in public areas to achieve the 10% forest cover desired. The Constitution also assures Kenyans of a healthy and clean environment. UTaNRMP has environmental conservation activities that aims at environmental sustainability
2. Vision 2030	UTaNRMP will contribute to the vision with regards to agriculture development, sustainable management and utilization of natural resources, improving rural livelihoods, and contributing to renewable energy (hydro) through rehabilitation and conservation of the Aberdares and Mt. Kenya which are the sources of the Tana, and whose water is used in power generation.  Vision 2030 emphasizes the need to conserve the Water Towers of which Mt Kenya and Aberdares forest ecosystems constitute 25% of the country's forests
3. National Poverty Reduction Strategy (2001)/ Economic Recovery Strategy for Wealth and Employment Creation (2003)	UTaNRMP is in line with these two strategy documents as it fights poverty and also improves livelihoods through agriculture which is the backbone of the country's economy. It is also in line with the two strategies with regards to partnerships, people's participation, and private sector engagement
4. Millennium Development Goals (MDGs), 2000	The programme is in line with the MDGs in terms of poverty eradication, through creation of employment and improving livelihoods through improved food

Policies and Plans	UTaNRMP objectives and activities consistency and compatibility
	security, and health; and with Goal 7 on ensuring environmental sustainability through reducing loss of biodiversity by improving protection of habitats; and improving access to safe drinking water.
5. National Climate Change Response Strategy, 2010	The UTaNRMP will address some of the challenges of climate change like human-wildlife conflicts, availability of potable water, and food security with regards to use of traditional food crops especially in the ASAL areas. Additionally, it will form part of the response strategy with regard to afforestation, water harvesting, protection of river banks, and use of improved energy saving stoves.
6. Agriculture Policy and Agriculture Sector Development Strategy (ASDS) 2010-20	UTaNRMP is in line with this policy and strategy with regards to increasing agricultural productivity, contributing to fisheries development – aquaculture; marketing through cooperatives, improving irrigation development and water resources, and improving natural resources management.
7. Land Policy -2012	UTaNRMP will ensure compliance with the new policy once passed. The policy may however not affect the project much as most activities will be in individual farms.
8. Livestock Policy	The UTaNRMP is in line with this policy in respect to improving livestock production, valued addition, improved breeds of livestock, and supporting development of milk cooling facilities as was done under MKEPP
9. New Irrigation Policy (2011):	UTaNRMP will need focus on improving water use efficiency and increasing retention of water within the farming systems, which is also a way of promoting irrigation
10. Water Policy (2002)	UTaNRMP will use structures set up under the Water Act. At the local level, the project will use the Water Resource User Associations (WRUAs) which are key community associations for management of river basins. Some of the funding will also be done through the Water Services Trust Fund
11. Wildlife Policy	The UTaNRMP aligns itself with this policy with regards to the mitigation of human wildlife conflicts which is one of the main problems experienced by the farming

Policies and Plans	UTaNRMP objectives and activities consistency and compatibility
	communities in the upper Tana
12. Kenya Fisheries Policy (2005)	UTaNRMP is in line with this policy with regards the promotion of aquaculture, which the policy states has the capacity to change the natural fish production in the country three fold. As per the policy, the project will also assist in forming groups of fish farmers. Aquaculture will further enhance food security in the region and country.
13. Forest Policy (2005) and Forest Conservation and Management Act (2014)	UTaNRMP is in line with the forest policy with regards to involvement of local communities in sustainable management of forests; promoting and building capacity in participatory forests management; promoting farm forestry to produce wood fuel, timber and other products; building capacity of community forest associations so that they are able to play a role in forests management; restoration of indigenous forests; promoting use of management plans and building capacity to implement the same; support to manage riverines forests and forestry activities for water and soil conservation; efficient use of fuel wood; and promotion of efficient wood energy technologies.
14. Draft Energy Policy (2012)	UTaNRMP is in line with this policy in promoting renewable energy sources like biogas, efficient jikos and improved charcoal kilns
15. Wetlands Policy (2010) and Ramsar Convention	UTaNRMP is in line with the policy with regards to creation of created wetland vide fish ponds; promoting efficient techniques and technologies for harvesting and processing fish and other food products within wetlands; conservation measures that protect fish breeding grounds; rehabilitation and restoration of degraded mining sites.
16. Tourism Policy (2010)	UTaNRMP is in line with the policy with income generating activities and opportunities in eco-tourism and community based projects like home-stays and agro-tourism

1. **Constitution of Kenya, 2010:** Kenya's supreme legislative document is the constitution, and this was recently re-enacted in the country. The new

constitution on the whole boasted the realm of natural resources management in the country. Indeed, the new constitution gives the environment and natural resources management a special place, with the Bill of Rights (Article 42) stating that “every person has the right to a clean and healthy environment”. The constitution also goes further to urge that efforts be made to achieve and maintain a tree cover of at least 10% of the land area in Kenya. Additionally, the constitution commits the government to:-

- ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;
- encourage public participation in the management, protection and conservation of the environment;
- protect genetic resources and biological diversity;
- eliminate processes and activities that are likely to endanger the environment; and
- utilise the environment and natural resources for the benefit of the people of Kenya.

UTaNRMP is thus clearly in line with the constitution, as it focuses on sustainable use of natural resources, building of the capacity of local people to manage their natural resources, to rehabilitate and conserve forests and degraded areas, and to improve tree cover on farm and in public areas.

2. **Vision 2030:** This is the country’s long term development plan which aims at creating a “globally competitive and prosperous country with a high quality of life by 2030”. Kenya’s economic development strategy emphasises the long term development of agriculture, tourism, manufacturing and the energy sector, all of which rely heavily on sustainable exploitation of natural resources, and especially, the five major water towers namely, Mt. Kenya, Aberdare, Mau Complex, Cherangany Hills and Mt. Elgon. UTaNRMP will contribute to the vision with regards to agriculture development, sustainable exploitation of natural resources, improving rural livelihoods, and contributing to renewable energy (hydro) through rehabilitation and conservation of the Aberdares and Mt. Kenya which are the sources of the Tana, and whose water is used in power generation.
3. **National Poverty Reduction Strategy (2001)/Economic Recovery Strategy for Wealth and Employment Creation (2003):** UTaNRMP is in line with these two strategy documents as it fights poverty and also improves livelihoods through agriculture which is the backbone of the country’s economy. It is also in line with the two strategies with regards to partnerships, people’s participation, and private sector engagement. Additionally, it supports the two pillars of

fighting poverty, namely, equity and improved targeting in ensuring access of the poor to basic services and better governance.

4. **Millennium Development Goals(MDGs), 2000:** These are eight international development goals that all 192 United Nations member states agreed to achieve by 2015 during an extra-ordinary General Assembly in 2000. They include eradicating extreme poverty, reducing child mortality rates, fighting disease and epidemics, such as HIV/AIDS, and developing a global partnership for development. The proposed project is in line with the MDGs in terms of poverty eradication, through creation of employment and improving livelihoods through improved food security, and health. The project is also in line with Goal 7 on ensuring environmental sustainability through reducing loss of biodiversity by improving protection of habitats; and improving access to safe drinking water.
5. **National Climate Change Response Strategy, 2010:** This document aims to put in place measures in government policies to mitigate climate change and variability. The document recognizes the inevitable changes in climate change, namely increased temperatures and irregular and unpredictable rainfall. The proposed project will address some of the challenges of climate change like human-wildlife conflicts, availability of potable water, and food security with regards to use of traditional food crops especially in the ASAL areas. Additionally, the project will form part of the response strategy with regard to afforestation, water harvesting, protection of river banks, and use of improved stoves.
6. **Agriculture Policy:** Agricultural policy in Kenya revolves around the main goals of increasing productivity and income growth, especially for smallholders; enhanced food security and equity; emphasis on irrigation to introduce stability in agricultural output; commercialization and intensification of production especially among small-scale farmers; appropriate and participatory policy formulation and environmental sustainability. The key areas of policy concern, therefore, include:
  - ◆ Increasing agricultural productivity and incomes, especially for small-holder farmers;
  - ◆ Emphasis on irrigation to reduce over-reliance on rain-fed agriculture in the face of limited high potential agricultural land;
  - ◆ Encouraging diversification into non-traditional agricultural commodities and value addition to reduce vulnerability;
  - ◆ Enhancing food security and a reduction in the number of those suffering from hunger and hence the achievement of Millennium Development Goals (MDGs);

- ◆ Encouraging private-sector-led development of the sector; and
- ◆ Ensuring environmental sustainability.

7. **Agriculture Sector Development Strategy (ASDS) 2010-20:** The strategy's goal is to achieve an average growth rate of 7% per year in agriculture. The growth of the sector is anchored in two strategic thrusts: (i) increasing productivity, commercialization and competitiveness of agricultural enterprises; and (ii) developing and managing the key factors for production. The sub-sector strategic focus of the ASDS is: (i) crops and land development; (ii) livestock development including in the ASALs; (iii) fisheries sub-sector; and (iv) cooperative development. In terms of production factors the ASDS prioritizes: (i) improving water resources and irrigation development; (ii) land use; (iii) developing Northern Kenya and other ASALs; (iv) improving management of the environment and natural resources; (v) developing river basins and large water body resources; and (vi) forestry and wildlife resources. UTaNRMP is thus in line with this strategy with regards to increasing agricultural productivity, contributing to fisheries development – aquaculture; marketing through cooperatives, improving irrigation development and water resources, and improving natural resources management.
8. **Land Policy:** A land policy, has been formulated to address the critical issues of land administration, access to land, land use planning, restitution of historical injustices, environmental degradation, conflicts, unplanned proliferation of informal urban settlements, outdated legal framework, institutional framework and information management. The policy aims to ensure that all land is put to productive use on a sustainable basis by facilitating the implementation of key principles on land use, productivity targets and guidelines as well as conservation. It encourages a multi-sectoral approach to land use, provide social, economic and other incentives and puts in place an enabling environment for agriculture and livestock development. But the policy is still not yet law, but UTANRMP will ensure compliance with the new policy once passed. The policy may however not affect the project much as most activities will be in individual farms.
9. **Livestock Policy:** the policy is similarly to increase livestock output and productivity, improving market access for livestock and livestock products and creating an enabling environment for livestock development. This is with a view to increase farmer's incomes through efficient delivery of extension service and research, inter alia. The policy deals with milk production, processing, and marketing; promotion of animal health by re-activating and expanding dips; breeding and clinical services- stocking of drugs by animal health technicians; monitoring and control of animal diseases, promotion of dairy goats, poultry and beekeeping, support development of facilities for milk handling such as collection and cooling centres encourage the private sector

and local authorities to establish small abattoirs and meat processing facilities, and to encourage the establishment of value adding processes. The UTaNRMP is in line with this policy in respect to improving livestock production, valued addition, improved breeds of livestock, and supporting development of milk cooling facilities as was done under MKEPP.

10. **New Irrigation Policy (2011):** The government has also formulated a new National Irrigation Policy which favours: (i) intensifying and expanding irrigation, rainwater harvesting and water storage; (ii) rehabilitating and protecting water catchments; and (iii) implementing the irrigation flagship projects identified in Vision 2030. UTaNRMP is in line with this strategy with regards to rehabilitating and protecting two of the major water towers, promoting water harvesting and storage. However, due to the fact that surface water resources of the Upper Tana catchment are already over-utilised, irrigation interventions under UTaNRMP will need focus on improving water use efficiency and increasing retention of water within the farming systems, which is also a way of promoting irrigation.
11. **Water Policy (2002):** A new water policy changed in the role of Government from being a service provider to becoming a facilitator and regulator of other water sector players, which is the same model UTaNRMP uses. The project also uses the various institutions created, especially the Water Resources Management Authority (WRMA) and the Water Services Trust Fund (WSTF). At the local level, the project uses the Water Resource User Associations (WRUAs) which are key community associations for management of river basins under MKEPP, and will continue to play a pivotal role under UTaNRMP.
12. **Draft Wildlife Policy (2007):** The UTaNRMP aligns itself with this policy with regards to the mitigation of human wildlife conflicts which is one of the main problems experienced by the farming communities in the upper Tana. Human wildlife conflicts also exacerbate poverty and food insecurity in the project area. The project will reduce human wildlife conflicts by use of wildfire barriers. By involving the communities in the fence maintenance, and mitigating human wildlife conflicts, the project will also promote positive attitudes towards wildlife and wildlife conservation, which is in line with the policy. The policy is also important with regards compensating farmers for damage to property, crops, human harm and other losses. The policy also gives user rights to communities which can be exploited by CFAs under the project.
13. **Kenya Fisheries Policy (2005):** UTaNRMP is in line with this policy with regards the promotion of aquaculture, which the policy states has the capacity to change the natural fish production in the country three fold. The project will also, through more widespread supply and availability of fish, promote fish

consumption, thereby also improving community health in line with the policy. As per the policy, the project will also assist in forming groups of fish farmers. Aquaculture will further enhance food security in the region and country.

14. **Forest Act 2005:** The Forest Act expanded the mandate in the management of all types of forests, including the involvement of adjacent forest communities and other stakeholders in forest management and conservation. It also brought about an ecosystem approach in forest management and further included incentives to promote sustainable use and management of forest resources. Additionally, it recognizes that there are benefits arising from involvement of local communities and other stakeholders in forest management. The policy also acknowledges that, given the growing population, it is not possible to meet all the demands of forest products from state forests and thus alternative sources of these products are expected to come from farmlands. The policy also provides for government to promote tree planting and land rehabilitation for carbon sequestration and to explore opportunities for carbon trade in conservation and management of forests.

UTaNRMP is in line with the forest policy with regards to involvement of local communities in sustainable management of forests; promoting and building capacity in participatory forests management; promoting farm forestry to produce wood fuel, timber and other products; building capacity of community forest association so that they are able to play a role in forests management; restoration of indigenous forests; promoting use of management plans and building capacity to implement the same; support to manage riverines forests and forestry activities for water and soil conservation; efficient use of fuel wood; and promotion of efficient wood energy technologies.

15. **Draft Energy Policy (2014):** the policy aims to ensure adequate, quality, cost effective and affordable energy for economic development without jeopardizing environmental conservation. The Energy Act and Policy both recognizes untapped potential sources of energy including solar energy, wind mills, small independent hydro-power generation plants in rural areas, biogas, co-generation and the introduction of bio-diesel. In addition, the energy sector promotes the conservation and efficiency use of energy consumption at various consumer levels including industrial, institutional and domestic. UTaNRMP is in line with this policy in promoting renewable energy sources like biogas, efficient jikos and improved charcoal kilns.

16. **Wetlands Policy (2010):** The wetland policy calls for the enforcement of relevant regulations and laws that promote maintenance of ecological integrity of wetlands and ensures protection of water sources. It also seeks to

promote and encourage sustainable use of ground water supply. UTaNRMP is in line with the policy with regards to creation of created wetland vide fish ponds; promoting efficient techniques and technologies for harvesting and processing fish and other food products within wetlands; conservation measures that protect fish breeding grounds; rehabilitation and restoration of degraded mining sites. UTaNRMP can also, under the livelihoods component, explore opportunities set out in the policy for promoting sustainable extraction and utilization of products derived from wetlands and developing appropriate marketing infrastructure for wetland products for maximum benefits to the community. In doing so, as per the policy, the project should give priority to subsistence and environmental needs before considering commercial interests. The policy also guides the project while rehabilitating any wetlands, with preference being given to indigenous vegetation and biodiversity.

**17. Tourism Policy (2010):** The policy acknowledges that Kenya's tourism industry is closely linked to the ecological sustainable development of the country's natural and heritage resources. The policy also embraces the precautionary principle and the polluter and user pays principle. The principle also obliges all tourism sector investments to undertake EIA, while tourism related policies, plans and programmes undertake SEA. UTaNRMP is in line with the policy with income generating activities and opportunities in eco-tourism and community based projects like home-stays and agro-tourism.

**18. Policies with a bearing with Social Development:** Policies and legislation on social development have evolved overtime. To date, Kenya does not have one consolidated law to guide interventions in development. Reference is made to various laws and policies to guide interpretations on social dimension in development. Key among these laws is the Kenya Constitution 2010. This has a strong bill of rights that provides for socio-economic and legal protection of all citizens. The constitution further provides for Devolution. This aims at promoting social and economic development and recognizes the right of communities' to manage their own affairs and to further their development.

Further, Kenya's development blue print, the Vision 2030 has the social pillar as one of its 3 key pillars. Others are economic and political pillars. The vision recognizes the importance of social issues in propelling Kenya to higher levels of development. Specifically, the social pillar seeks to create just, cohesive and equitable social development in a clean and secure environment. The key focus of the social pillar is on the need to recognise regional and social disparities and more and genuine involvement of people including marginalized and vulnerable while doing development.

Other National Development Plans have similarly focused on reducing poverty in the country. These include the National Poverty Eradication Plan 1999-2015, which was designed to address poverty as set out in the Millennium Development Goals (MDGs), particularly that of reducing poverty by half by 2015. The Government also prepared an Interim Poverty Reduction Strategy Paper for the period 2000-2003 which was followed by the Economic Recovery Strategy (ERS) for Wealth and Employment Creation prepared for the period 2003-07. These plans laid special focus on community involvement in affairs that affected them.

Further, the government has over the years sought to take development decisions closer to the people most affected by development Interventions. Some of the main mechanisms used include the District Focus for Rural Development (DFRD), establishment of devolved funds such as Constituency Development Fund (CDF), Roads Maintenance Funds, Women enterprise and Youth enterprise funds, Local Authority Transfer Funds etc.

This notwithstanding, social dimensions of development has for long been entrenched in the government of Kenya development agenda. This is attested to by the presence of policies and sessional papers that sought to mainstream social considerations in development interventions. These include

- a) Sessional papers no. 7 & 8 on development of 1955 which guided the early phase of departmental work. From a broad point of view, the two were oriented towards bettering the lives of the people of Kenya, by helping them to help themselves. Social Dimensions in Development in Kenya are guided by various pieces of legislations, Sessional papers and presidential circulars. These include;
- b) Social welfare policy, 1964 – This assigned the department of gender the mandate and responsibility to deal with welfare issues.
- a) National Community Development Plan, 1964 – launched in February 1964. The plan emphasized the concept of community development as being “the democratic process of including people and government in planning and working for the type of society we wish for ourselves”.
- b) Sessional paper No. 10(1965) on the *‘Concept of African Socialism’* emphasizes on community development programme aspects such as self help efforts and control system.
- c) Sessional paper No. 7 of 1971 on National Social Welfare: - This places emphasis on social welfare development.
- d) Cabinet memorandum 78 (b) of 1976 which established the Women’s Bureau with the broad and general objective of development of strategies and design

of implementation mechanisms that integrate gender concerns into national development process.

- e) The National Policy on Gender and Development 2000, which provides guidelines on gender and development in the country.
- f) Sessional Paper No. 2 of 2006 on Gender and Equality which provides a framework for gender mainstreaming in all sectors of the economy.
- g) In addition to the above, a number of other policies are under way. These include the National Policy on Older Persons and Ageing, which is in draft form and awaiting approval by cabinet, the National Policy on Social Protection, National Policy on Female Genital Mutilation (FGM), Gender and Affirmative Action policy and the National Policy on Community Development, which are all still being developed.

There are institutions that guide the implementation of policies on social development, especially issues on gender mainstreaming in development. These include the National Commission on Gender and Development, the Department of Gender and Social Services and the District Gender and Social Development Committees. The government equally works closely with civil society organizations, UN bodies, multilateral and bilateral donors in an effort to mainstream gender issues in development for women's empowerment

## **4.2 Alignment with IFAD Strategies and Policies**

In addition to complying with the GoK policy and legal framework described above, the **UTaNRMP** must also comply with applicable IFAD procedures, policies and strategies including IFADs Strategic Framework (2011-15), Country Strategic Opportunities Programme (COSOP –[2007-012]), Environment and Social Assessment Procedures (2009), the Environment and Natural Resource Management Policy (2011) and the Climate Change Strategy (2010).

1. **Strategic Framework:** UTaNRMP is closely aligned with IFAD's strategic framework, covering the period 2011-15. The framework reflects IFAD's overarching goal of enabling poor rural people to improve their food security and nutrition, raise their incomes and strengthen their resilience. The framework has five strategic objectives: (i) to create a natural resource and economic asset base that is more resilient to climate change, environmental degradation and market transformation; (ii) to improve access to services and build resilience in a changing environment; (iii) to enable poor rural people and their organisations to manage profitable and sustainable enterprises and take advantage of decent work opportunities; (iv) to enable poor rural people

to influence policies and institutions that affect their livelihoods; and (v) to create enabling institutional and policy environments to support agricultural production and related activities.

2. **Country Strategy:** The current (2007-12) COSOP has the overall goal of intensification, diversification, commercialisation, and value addition in the agricultural sector. It has three strategic objectives: (i) improving delivery of services to the rural poor by strengthening the capacity of the public and private sector and civil society organisations; (ii) increasing incomes for the rural poor through improved access to and utilisation of appropriate technologies, markets, and community-owned productive and social infrastructure; and (iii) increased investment opportunities for the rural poor through improved access to rural financial services. In terms of targeting the COSOP aims at improving the lives of poor small producers, agro-pastoralists, and pastoralists in medium to high potential areas as well as the ASALs. However, the COSOP states that most of the interventions in the ASALs will only be through IFAD grants.

The COSOP states that IFAD will engage Government in policy dialogue in the implementation of the strategy for revitalising of agriculture, by participation in the agriculture and rural development sector donors' group. The principal form of partnership is IFAD's participation in the Kenya Joint Assistance Strategy under which there is partnership development with a large number of NGOs and private sector service providers. This includes contracting non-state actors for selected services, such as value chain analysis, business training for farmer groups and rural infrastructure development; forging links with institutions that can provide rural financial services to IFAD's target group; and capacity building for private operators who deliver services to farmers.

3. **Environment and Social Assessment Procedures.** IFAD promulgated its Environment and Social Assessment Procedures (ESA Procedures) in 2009, reaffirming its commitment to environmental management as one of the pillars of sustainable development. The ESA Procedures gave IFAD the opportunity to identify the environmental and social values and principles that inform IFAD's work and form the basis for its assessment of the environmental and social impacts of its development projects. IFAD applies its ESA Procedures to formalize the integration of environmental and social issues into its rural development initiatives.

According to the ESA Procedures, the UTaNRMP was classified a Category A project, as one having "significant environmental and social implications that are sensitive, adverse, irreversible or unprecedented and affect an area broader than the sites or facilities subject to physical interventions". The Category A designation requires that a project perform an ESIA during

formulation. This ESIA is intended to satisfy that requirement. The UTaNRMP scales up the various interventions initiated under the MKEPP, which was classified a Category A project, and the project area includes important, nationally protected sites (i.e. forest reserves but not national parks). For these reasons, the ESIA team understands why the UTaNRMP was initially classified a Category A project. However, based on the environmental and social impacts to date of the MKEPP reviewed by the ESIA team and the results and recommendations of this ESIA, the ESIA team recommends that the UTaNRMP be reclassified a Category B project under the ESA Procedures.

4. Environment and Natural Resource Management Policy. Another important IFAD policy with which the UTaNRMP must comply is the Environment and Natural Resource Management Policy (NRM Policy), which IFAD adopted in May 2011. The goal of the NRM Policy is “To enable poor rural people to escape from and remain out of poverty through more-productive and resilient livelihoods and ecosystems”. Its purpose is “To integrate the sustainable management of natural assets across the activities of IFAD and its partners”. The NRM Policy sets out ten core principles to guide IFAD’s support for clients in NRM (see Box 1). These core principles underpin many of the interventions of the UTaNRMP.

**Table 4.1: IFAD ENRM Policy: Summary of Core Principles**

**IFAD will promote:**

1. Scaled-up investment in multiple-benefit approaches for **sustainable agricultural intensification**;
2. Recognition and greater awareness of the economic, social and cultural **value of natural assets**;
3. '**Climate-smart**' approaches to rural development;
4. Greater attention to **risk and resilience** in order to manage environment- and natural-resource-related shocks;
5. Engagement in **value chains** to drive green growth;
6. Improved **governance** of natural assets for poor rural people by strengthening land tenure and community-led empowerment;
7. **Livelihood diversification** to reduce vulnerability and build resilience for sustainable natural resource management;
8. **Equality and empowerment for women and indigenous peoples** in managing natural resources;
9. Increased access by poor rural communities to **environment and climate finance**;
10. **Environmental commitment** through changing its own behavior.

5. **Climate Change Strategy.** The goal of IFAD's Climate Change Strategy (2010) is to maximize impact on rural poverty in a changing climate. The main strategy output is a more 'climate-smart' IFAD, where climate change – alongside other risks, opportunities and themes is systematically integrated into core programmes, policies and activities. The goal will be pursued in three ways: (i) to support innovative approaches to helping smallholder producers – both women and men – build their resilience to climate change; (ii) to help smallholder farmers take advantage of available mitigation incentives and funding; and (iii) to inform a more coherent dialogue on climate change, rural development, agriculture and food security. The **UTaNRMP** will fully comply with IFAD's Climate Change Strategy, supporting smallholder producers in the project area with capacity building and innovative approaches for building resilience to climate change.

### **4.3 National Legislation**

1. **The Environmental Management and Coordination Act, 1999:** Prior to enacting this law, Kenya did not have consolidated legislation for the protection and management of the environment. Instead, 77 statutes touching on various aspects of environment management were used.

The EMCA provides, under the Second Schedule, a list of projects that must undergo EIA. Developers of any project are therefore required to submit a detailed EIA project report to NEMA for review. The expert review by NEMA of the project report will then advise on whether the project requires an EIA study or not. EIA is undertaken by registered experts and their report is submitted to

NEMA. Both the EIA project report and the EIA study report are open for review by the public and individuals. Section 68 and 69 also states that the proponent must submit an Environmental Audit Report one year after commencement of the project, and thereafter undertake Self Audit. Strategic Environmental Assessments (SEAs) were not listed as requirement in EMCA but are mentioned under the EIA Regulations

Of particular relevance to the **UTaNRMP**, Part 5 of the EMCA provides legal tools for sustainable management of the environment. This covers protection and management of wetlands, hilly and mountainous areas, environmentally significant areas, the ozone layer and the coastal zone.

Also of relevance is Part 6 of the EMCA, which provides for environmental impact assessment (EIA). This is in agreement with Principle 17 of the Rio Declaration which extends the rule of prior assessment of potentially harmful activities to include those activities which have impacts solely within a state: "Environmental Impact Assessment (EIA), as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent National authority."

Pursuant to EMCA, NEMA has promulgated a number of environmental regulations of direct relevance to **UTaNRMP**:

- **Environmental (Impact Assessment) and Audit Regulations, 2003:** These Regulations stipulate how an EIA will be undertaken and what the EIA project and study report should contain. It also gives regulations on environmental audits (EAs), which the proposed project will be required to undertake later on. The regulations are thus important to the proposed project with regard to EIA and EA. Section 42 of the regulations also outlines what a Strategic Environmental Assessment (SEA) is and what it should entail. It vests the responsibility of carrying out an SEA on lead agencies in consultation with NEMA.
- **Environmental Management and Co-ordination (Water Quality) Regulations, 2006:** The new Water Quality Regulations provide for the protection of lakes, river, streams springs, wells and other water sources. This regulation also gives a minimum distance from a water body for which any development may be undertaken. The regulations also give quality standards for different water uses, and for effluent to be discharged into the environment.
- **Environmental Management and Co-ordination (Waste Management) Regulations, 2006:** The Waste Management Regulations set out standards for handling, transportation and disposal of various types of wastes. The regulations stipulate the need for facilities to resort to waste minimization or cleaner production, waste segregation, recycling or composting.

- **Environmental Management and Coordination (Conservation of Biodiversity, Access to Genetic Resources and Benefit Sharing) Regulations, 2006:** The Conservation of Biodiversity Act, sections 5-9, provides for the protection of endangered species, creation of an inventory and monitoring of their status, protection of environmentally significant areas, provision of access permits, and material transfer agreements and benefit sharing.
  - **Environmental Management and Co-ordination (Fossil Fuel Emission Control) Regulations, 2006:** The Fossil Fuel Emission Control Regulations provide for acceptable emission standards in Kenya. Section 4 of the regulations states that any internal combustion engine for motor vehicles and generators must comply with the emission standards provided for in the First Schedule of those regulations. Section 8 provides that any person intending to use any fuel catalysts other than those permitted by the authority to disclose it and seek prior approval. Establishments (including construction sites and operational substation sites) that use generators as alternative sources of energy must take account of the regulation on the emission standards.
  - **Draft Environmental Management and Coordination (Air Quality) Regulations, 2008:** These regulations provide for the safeguarding of the ambient air quality and give guidelines to prevent and control air pollution. The first and seventh schedules of the regulations provide a list with associated emission limits of prohibited, controlled, and un-controlled air pollutants. The regulations also give ambient air quality tolerance limits.
  - **Environmental Management and Co-ordination (Noise and Excessive Vibrations) Regulations 2009:** These regulations define noise as any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment. The regulations prohibit any person from making or causing to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.
  - **Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009:** These regulations provide for the protection of all wetlands on both private and public land. The regulations provide for sustainable exploitation of wetlands and are aimed at maintaining both the wetlands and hydrological, ecological, social and economic functions and services.
2. **The Forest Act, 2005 and Forest conservation and Management Act 2014:** This Act creates a new semiautonomous body, the Kenya Forest Service (KFS) and supportive institutions for management and conservation of all types of forests. This Act mandates the KFS to conserve and manage all forests. It also sets out the roles and responsibilities of communities in managing forests. KFS is also responsible for formulating policies regarding the management, conservation and use of all types of forest areas in the country. The Act embraces the concept of participatory forest management and gives particular consideration to formation

of forest community associations (CFAs), which are recognized as partners in management. It enables members of forest communities to enter into partnership with KFS through registered CFAs. It also allows lease arrangements by interested groups to supplement Government efforts in plantation forest. With regards to UTaNRMP, the act is important in the engagement and participation of CFAs in participatory management of forests, and allowing the communities to accrue tangible economic benefits from conservation activities.

3. **The Water Act, 2002:** This Act provides for the management and developments, conservation, use and control of water resources and for the acquisition and regulation of rights to use water, to provide for the regulation and management of water supply and sewerage services. The Act provides for increased and deliberate focus on the two key sub-sectors: Water Resources Management (WRM) and Water and Sanitation Services (WSS). The Water Act commenced by virtue of Legal Notice No. 31 of 18<sup>th</sup> March 2003 and Legal Notice No. 158 of 29<sup>th</sup> August 2003 provided for a reformed legal/institutional framework for the management and development of Kenya's water resources and the provision of water services.
4. **The Agriculture Act (Chapter 318):** This Act is the principal land use statute covering *inter alia* soil conservation, agricultural land use and conservation issues such as the preservation of soil fertility. The Act prohibits any land use practices that may intensify soil erosion. They prohibit cutting down or destroying vegetation on any land of which the slope is 35 per cent, except if the activity is done within the conditions sanctioned by an agricultural officer. Section 48 on land preservation rules prohibits the cultivation, cutting down or destruction of vegetation on any land of which the slope exceeds 20 percent. The rules stipulate strict regulations on the cultivation of any land whose slope is between 12 percent and 35 per cent when the soil is not properly protected from erosion. The Act also provides for protection of watercourses setting aside a riparian zone of a minimum two meters equivalent to the width of river to a maximum of 30 meters.
5. **The Irrigation Act (CAP 347):** This Act created the National Irrigation Board (NIB) and is being reviewed. It basically created tenant-based irrigation schemes which, though ideal at the time, are no longer ideal in the present times. In the current form the irrigation act does not give clear provisions for the management and coordination of irrigation activities. Further the irrigating communities are not empowered to participate in the planning and implementation of the schemes. Other acts closely tied to the irrigation act are those for regional development authorities.
6. **The Lakes and River Act, Cap 409, Laws of Kenya:** This Act provides for protection of rivers, lakes and associated flora and fauna. The provisions of this Act shall be

applied in the management of the WRM projects. The Act in its Part IV specifies that the Minister may make rules for protecting the bird or animal life on or in a lake or river. This Act in essence has an environmental accent specific to the use of lakes and rivers and maintenance of the same with respect to dredging and transportation.

- 7. The Fisheries Act, 1991 Edition:** This Act (CAP 378) is an Act of parliament providing for the development, management, exploitation, utilization and conservation of fisheries. Fisheries, as defined by the act, include all living and non-living marine and fresh water animals. These animals constitute a large share of the water resources that need to be well managed. The Act has contributed positively to the promotion of extension and training services, research, and marketing and conducive fish management infrastructure. It has further provided guidelines and auxiliary legislations on proper management of any fisheries. These include: fish management measures, registration and licensing, fishing methods and fishermen credit facilities.
- 8. The Public Health Act (Cap 242):** Health and hygiene are particularly important where communities congregate for a shared resource such as water. Section 116 requires Local Authorities to take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Part IX Section 115 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under Section 118. Any noxious matter or waste water flowing or discharged from any premises into a public street or into the gutter or side channel or water house, irrigation channel or bed not approved for discharge is also deemed as a nuisance.
- 9. The New Wildlife Bill:** The new bill once passed will replace the current Act. The bill deals with the protection, conservation and management of wildlife in Kenya. As per the Bill, the overall mandate of KWS is to conserve and manage wildlife in Kenya. The bill however opens up the management of wildlife to other partners and even communities in collaboration with KWS. Further, the new bill proposes to establish County wildlife areas and committees which will incorporate locals and provide a platform for collaboration between the Service, communities, county governments, landowners and other stakeholders. The Bill also facilitates communities and landowners to benefit from revenues and other rights derived from use of wildlife resources within their regions. The bill further provides for compensation for wildlife damage and also provides incentives including payment for Environmental Services for wildlife conservation and protection. Under UTA-NRMP the bill/act is important with regards to mitigation of human wildlife conflicts, and the management of the Aberdares and Mt. Kenya ecosystems.

A number of other laws, as shown in **Table 4.2** make up the legal/regulatory framework with relevance to **UTaNRMP**.

**Table 4.2: Other Relevant Laws**

Laws of Kenya	Mandate
The Local Government Act, Cap 265	Provides for making by-laws and institutions by the Local County Councils. By-laws can be made on the governance of a project under the provisions of this Act.
The Registered Land Act, Cap 300	Provides for the absolute proprietorship over land (exclusive rights). Such land can be acquired by the state under the Land Acquisition Act.
The Land Adjudication Act, Cap 95	Provides for ascertainment of interests prior to land registrations under the Registered Land Act.
Labour Laws of Kenya, including Employment Act 2007	Deals with new conditions of employment and rights of workers, including paternity leave for fathers. All workers, including those employed during the construction phase, will be employed under this Act, which includes provisions with respect to minimum wage, working conditions and time, and also in the resolution of disputes.
The Factories and Other Places of Work Act (Cap 514)	Governs requirements for occupational health and safety at the place of work. The Factories Act identifies up to 43 requirements which include; observing high standards of cleanliness, avoiding overcrowding, constructing and maintaining adequate ventilation, and providing and maintaining suitable natural or artificial lighting, as appropriate. Once again, this will be of particular relevance to the construction phase and operation of temporary worksites, as well as to the operation of substation sites.
Traffic Act Cap 403	Prohibits air pollution through Section 51 which requires that motor vehicles use proper fuels. The Act requires that every vehicle be so constructed and used as not to emit any smoke, or visible vapour. The amendment further prohibits the use of any stationary internal combustion engine, discharging exhaust gas into the atmosphere without treatment.
The Lakes and River Act, Cap 409	Provides for protection of rivers, lakes and associated flora and fauna. Part IV of the Act specifies that the Minister may make rules for the protecting bird or animal life on or in a lake or river
National Museums and Heritage Act 2006	Gives provision for an area of land of cultural significance to be set-aside or acquired under compulsory provision and declared a protected area under Sections 34 and 35 of the Act. Monuments gazetted under this Act fall under the management of the National Museums of Kenya. Several of these monuments include forests of cultural and biodiversity significance.
The Antiquities and Monuments Act, 1983 Cap 215	The Act aims to preserve Kenya's national heritage by empowering the National Museums of Kenya to collect, document, preserve and enhance knowledge, appreciation,

	management and the use of these resources for the benefit of Kenya and the world. Through the National Museums of Kenya, many sites are protected by law by having them gazetted under the Act.
The Penal Code (Cap. 63)	Section 191 of the Penal Code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same act says a person who makes or vitiates the atmosphere in any place to make it noxious to health of persons/institution in dwellings or business premises in the neighbourhood or those passing along way, commits an offence punishable by law.

#### 4.4 Multilateral Environmental Agreements

Kenya has ratified various international conventions on environment that may be applicable to activities under the **UTaNRMP**. Kenya has signed the **International Convention on Biological Diversity (CBD) of 1992**, which promotes the protection of ecosystems and natural habitats, respects the traditional lifestyles of indigenous communities, and promotes the sustainable use of resources. The country is already reviewing its National Biodiversity Strategy and Action Plan (NBSAP) so as to meet the Aichi Target which aims to halt loss by biodiversity by year 2020. UTaNRMP is in line with the CBD and NBSAP, including the Aichi target with regards to promoting local communities appreciating and valuing biodiversity so as to conserve and use it sustainably; suing area based conservation; and ensuring biodiversity conservation in agriculture and aquaculture.

Kenya is also party to the World **Heritage Convention (1972)**, which is concerned with cultural and natural heritage. The convention deals with monuments and areas that are deemed to be of “outstanding universal value” in terms of beauty, science and/or conservation. Kenya has several sites that have been declared World Heritage Sites, such as Mt. Kenya’s natural forests. Any deterioration or disappearance of such heritage is a loss to all the nations of the world.

The importance of wetlands and water birds are also covered under the **Ramsar Convention of 1971**, which governs wetlands of international importance. The convention entered into force in Kenya in 1990 and Kenya is therefore committed to avoid degradation of wetlands under its jurisdiction. UTaNRMP is in line with this convention as it tries to conserve wetlands.

Kenya has also ratified the **Agreement of the Conservation of Eurasian Migratory Water Birds (2001)** and the **African Convention on the Conservation of Nature and**

**Natural Resources (1968), the Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES) 1973**, which prohibits trade in species such as Dugongs and also in Ivory. This will be observed as the project tries to minimize human-wildlife conflicts, which mainly involve elephants.

The **United Nations Framework Convention on Climate Change (UNFCCC or FCCC)** is an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty itself sets no mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. In that sense, the treaty is considered legally non-binding. Instead, the treaty provides for updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol, which has become much better known than the UNFCCC itself. UTaNRMP is in line with this convention as it reduces green house emission through afforestation programmes, use of biogas plants, and promoting energy efficient appliances.

The **United Nations Convention to Combat Desertification (UNCCD)**: Kenya is also a signatory to this treaty which aims to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements. The Convention, the only convention stemming from a direct recommendation of the Rio Conference's Agenda 21, was adopted in Paris on 17 June 1994 and entered into force in December 1996. It is the first and only internationally legally binding framework set up to address the problem of desertification. UTaNRMP is in line with the convention with regards to trees planting, soil conservation, and water management. Kenya is in the process of reviewing its National Action Plan over the next 18 months with UN/GEF support.

## **5. OVERVIEW OF CONSULTATIONS AND PUBLIC/STAKEHOLDER ENGAGEMENT ACTIVITIES UNDERTAKEN**

The SEA report benefited from extensive community consultations with a wide cross section of stakeholders. The consultations were categorised into two. The first was the institutional stakeholders and the second was the community stakeholders.

The institutional stakeholders were drawn from line government ministries and departments, as well as the related projects. Community stakeholders on the other hand were community representatives drawn from various structures that deal with natural resources management such as Water Resources User Associations, (WRUAs), Community Forest Associations (CFAs), irrigation schemes, dairy goat breeding groups, Women groups, groups for people with disabilities, youth groups and tea and coffee factories (please see annexes 2 & 3 for the full list of participants in these stakeholder forums.

One institutional stakeholders meeting and four community stakeholders' workshops were held between 2<sup>nd</sup> and 9<sup>th</sup> of March. Community meetings were held in Nyeri Meru and Embu, so as to improve accessibility and attendance. A total of 140 community representatives attended the community consultations forums while about 40 institutional stakeholders attended the consultative meeting.

The consultation meetings served two purposes. First they offered an opportunity for stakeholder sensitisation on the upcoming project. Secondly they presented an opportunity for the SEA study team to gather data information on issues relevant to the SEA study. To better address the latter objective of the consultation meetings, participants were first taken through the key highlights of the issues to be explored under the SEA study. This initial presentation got the participants to focus on the issues under focus. The presentation was followed by a plenary session where clarifications and elaborations were sought. Participants were then divided into groups based on the sector one represented and in the case of community consultation meetings, participants were divided into agro-ecological zones that they came from. Two broad categories of agro-ecological zones were used, the upper and the lower parts of a county. This strategy worked in ensuring people were responding to issues based on their daily experiences.

In the breakout groups participants were issued with a list of questions to guide their discussions. The questions were aimed at generating additional information from the participants which could compliment what was already available in documents. More time was allowed for these discussions.

In general institutional stakeholders highlighted the need to highlight and document ways in which the project fits in within the broader legislative and policy framework

in the county. They also observed that issues on climate change will need to be explored and documented. Climate change is directly linked to project activities. Participants further highlighted some of the key environmental and social concerns that need to be incorporated into the SEA report. Similar suggestions came from community stakeholders. In-deed, results from these consultations form the basis of this report.

## **6. PREDICTION AND EVALUATION OF IMPACTS INCLUDING CUMULATIVE EFFECTS**

The environmental and social impact arising from MKEPP as seen through Impact Assessments and Environmental Audits were largely positive and the same is expected of the UTaNRMP project.

The total project cost (not including management and coordination) is USD 60 million. Overall, the direct project beneficiaries are estimated at 200,000 households and the project cost per household is approximately USD 300. Green Water Credits (GWC) has estimated that an intervention of this magnitude would generate about USD 2.0 million per annum in benefits to downstream water users alone, mainly through increased quality and availability of water for domestic use and hydropower generation.

There will also be a much larger number of indirect beneficiaries who will enjoy the improved environmental conditions in the project area, community empowerment, and various forms of training and capacity building. Indirect beneficiaries also include downstream water users outside the Upper Tana catchment, like those in Nairobi City.

Due to the environmental and social conditions in the Upper Tana, and the potential nature of environmental and social adverse impacts, caution must however be taken in the design, implementation, operations, maintenance, and possible decommissioning of some activities in the eight year period. Monitoring and mitigative measures must thus be incorporated in the overall programme.

### **6.1 Potential Positive Impacts**

- 1. Improved Environment:** The Thrust of the project is exploiting existing opportunities that both improve livelihoods, and the natural environment. This is because poverty contributes to environmental degradation which in turn reduces sustainable livelihood opportunities. The project thus simultaneously addresses both social and environmental objectives.

The improved environment will arise as a result of direct investments in the environment including forests and hill top rehabilitation, on-farm soil conservation, on-farm tree planting, school greening, protection of springs and wetlands, protection of river banks, and rehabilitation of environmental hot spots. Additionally, an improved environment will arise as a result of improved and heightened environmental awareness within the Upper Tana Communities. The awareness will be complimented with capacity building in sustainable

management of natural resources through training which will in turn assist communities play an active role in reversing the degradation already in place.

- 2. Improved water resources management:** UTaNRMP is expected to realize overall environmental and social benefits in improved water resources management very similar to those achieved by MKEPP. These include enhancement of water-use efficiency and rationalization of water abstractions from rivers and springs; improved water supply; sound management practices in the river basins by WRUAs and communities; springs protection; river banks stabilization; remedial work on pollution and environmental hotspots; and protection of wetlands. All these will translate into cleaner water, improved water supplies; less water related conflicts, and improved sanitation and subsequently better health to communities. Overall about 60,000 households are set to benefit from UTaNRMP in this sector, mainly through improved water access arising from the protection and construction of springs, boreholes, and wells. Ground water recharge will also be aided through harvesting structures like small dams at household level.

A further 2,000 households will benefit from improved water saving irrigation technologies like micro-irrigation techniques and piped conveyance systems. The UTaNRMP will upgrade irrigation systems on about 1,000 ha of land, creating savings in water use of about 5,000 cubic metres per hectare. The value of water saved and available for downstream usage is estimated by GWC to be worth some KES 18 per cubic metres. The total value of water saved is estimated at KES 90 million (USD 1.0 million) per annum.

- 3. Enhanced conservation of forests, soils, and other natural resources.** UTaNRMP is also expected to realize environmental benefits from enhanced conservation of natural resources similar to those achieved by MKEPP. This will effectively reverse environmental degradation taking place in the project area and promote sustainable management of the natural resource base on which the communities depend for their livelihoods. This will translate into improved tree cover, reduced soil erosion, rehabilitation of degraded areas, and improved conservation practices. This will also have benefits to downstream water users, associated with reduced reservoir siltation rates and increased dry season stream flows which will translate to improved availability of water for Nairobi and increase the amount of hydro-power generated. To further enhance this impact, the project will give matching grants for soil and water conservation to benefit about 16,000 households. The net cash flow generated from S&WC interventions on about 8,400 ha of agricultural land is expected to reach almost KES 500 million (USD 5.6 million) per annum, equivalent to about USD 660 per hectare.

Enhanced conservation will also be greatly boosted by the capacity building of communities, and community based institutions responsible for natural resources

management like CFAs, WRUAs, and FDAs, and using the same capacitated persons and institutions to manage and serve as custodians of the natural resources.

4. **Climate change mitigation and adaptation:** Forest restoration and overall tree planting will lead to improved carbon sequestration, thereby helping reduce the accumulation of CO<sub>2</sub> in the atmosphere. Coupled with improved water flow, this will also enhance the capacity of local people to cope with climate change through livelihood adaptation. Amelioration of climate change will also arise from the use of efficient energy technologies, and other renewable energy technologies like biogas.
5. **Reduced Human-Wildlife conflicts:** Human-wildlife conflicts in the forest adjacent communities have a lot of negative impacts to both humans and wildlife, threatening their livelihoods and life. The erection of the electric fence will drastically reduce this conflict, improving the livelihoods of neighboring communities and even endearing the animals to them. Fencing of the ecosystem will also enhance conservation activities in Mt. Kenya. Illegal activities such as poaching or subsistence hunting will be minimized, as access to the forest will be done through legal access routes. The involvement of communities in project will also ensure that perpetrators of such illegal activities are apprehended through community policing. The fence will also enhance food security and alleviate poverty as farmers who might have abandoned their farms will start farming since the problematic animals will be contained within the protected area. Overall, the fence will benefit about 80,000 households and will also improve relations between communities and KWS/KFS.
6. **Improved security and social order:** Tied to the electric fence, will be improved security as the community members will no longer live in fear of potential raids and attacks by animals. Initially, community members formed vigilante groups to keep away animals especially elephants. This in essence disrupts their social order as they sleep during the day when they are supposed to work. Children also go to school late due to fear of encountering animals on the road or sleep in class as they keep vigil at night. This will drastically change once the fence is put up. Keeping vigil at night to prevent animals from raiding farms predisposes community members to cold related diseases such as pneumonia. Hence erecting a fence will ensure that farmers can stay in their houses at night.
7. **Improved incomes and livelihoods:** Incomes and livelihoods will improve from increased food production through the adoption of soil and water conservation measures in farmers' fields, from improved irrigation, from adoption of Income Generating Activities (IGAs). Incomes and livelihoods will also increase as a result

of improved capacity of communities arising from training. The Impact Assessment Study (IAS) for MKEPP performed in 2009 cited positive changes in income levels since MKEPP started operating in the project area in 2005. The IAS found that the increases in income levels ranged from a high of 44 percent in Meru South to a low of 12 percent in Mbeere. While these increases in income cannot be attributed to MKEPP alone, the pilot project clearly made a contribution, and the same is expected from UTaNRMP. Matching grants for IGAs, estimated to be given to 3,200 CIGs (about 40,000 households) during the project are expected to reach a cash of KES 950 million (USD 10.5 million) or about USD 260 per household participating. Incomes will also arise from the opportunities to develop eco-tourism enterprises, and other non-consumptive uses of natural resources like bee keeping and processing, and fish farming (including along rivers).

- 8. Maintenance of biodiversity:** By rehabilitating degraded areas using indigenous trees, and promoting natural regeneration where possible, as has been done under MKEPP, UTaNRMP will help conserve biodiversity. Biodiversity conservation will also arise from restoration of forest habitats. The maintenance of biodiversity will also assist communities fully comprehend and internalize the concept of participatory forest management.

## **6.2 Potential Negative Impacts**

The activities proposed under UTaNRMP can actually be described as mitigative measures for the ongoing environmental degradation in the Upper Tana. The same activities have indeed, been undertaken under MKEPP, the pilot for UTaNRMP, with largely positive impacts.

It is however important to consider any potential adverse impacts which can arise, as even mitigation measures themselves can give rise to some form of adversity, albeit of a comparatively lesser impact than that being mitigated. The identification of potential impacts is important so that measures to avoid, reduce or offset them are put in place in the project design and in the Environmental and Social Management Plan (ESMP) or Framework (ESMF). Cumulative impacts are also a major consideration among the adverse impacts, as several small impacts may become significant when consolidated.

- 1. Change in vegetation pattern:** This can arise from construction related activities which lead to clearing of vegetation. In erecting a wildlife barrier, for example, a 10 metre corridor is usually cleared where the fence will be aligned to give way to a motorable road on either side of the fence. This results in the clearing of a lot of vegetation in the form of trees, shrubs and undergrowth which in turn destroys some biodiversity and also reduces wildlife and other habitat. Vegetation

also forms part of the overall life supporting resources for animals, and an important component of the forest's ecological services role which is lost with the clearing. Loss of vegetation will also result in soil erosion and loss of soil moisture.

**2. Soil erosion:** This is closely tied to loss of vegetation which exposes the soil to soil erosion, lowers soil organic matter, soil carbon, and nutrients, reducing soil fertility and even biodiversity. Soil erosion may also arise from excavation works during any construction of dams, wells, pitting, roads construction, and rehabilitation works. Soil erosion may lead to sedimentation of water bodies, especially rivers and dams, impacting on hydrology, freshwater stream flow, light penetration, and hydro-electricity generation.

**3. Restriction of wildlife movement:** Mt. Kenya forest is already virtually isolated from neighbouring wildlife habitats by intense small scale agriculture. However, the fence will have the effect of curtailing all animal movement outside the forest, where it is erected. The fence will thus reduce their habitat and access to any resources like water and salt licks which may be fenced off. The reduced access to any resources that animals currently use may result in overgrazing and trampling of vegetation leading to environmental degradation, changes in breeding patterns and behaviour.

**4. Transfer of human wildlife conflicts:** The construction of sections of the fence might also lead to wildlife seeking alternative routes, which might create or increase conflicts in other areas. This mainly comes about as problem animals, especially the elephant, are able to follow the built fence until where it terminates, and then moving out of the protected areas, thus causing conflicts in the non-fenced area.

**5. Cumulative impacts:** These may appear insignificant but when the number of interventions and geographical coverage of the area is considered might be the most significant. Cumulative impacts include:-

**A. Compaction of soils:** This can arise from vehicular movement during surveys, transportation of materials and persons, and during monitoring and evaluation activities. Compaction of soils can also arise from livestock convergence at watering points provided through project interventions. The compacted soils facilitate erosion especially at the onset of rains.

**B. Water Pollution:** This can arise from construction works like water intakes, and springs development. Others may arise from anthropogenic activities around project activities e.g. washing of clothes at springs leading to pollution downstream. Water

pollution may also arise from use of chemicals and pesticides in irrigation projects as these might substantially increase nitrogen, nitrates, potassium, sulphites and phosphates in the soil with subsequent leeching into ground and surface water, potentially leading to eutrophication.

**C. Solid wastes:** These can arise during construction works e.g. from left over construction materials used, and wastes generated by construction workers in form of waste food, papers, and packaging materials. Solid wastes may result to subsequent soil pollution, foul smells, and if allowed to pile up or spread, to an eyesore. Solid wastes especially food, also have the potential for affecting some wildlife behaviour as some become dependent on human foods. Littered plastic paper bags in conservation areas may be swallowed by animals leading to death.

**D. Air pollution:** This can arise from dust and exhaust fumes from vehicles and machinery used. Air pollution may also arise from foul smells arising from improperly disposed solid and liquid wastes.

**E. Noise:** This may arise from vehicular movement, construction machinery, and construction workers. Noise may impact on communities and animals in protected areas.

**F. Water Losses:** This may arise from burst pipes during construction and operation phases for domestic and irrigation projects. Water losses may also be experienced in irrigation schemes where excess water may be utilized.

**G. Water Logging:** This may arise in irrigation projects and may result in poor drainage and soil salination. This may subsequently impact on water quality in water bodies.

**I. Water-borne diseases:** This may increase as a result of stagnant waters which aid breed disease vectors like mosquitoes, or nematodes giving rise to diseases like malaria and bilharzia.

**J. Over abstraction of Water:** the various water interventions may result in over-abstraction of water leading to severe shortages downstream. This is critical as the water in the upper Tana is not sufficient for own use, especially considering that the catchment also provides water for key cities like Nairobi. This is more so during the drier months of the year.

**K. Water-Conflicts:** Insufficient water for downstream users usually creates conflicts with upstream. Investment in the catchment areas will take a while before water volume increases. In the medium term it is expected that demand for water will increase as people learn better farming methods, for example through irrigation. This will inevitably lead to changes in water resources usage which may trigger conflicts. Fortunately, potential areas of conflicts are well known by the community members and different groups have different ways of resolving these differences. Conflict resolution methods that community members employ will come in handy in avoiding and resolving any conflicts that may emerge.

**L. Increased accidents:** This may arise from electric shocks during maintenance of the fence impacting on people and livestock especially if they are not sensitized about the dangers of the electric fence. Other accidents may occur during transport and construction phase as people handle different machines, tools and vehicles.

**M. Use of Agro-chemicals:** The use of irrigation has led farmers to shift from traditional crops to grow new crops. The new crops require artificial fertilizers and pesticides and their use has increased substantially during the MKEPP period. This trend is bound to continue under UTaNRMP. Artificial fertilizers and pesticides have these impacts on micro-organisms and thus overall soil fertility.

**N. Inappropriate choice of tree seedlings:** Though tree planting is generally helpful to the environment, planting of wrong tree species or planting them in the wrong areas e.g. eucalyptus trees in riverine area, can have a negative impact. The Mount Kenya region supports a narrow range of tree seedlings which is risky in case of disease and pests outbreak.

## **7. ALTERNATIVES PROGRAMME OPTIONS COMPARED AGAINST ENVIRONMENTAL INDICATORS AND JUSTIFICATION FOR CONSIDERED ALTERNATIVES**

UTaNRMP is a scaling up of MKEPP, and the project is largely based on what worked well in MKEPP, with appropriate modifications based on lessons learned. MKEPP, being a pilot, was the stage where various alternatives were actually tested and considered. The pilot phase was highly successful, and the UTANRMP is thus based on what was tried and tested, and seen to be both environmentally and socially sound. Lessons learnt from the pilot have also largely informed the new project with respect to mitigating adverse impacts and enhancing positive ones.

The main goal of the project is to contribute to reduction of rural poverty in the Upper Tana River catchment through increased sustainable food production and incomes for poor rural households and sustainable management of natural resources for provision of environmental services.

The environmental and social indicators for desired outcomes of the proposed project include:

- Improved incomes of communities in project area;
- Improved food production and security;
- Improved farm and non-farm income generating activities by common interest groups;
- Communities with increased awareness of natural resources management;
- Improved capacity of local community groups in managing natural resources sustainably;
- Community action plans for livelihood improvement and sustainable NRM;
- Agricultural packages adopted to various agro-ecological and socio-economic contexts;
- Sustainable management of water resources the Upper Tana; and
- Sustainable management of forests and agricultural ecosystems.

To meet these indicators, several alternatives were considered including:-

**Geographical targeting:** The project area is quite large and the proposed interventions would be spread too thinly if undertaken throughout the upper Tana catchment. A river basin approach, targeting critical river basins and forest areas was thus chosen. In targeting the river basins, the project will further target only 5 KMs stretches on each side of the river. The project will however include known environmental hotspots in the whole upper catchment.

Additionally, within the river basins, the project will target Focal Development Areas based on poverty, degradation of natural resources and other social indicators. Further, the project will use an ecosystem approach rather than an administrative one. In this regard, some river basins and FDAs might be in more than one county.

**Prioritization of river basins:** Instead of initiating project activities in all the river basin, the project will initially work in 12 river basins which were selected based on five criteria: (i) rivers that are over-utilised with high levels of water use inefficiencies; (ii) those with significant pockets of environmental degradation; (iii) those with greatest risk of natural resources degradation; (iv) those cutting across several agro-ecological zones and; (v) those having a large section of needy population.

**Sustainability:** For sustainability and ownership, the project chose to engage and work with local communities to implement project interventions. It has gone further to working with community groups engaged in natural resources management, namely CFAs, WRUAs, and FDACs. It will build capacity of these institutions and their members to sustainably manage their local natural resources, while at the same time deriving benefits for their sustenance. The project will work with recognized environmental management tools developed by the communities themselves, such as Sub-catchment Management Plans developed by WRUAs and Forest Management Plans developed by CFAs.

The project will work with the custodians of natural resources in the Upper Tana providing them with a number of direct and indirect incentives to do things that are good for the environment, good for them, and from which other parties will also derive benefit.

**Irrigation:** Rather than expand existing irrigation systems or areas, the project specifically targeted improving water use efficiency where the irrigation is already taking place. The project found this alternative more environmentally friendly. Water use efficiency will also entail putting pipes where open canals exist and using drip irrigation rather than overhead irrigation.

**Technology:** The project also proposes to use the most environmentally friendly technologies available. This will include promoting drip rather than overhead irrigation, solar energy rather than diesel fuel for pumping water, solar power for the electric fencing, and innovative water harvesting technologies. Most of the technologies chosen are also simple, easy to use, and low cost.

**Human-wildlife conflicts:** to address human wildlife conflicts, the project has analyzed several methods including translocation of problem animals, use of game moats, control shooting, scaring and compensation for loss of property, among others. The effectiveness of these methods varies depending on the animals causing

the problems and the design and maintenance of barriers, such as game moats. Some of the methods used, like moats, were found to be expensive especially with regard to maintenance. Additionally, animals like elephants have with time learned how to fill moats up with soil and cave in the sides. Others like live fences may be limited in terms of efficacy.

The electric fences were thus found to be the preferred and most suitable human-wildlife resolution mechanism. They have been tried and have had a good success rate in mitigating the problem. They are also a long-term solution so long as they are well maintained, and vandalism addressed.

The fence alignment has also considered various alternatives as fences need maintenance. Other alternatives considered were sources of power, and materials for construction. Solar power was found to be the best option and is fairly easy and cheaper in the long run. It has also been tried and seen to work elsewhere. Its main handicap is vandalism and theft of panels and batteries. **Table 13** shows the various fencing alternatives the project considered:

**Table 13: Various Animal Control Alternatives Considered**

Control Method	Effectiveness	Environmental Impact	Cost
Electric Fencing	High	Medium	High
Vegetation barriers	Low	Medium	Low
Elephant Drives	Low	Low	High
Control shooting	Medium	High	High
Brush fences	Low	Low	Low
High Tensile fences (Steel fences)	Medium	Medium	High
Stone Walls	Low	Low	Medium
Moats and Ditches	Low	Medium	High

Source: DHV consultants, 1992.

**No action alternative.** The “no action” or no project alternative would maintain the *status quo* of the situation in the Upper Tana catchment. As such, the project proposed interventions would not be implemented. This alternative would thus result in (i) the ongoing degradation of the water and other natural resources of the catchment including forest encroachment, high rate of high rates of soil erosion, river siltation, loss of productive agricultural land, and further decline of crop yields (ii) the continuation of human-wildlife conflicts, and (iii) little or no improvement in the low agricultural production of farms in the project area, the high poverty levels of catchment communities, and the social hardships endured by local populations. In fact, the social situations and environmental degradation can only become worse

with rising populations, with continued unsustainable exploitation of the natural resources, making the poverty–environmental degradation cycle even more vicious. Indeed, the project concept identifies poverty as the main cause of environmental degradation, which leads to even worse poverty levels in the long term. This makes the no project alternative both expensive and unacceptable to the local communities. For these reasons, this alternative was rejected in favor of the current project design.

## 8. LINKAGES WITH ONGOING PROJECTS

**MKEPP** is the main link to the proposed project as UTaNRMP is a scaling up of the pilot phase, with appropriate modifications based on lessons learned. Key linkages with MKEPP include: (i) the extensive use of participatory approaches in project implementation, community engagement and institutional collaboration, hence enhanced community involvement and ownership of Project activities; (ii) technical and social capacity building of stakeholders to enhance sustainability, including the use of community resource persons to provide extension services; and (iii) input and financial support to community livelihood projects to encourage technology uptake.

MKEPP aspects to be strengthened in UTaNRMP include: (i) transparent mechanisms for access to project support for livelihoods; (ii) collaboration with the private sector, for example, to improve soil and water conservation in coffee fields; (iii) collaboration with private sector service providers, as well as research institutions to develop public-private partnerships for more sustainable development; and (iv) greater emphasis on reducing human-wildlife conflicts which jeopardise the conservation-livelihoods thrust of the project.

UTaNRMP will also link up with the World Bank Sponsored **Natural Resources Management Project (NRMP)** which is being implemented in the same project area till mid-2013. NRMP is also a natural resource management project with similar interventions to UTaNRMP and thus the new project will seek synergies with the project especially with regards to funding and technical support to the Community Forestry Associations (CFAs) and Water Resource User Associations (WRUAs). The project will therefore develop a phased plan for transferring funding and support of the WRUAs from NRMP to UTaNRMP during 2012-13.

UTaNRMP will also incorporate some of the **MKEPP-GEF** activities into the new project, with considerable potential for synergies arising from closer integration between environmental and livelihood activities. MKEPP-GEF activities considered most suitable for inclusion in UTaNRMP are those that deliver direct livelihood benefits to the target group, especially the forest-dependent communities who live on the margins of the forest reserves. It is also possible that in next round of GEF funding (GEF6) beginning in 2014 new funding could be mobilised to continue some of the MKEPP-GEF activities which are not eligible for IFAD support.

**Payments for Environmental Services (PES):** UTaNRMP will collaborate with the IFAD/Alliance for a Green Revolution in Africa (AGRA) supported **PROFIT** which has a USD 20 million risk-sharing facility. This will be done through support to commercially viable investments by “land care” and “forest care” groups in soil and water conservation which incorporate sufficient incentives to provide the desired ecosystem services.

**Wildlife Barriers:** In putting up the wildlife barrier, UTaNRMP will collaborate with KWS, KFS, Rhino Ark, Bill Woodley Trust, local communities and other stakeholders who target to fence round the Mt. Kenya to reduce human wildlife conflicts. UTaNRMP will also have linkages with other IFAD projects in East and Central Africa, where lessons from these projects can be incorporated. Key lessons learnt and incorporated in the UTaNRMP design include:

- sustainability is enhanced by active involvement of communities in NRM through participatory planning and the development of CAPs which reflect the linkages between livelihood improvements and environmental management;
- legal and regulatory instruments have a role to play in achieving more sustainable utilisation of natural resources, along with participatory and community based approaches;
- the approach to irrigation development should focus on improving the efficiency of water utilisation and control of illegal water abstractions;
- improvements in the profitability of agro-based income generating activities are best achieved by engaging with the entire value chain; and
- Rewards or incentives for environmental services should be in the form of commercially sustainable investments in improved soil and water management, rather than cash payments.

**Mt Kenya Ecosystem Management Plan, 2010-2020:** This plan was funded under the MKEPP-GEF project, and involved KWS, KFS, WRMA, KEFRI, and NEMA. The ten year plan follows the KWS Protected Area Planning Framework (PAPF) which adopts an ecosystem approach to plan development and implementation with a view to addressing conservation issues holistically and actively involving local communities and other stakeholders in ecosystem conservation and management. The plan has seven main programmes:

1. Ecological Management Programme
2. Forest Resource Management Programme
3. Water Resource Management Programme
4. Tourism Development and Management Programme
5. Community Partnership and Education Management Programme
6. Security Management Programme
7. Protected Area Operations Programme

UTaNRMP will have linkages with the management plan with regards to ecological management through habitat restoration and protection; forest resource management through promoting participatory forest management, re-forestation and establishment of indigenous and plantation forests; water resources management through controlled water abstraction, and conservation by controlling illegal abstraction, riparian cultivation, pollution and siltation of rivers and dams, and

soil erosion; and community partnership and education programme in reducing human-wildlife conflicts.

**Aberdare Ecosystem Management Plan 2010-2020:** This plan was funded by Rhino Ark and KWS, and also involved KWS, KFS, WRMA, KEFRI, and NEMA. The ten year plan also follows the KWS Protected Area Planning Framework (PAPF). The plan has nine main programmes:

1. Ecological Management Programme
2. Natural Forest Resource Management Programme
3. Plantation Forest Establishment and Management Programme
4. Farm Forestry Management Programme
5. Water Resource Management Programme
6. Tourism Development and Management Programme
7. Community Partnership and Education Management Programme
8. Security Management Programme
9. Protected Area Operations Programme

UTaNRMP will have linkages with the management plan with regards to ecological management through habitat restoration and biodiversity protection; natural forest management through promoting participatory forest management; plantation establishment and management through establishment of plantation forests through PELIS; Farm forestry through establishing nurseries and woodlots, and the school greening programme; water resources management through controlled water abstraction, and conservation by controlling illegal abstraction, riparian cultivation, pollution and siltation of rivers and dams, and soil erosion; and community partnership and education programme in reducing human-wildlife conflicts.

**TIST:** The International Small Group & Tree Planting Program (TIST), is one of the most innovative tree planting programs in the world. It operates in Embu, Meru and Nanyuki which also fall under the UTaNRMP. TIST provides hard-working farmers, both women and men, a stipend for planting trees, plus access to future, long-term income, through the global market for greenhouse gas (GhG) credits. The trees they plant store carbon by capturing and containing it as the tree grows. This stored carbon can be sold in the international carbon market to offset the carbon dioxide being released into the atmosphere by environmentally conscious individuals, companies and the world's most industrialized nations. TIST members learn to develop nurseries, plant trees to improve their land, recognize medicinal plants, and use water and wood efficiently. UTaNRMP has several areas where they can link up with TIST under their tree planting and forest rehabilitation initiatives. Collaboration with TIST may also enable UTaNRMP develop some Clean Development Mechanism (CDM) aspects.

**CCBA:** The Climate, Community and Biodiversity Alliance (CCBA) is a partnership of international NGOs and research institutes seeking to promote integrated solutions

to land management around the world. The CCBA has developed voluntary standards to help design and identify land management activities that simultaneously minimize climate change, support sustainable development and conserve biodiversity. UTaNRMP can borrow some of the CCBA standards with regards to climate smart initiatives, and biodiversity conservation under forest rehabilitation.

**The Rainforest Alliance:** The alliance's work in Kenya focused on large tea plantations. As part of the certification process, the organization reaches out to smallholder farmers -- each covering approximately half an acre. Each farmer has to consider and implement ecosystem conservation, worker rights and safety, wildlife protection, water and soil conservation, and agrochemical reduction which bring about environmental, social and economic benefits. The farmers are introduced to the Sustainable Agricultural Network (SAN) standards through a combination of farmer field schools and intensive training. UTaNRMP can link up with the alliance with regards to trees planting by farmers especially in the tea growing areas.

**KAPAP:** Kenya Agricultural Productivity and Agribusiness Project (KAPAP) is part of the Kenya Agricultural Productivity Program (KAPP) and will run to year 2015. The Project Objective is to increase agricultural productivity and incomes of smallholder farmers from agricultural and agribusiness activities. This objective is to be achieved by supporting improvement of agricultural research and extension systems and their linkages to sector priorities. The main focus of KAPAP is on agricultural diversification into high paying on-farm and off-farm activities, value addition, linking small scale farmers to markets, and promoting public private partnerships in service delivery. UtaNRMP can link with this programme under the Rural Livelihoods component, and especially with value addition, and marketing of products. KAPAP extension activities are focused on nineteen counties including Meru, Nyeri, Nyandarua, and Embu which also fall under UTaNRMP.

**GreenBelt Movement (GBM):** This is a grassroots organization which deals with tree planting both in the forests and on-farm. UTaNRMP can link up with GBM especially with regards to their Reforestation Biocarbon Project which is located in the Aberdares Range and Mt. Kenya. The project is a small scale Reforestation CDM project expected to sequester approx. 400,000 tonnes of carbon dioxide by 2017 by rehabilitating 2,000 ha of degraded land with indigenous trees. The project is to use 20 year crediting period with the option of renewal twice (to a maximum of 60 years). Communities carbon rights are ensured through Contract Agreements signed between GBM and CFAs. The project has been granted operating licence by NEMA after undertaking ESIA.

## 9. RECOMMENDATIONS

### 9.1 Recommended Inputs to Project

1. **Wetlands:** While MKEPP dealt with some wetlands which were adjacent or near springs, the whole upper Tana faces serious wetland reclamation for agricultural purposes, especially rice growing, and horticultural production. It is recommended that UTaNRMP take up the issue of protecting wetlands, which can be considered environmental hotspots in the project area. Wetlands, in their conservation, also offer several income generating options, in line with the wetland policy, where community livelihoods can be improved. These options, should be explored and exploited to conserve wetlands while at the same time improving livelihoods.

2. **State of Environment (SOE) Reports:** MKEPP undertook an SOE study for each of the 47 Focal Development Areas before any project interventions were carried out in order to provide a baseline status of the environment situation in each case. This SEA recommends that the UTaNRMP continue this policy of preparing SOEs for the new FDAs.

3. **Wildlife Barrier:** MKEPP GEF put up two fences of 10 KMs and 40 KMs respectively at Timau (Emburi Farm) and Kangaita/Chehe respectively. The 10 Km fence bridged a gap between other wildlife barriers and was effective in reducing wildlife conflicts in the area. The other fence has also effectively reduced conflicts in the specific area but has also had the impact of aggravating the impact where it terminates. It is thus recommended that UTaNRMP continue fencing from where the MKEPP- GEF fence ended. Further, it is recommended that the project collaborate with the Rhino Ark Project which aims to fence off the whole of the Mt. Kenya.

4. **Sustainable energy alternatives:** The human pressure on forest resources for fuel wood in the project area continues to result in forest degradation and increased release of green house gas emissions. UTaNRMP should investigate promoting additional energy-efficient and alternative energy interventions appropriate to the project area. These may include small-scale biogas systems for supplying energy for lighting and cooking; solar energy systems; and improved charcoal production using registered charcoal producers association as required in the new charcoal regulations by KFS.

5. **Capacity Building:** Under the various capacity building programmes, UTaNRMP should also consider including the following:

- While improving irrigation efficiency, UTaNRMP should also give basic capacity building in pest and pesticide management, including integrated pest management (IPM) techniques and traditional pest control methods, for

farmers and farmers' associations. This would be an additional topic for farmer capacity building already included in the project design and budgeted in the project costs.

- In light of recent fires which destroyed large tracks of vegetation and forests in both the Mt. Kenya and Aberdares, UTaNRMP should provide technical capacity building, including basic safety gear and equipment, for forest fire prevention and control for CFAs that assist in management of forested lands in the project area. The capacity building is already included in the project design and budgeted in the project costs. The gear and equipment may involve additional project costs.
- Technical capacity building for CFAs in developing and implementing Participatory Forest Management Plans that clearly indicate the carrying capacities of forest blocks. This would be an additional topic for capacity building already included in the project design and budgeted in the project costs.
- Technical capacity building in good water conservation and management practices for water service providers in the project area. This additional capacity building could be added to the capacity building already included for WRUAs and budgeted in the project costs.
- Technical capacity building in good water harvesting practices. This capacity building is already included in the project design and budgeted in the project costs.
- Technical guidance and project implementation manuals for water management and natural resource conservation sub-projects financed by the project and implemented by WRUAs, FDACs, and CFAs. This would be in addition to the Project Implementation Manual to be prepared by the PMU already included in the project design and budgeted in the project costs.

**6 Climate change:** The UTaNRMP must take into consideration the potential adverse impacts of climate changes on the project area. Climate change impacts to date are certainly difficult to quantify, but the SEA team heard anecdotal evidence supporting the projected changes in rainfall patterns, with similar rainfall amounts falling in shorter periods followed by longer dry spells from communities. UTaNRMP should identify and implement climate-smart interventions appropriate to the project area including:

- Raising awareness among farmers and community organizations of the potential impacts of climate change, using media campaigns, farmer field schools, etc. Awareness raising of this nature for WRUAs is already included in

the project design and budgeted in the project costs.

- Emphasizing increased water harvesting and storage at the household, farm and community levels in response to climate variability. Water harvesting and storage activities are already included in the project design and budgeted in the project costs.
- Producing and promoting drought-tolerant, disease and pest-resistant, as well as early maturing, crop varieties. Support for KARI research on these sorts of crop varieties is already included in the project design and budgeted in the project costs. This addresses also one of the priorities identified by the National Climate Change Response Strategy.
- Promoting orphan crops, such as sorghum, cassava, pigeon pea and sweet potato, which have been abandoned but are better adapted to the Kenyan context. This may be addressed in the support for KARI already included in the project design and budgeted in the project costs. Again, this is a priority of the National Climate Change Response Strategy.
- Enhancing systems for conveying climate information to rural populations, supporting Kenya's early warning system for disseminating weather information to farmers in the project area. This is also a priority of the National Climate Change Response Strategy that should be considered in project design and budgeting.
- Promoting conservation agriculture for sustainable and profitable crop production, based on minimal soil disturbance, permanent soil cover and crop rotations. This is already included in the SWC activities in the project design and budgeted in the project costs.
- Promoting intensive livestock production techniques, including animal feedlots, supported by extension services, to reduce illegal and over-grazing and livestock incursion into forest areas. This is consistent with zero-grazing policies in the project area and should be considered in project design and budgeting.

**7. Payment for Environmental Services (PES):** Environmental services are expensive to farmers and they thus need assistance to implement them. This can be through grants or payments/rewards for environmental services. Though UTaNRMP does not have this component, it should explore linkages with both PROFIT and TIST to assist farmers benefit from this aspect.

**8. Plantation Establishment and Livelihood Improvement Scheme (PELIS):** Under MKEPP, this scheme has proved to be successful and should be explored under UTaNRMP with regards to forests rehabilitation. Other than successful rehabilitating forests, PELIS has been proven to have high environmental and social benefits.

**9. Gazettement of community owned lands:** One of the lessons learnt under MKEPP is that communally owned lands are difficult to manage e.g. hilltops.

UTaNRMP should support initiatives to gazette these areas for ease of their rehabilitation and management.

## **9.2 Recommended Mitigation Measures**

- 1. Changes in vegetation mix:** This will be mitigated by limiting of areas to be cleared, and by restoration of cleared areas through re-vegetation. Afforestation and rehabilitation of other degraded areas will also supplement mitigation measures in this respect.
- 2. Soil erosion:** This impact will be mitigated through various project activities like on-farm soil conservation structures, roadside harvesting of water for farms; rehabilitation of degraded areas, afforestation, on-farm trees planting, and school greening programmes.
- 3. Restriction of wildlife movement:** Fencing will be done with KWS so that issues of wildlife corridors can be incorporated to allow animals movement. The rehabilitation of degraded areas will further boost the wildlife habitat.
- 4. Transfer of human wildlife conflicts:** The construction of the wildlife barrier will be done in collaboration with KWS and Rhino Ark who target to fence round Mt. Kenya. This will mitigate transfer of conflicts to other areas.
- 5. Cumulative impacts:** Overall, the thrust will be to reduce adverse impacts at each individual project intervention. This will be done through proper identification of the impacts through screening, capacity building of institutions and communities, and through the implementation of framework EMPs proposed.

## **9.3 Recommended Alternatives**

As earlier mentioned, most of the alternatives were tried out during the pilot phase, and the UTaNRMP is thus an up-scaling of only what was seen to work well for both the environment and the communities. Lessons learnt from the pilot and other IFAD projects have also informed the UTaNRMP design with a view of enhancing the positive outcomes of the pilot phase, and mitigating any adverse impacts. Compared to the No-Option, the project should thus be allowed to proceed.

## 9.4 Need for Subsequent EIAs

Although MKEPP never established a formal environmental and social screening and assessment process, the Natural Resources Management Officer in the PMU performed this screening function and identified the sub-projects that required additional environmental assessment under Schedule II of EMCA. With the scaling up of the UTaNRMP, this practice should now be institutionalized within the project management framework with established procedures, elaborated in the Project Implementation Manual, for environmental and social screening and assessment of project activities that may present potential adverse impacts. This SEA has also recommended a screening programme which may be adopted.

This SEA also proposes that an EIA be undertaken for the wildlife barrier so that the area specific environmental issues, fence alignment, maintenance, and design(s) are fully dealt with.

Other projects that may require an EIA, after going through the screening process provided include:-

- Domestic water projects;
- Improvement of irrigation projects;
- Large scale forest afforestation;

## **10. ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK (ESMF)**

To fulfil both IFAD and NEMA requirements, an Environmental and Social Impact Assessment (ESIA) was undertaken before the commencement of the SEA. The ESIA study informed the SEA process and the Environmental and Social Management Plan (ESMP) in the ESIA expanded in the latter process to formulate an Environmental and Social Management Framework (ESMF) for the various interventions. This was mainly because the programmatic nature of the UTaNRMP means that the exact number and location of the specific sub-projects to be financed by the project have yet to be determined. Therefore, this SEA is limited to identifying generic impacts and specifying generic preventive actions and mitigation measures for these impacts.

As with the ESMP developed in the ESIA, the ESMF contains:

4. Environmental and Social Screening and Assessment Procedures;
5. Framework Environmental Management Plans which are an expansion of the Mitigation Management Plan (MMP) developed in the ESIA; and
6. Monitoring Plan (MP)

All these are designed to ensure that the any potential adverse environmental or social impacts are identified and that appropriate prevention and/or mitigation measures will be properly undertaken during implementation of the UTaNRMP.

The Environmental and Social Management Framework (ESMF) for the UTaNRMP was developed with the aim of mainstreaming environmental and social considerations into the project. The ESMF draws on elements of the national environmental and social legislation of Kenya, as well as on the core principles contained in IFAD's Environment and Natural Resource Management Policy (see Box 10.1). These policies are geared towards maximizing the environmental and social benefits of the project, and at the very least preventing or mitigating any potential negative impacts that may result from project interventions. In this respect, the ESMF ensures compliance with Kenya's law and regulations on EIA, as well as with IFAD's Environment and Social Assessment Procedures.

### Box 10.1: IFAD ENRM policy: summary of core principles

**IFAD will promote:**

1. Scaled-up investment in multiple-benefit approaches for **sustainable agricultural intensification**;
2. Recognition and greater awareness of the economic, social and cultural **value of natural assets**;
3. **'Climate-smart'** approaches to rural development;
4. Greater attention to **risk and resilience** in order to manage environment- and natural-resource-related shocks;
5. Engagement in **value chains** to drive green growth;
6. Improved **governance** of natural assets for poor rural people by strengthening land tenure and community-led empowerment;
7. **Livelihood diversification** to reduce vulnerability and build resilience for sustainable natural resource management;
8. **Equality and empowerment for women and indigenous peoples** in managing natural resources;
9. Increased access by poor rural communities to **environment and climate finance**; and
10. **Environmental commitment** through changing its own behaviour.

Overall, the ESMF has been designed to maximize the contribution of the project to sustainable management of the catchment and watershed and to screen for and manage any potential adverse environmental or social impacts of the project. Its purpose is to strategically manage UTaNRMP's overall environmental and social impact.

#### 10.1 Environmental and Social Screening and Assessment Procedures

In order to ensure that the appropriate preventive actions and mitigation measures are applied to specific sub-project sites on a case-by-case basis, the ESMF includes environmental screening and review procedures.

The objective of the screening and review procedures is to review the individual sub-projects proposed for financing for the purpose of identifying and addressing (preventing or minimising) the site-specific potential adverse environmental and social impacts.

All of the sub-projects to be financed by the UTaNRMP are subject to these environmental and social screening and review procedures. For the most part, based on experience under MKEPP, these sub-projects will be small in scale and limited in impact. However, the sub-projects may also include interventions that could involve potential adverse impacts (e.g. rehabilitation of irrigation schemes, drilling of boreholes, and rehabilitation of access roads).

The sub-projects will be proposed and implemented by community groups (i.e. WRUAs, CFAs, FDACs and CIGs for IGAs) participating in the UTaNRMP. These are the groups who shall thus fill in the screening checklists.

### **10.1.1 Screening Checklists**

Environmental and social screening will be incorporated into the regular project preparation cycle for sub-projects under the UTaNRMP. Screening will begin with the identification and preparations of the sub-project proposal, followed by review and approval as described below, and end with execution of the sub-project under the supervision of PCT technical staff.

To aid in operationalizing the screening and review process, a number of project screening checklists have been developed. These will be used by the various stakeholders to screen proposed sub-projects for any potential negative impacts that the project may cause. The checklists contained in Appendix 4 should aid evaluation of whether project interventions under the UTaNRMP have potential adverse environmental or social impacts, and if so, to put in place a mechanism whereby such impacts can be prevented or mitigated.

The checklist is based on a categorization of projects into Categories A, B or C as per IFAD's Environment and Social Assessment Procedures. The screening checklists are to be filled out by the sub-project proponent as part of the sub-project identification process. Under the UTaNRMP the main community groups who will constitute sub-project proponents include: WRUAs, CFAs, FDACs and CIGs for IGAs.

### **10.1.2 Review of Checklists**

The ESMF also has a Screening Checklist Review Form (see Appendix 5), which is to be filled in by the County Project Coordinator (CPC), or a designated member from the County Project Facilitation Team (CPFT). In some cases, the review should also include field appraisals by the PCIT. A summary report on the projects reviewed should then be made by the CPC and submitted to the County Project Coordinating Committee (CPCC), with a copy for the Land and Environment Coordinator, who will in turn brief the Project Coordination Team (PCT). It is envisaged that NEMA will be represented in the CPCC. If not, then it will be important to share the project screening report with the County Environmental Officer, who will in turn share it with the County Environmental Committee.

### **10.1.3 Project Report Forms**

For projects where the CPC thinks there are some impacts which may require advice from NEMA or the PCT, a Project Report Form (see Appendix 6), shall be filled in by the CPC or the Designated CPFT member. The completed Project Report Form should

be submitted as a screening request to NEMA for review. The aim of the form is to inform NEMA on the ongoing projects and to avoid cases of infringing on NEMA regulations. The Project Report Form should also be submitted to the Land and Environment Coordinator, who will in turn brief the Project Coordination Team (PCT).

#### **10.1.4 Review of Project Report Forms**

Review of the Project Report Form will be done by NEMA (County Environment Officer (CEO) or District Environment Officer (DEO)/District Environment Committee (DEC), who will then either approve it or determine that the project requires an EIA study (Project Report or full EIA study) and subsequently advise UTaNRMP on the same.

NEMA usually issues approval letters, rejection letters, licenses, improvement orders, easements etc. All of these will be attended to by the PCT and in some cases the CPC.

#### **10.1.5 Annual Report Forms**

All CPCs should prepare an annual report to the Land and Environment Officer on the environmental screening and evaluation process and also on the environmental impacts of the ongoing projects. This will assist the annual environmental auditing process. The Land and Environment Officer will in turn prepare a report to the PCT, the PSC, and IFAD.

#### **10.1.6 Annual Independent Audits**

These will be commissioned by the PCT and will be undertaken by an independent consultant registered by NEMA, who shall prepare the reports as stipulated by the Environmental (Impact Assessment) and Audit Regulations, 2003.

#### **10.1.7 Further EIA Studies**

Any further EIA study will be commissioned by the UTaNRMP – PCT. The EIA studies require an independent consultant registered by NEMA who shall prepare the reports as stipulated by the Environmental (Impact Assessment) and Audit Regulations, 2003. The reports, including ESMPs, will then be submitted to NEMA for review. The review process will also include the relevant lead agencies.

## **10.2 Framework Environmental Management Plans**

The Framework Environmental Management Plans are an expansion of the Mitigation Management Plan (Table 10.1) developed during the ESIA. The framework EMPs are for the various UTaNRMP interventions and will be adapted to the actual situation on the ground. The framework EMPs should also be incorporated into the Project Implementation Manual (PIM).

This SEA has proposed framework EMPS for the implementation of the various activities undertaken. This will then be adapted to the actual situation on the ground.

1. Forestry Activities - Hilltop rehabilitation, forest rehabilitation and plantations establishment, school greening, woodlots establishment
2. Riverine planting and springs protection
3. Tree Nurseries
4. Irrigation Projects
5. Domestic water projects
6. Boreholes
7. Dams/Water Storage Structures

**Table 10.1: Mitigation Management Plan Developed in ESIA**

<b>UTaNRMP Activity</b>	<b>Issue</b>	<b>Preventive Action/ Mitigation Measure Recommended</b>	<b>Institutional Responsibility</b>	<b>Oversight</b>
<b>Sub-projects:</b> Irrigation schemes	Adverse impacts identified by screening checklist	Measures identified by the environmental and social assessment and screening checklists	Measures implemented by sub-project contractor	FDAC, CEC, NEMA MWI/PCT
Water supply systems	Adverse impacts identified by screening checklist	Measures identified by the environmental and social assessment and screening checklists	Measures implemented by sub-project contractor	FDAC, CEC, NEMA MWI/PCT
Rural access roads	Adverse impacts identified by screening checklist	Measures identified by the environmental and social assessment and screening checklists	Measures implemented by sub-project contractor	FDAC, CEC, NEMA MT, PCT
<b>Capacity building:</b>	Weak capacity in NEMA and D/CECs	Targeted technical capacity building in environmental management/assessment	NEMA	PCT
	Weak capacity in pest/pesticide management	Basic capacity building for farmers in pesticide management, IPM, etc.	MOA extension services	PCT
	Weak capacity in CFAs for forest fire control	Technical capacity building and safety gear for CFAs in fire prevention and control	KFS	PCT
	Weak capacity in water service providers	Technical capacity building in good water conservation and management practices	WMI	PCT
	Weak technical capacity for water harvesting	Technical capacity building in water harvesting practices for farmers	WMI	PCT
	Weak capacity for sub-project implementation	Technical guidance and project implementation manuals for sub-projects	PCT	PCT, IFAD

<b>Climate change adaptation:</b>	Lack of awareness of climate change impacts	Raise awareness among farmers and communities through media campaigns, etc.	MWI, PCT	PCT
	Variability of rainfall in project area	Increase investment in water harvesting and storage at household, farm, community levels	MWI, PCT	PCT
	Lack of drought-tolerant and pest-resistant crops	Produce and promote these crop varieties in the project area	MOA, PCT	PCT
	Abandonment of many native crop varieties	Promote native crops (sorghum, cassava, etc.) in project area	MOA, PCT	PCT
	Lack of weather information for farmers	Support early warning systems for disseminating weather information to farmers	MOA, PCT	PCT
	Inappropriate agricultural practices	Promote conservation agricultural practices: no tillage, permanent cover, crop rotations	MOA, PCT	PCT
<b>Renewable energy:</b>	Intense human pressure on forests for fuel wood for lack of alternatives	Demonstrate the suitability of biogas energy systems to supply energy to small-holder farmers	MOA, MEMR PCT	PCT
	Intense human pressure on forests for fuel wood for lack of alternatives	Demonstrate the feasibility of solar energy systems to supply energy to small-holder farmers	MOA, MEMR PCT	PCT
	Inefficient charcoal production that consumes forest resources	Promote registered charcoal producers in the project area as required by KFS	KFS, PCT	PCT

**Table 10.2: Framework Environmental Management Plan for Forestry Activities**

Project Activities	Impact Description	Mitigation/ Enhancement Measures	Cost in KES of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
<b>1. Land Preparation and Planting</b>						
Site clearing of existing vegetation	Soil erosion, and solid wastes comprising of vegetation	Spot clearing	10,000 per hectare	KFS/CFA	Every season before planting	Spot clearing; no soil erosion
Pitting	Soil erosion, dust, waste soils	Refill pits using same soils; pitting at onset of rains	No extra cost	CFA/KFS	During planting season	Observations on soil erosion; refilled and planted pits
Transportation of seedlings and implements	Noise and dust	Bulk transportation; and sourcing of seedlings from neighbouring communities	No additional cost	KFS/CFA	Yearly before planting season	Source of seedlings and mode of transportation
Planting	Late planting due to late arrival of seedlings with resultant lower survival	Source seedlings near forest and deliver at onset of rains	No additional costs	KFS/ CFA	During planting	Record of seedlings delivery
	Death of seedlings	Training of staff/communities on seedlings handling	KES 50,000 - tied to other training	KFS/CFA	During planting	Record of seedlings delivery
	Solid wastes from plastic papers, and waste containers from chemicals used	Collection and disposal of plastic papers and containers by burning	One man day rate per 2 hectares	KFS/CFA	Daily, during planting	Records of persons employed during planting; record of plastic bags collected and disposed.
	Increased cover, improved infiltration,	Proper planting and promoting uptake elsewhere	Supervision and tree promotion costs – 5,000 per ha	KFS/CFA	Daily, during planting	Area and No. of trees planted and their survival rate; No. of trees planted by local communities and their survival

Project Activities	Impact Description	Mitigation/ Enhancement Measures	Cost in KES of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
<b>2. Silviculture Phase</b>						
Weeding	Soil erosion while weeding; suppression of by weeds due to non-weeding;	Spot weeding by hand around seedlings; ensuring time frames followed under PELIS	KES per 5,000 per ha; free under PELIS	KFS/CFA	Twice a year for first three years	Records of areas weeded,
Beating up	Improved vegetative cover	Replace with original tree seedlings planted	KES 5,000 per ha KES 3,000 per ha	KFS/CFA	Once after each planting	No. of trees surviving and those replaced
Pruning	Improved tree growth	Use pruned branches for mulching		KFS/CFA	Yearly	Records of pruning
<b>3. Thinning and Harvesting</b>						
Felling of trees	Vegetation damage, noise, dust	Directional felling, protective clothing	5% extra costs	KFS/CFA	During harvesting	Felling report , records of protective clothing purchased, pattern of clear felled areas
Trimming	Small injuries by tree branches	First aid available	1,00 for kit	KFS/CFA	During harvesting	Trimming reports
Skidding	Soil erosion/ compaction; noise and dust	Skidding along contours. Minimize skidding distances. use human labour	5% extra cost	KFS/CFA	During harvesting	Skidding report; Record of skidding distance, number of labourers hired for trees extraction
Cross cutting logs	Small injuries	First aid , training Training of loaders	KES 10,000	KFS/CFA	During harvesting	Skidding report
Loading	Soil erosion and compaction	Small landings; use of lighter vehicles and wide tyres.	10% extra costs	KFS/CFA	During harvesting	Transportation Report
Transportation	Road damage	Use of lighter vehicles	10% extra costs	KFS/CFA	During harvesting	Record of number of landings used, number of tucks used n transportation and logs carried per truck
<b>4. Socio-economic Aspects</b>						
All activities	Income from sale of tree seedlings	Purchase seedlings from forest adjacent communities		KFS/CFA	Planting season	Records of tree seedlings purchase

Project Activities	Impact Description	Mitigation/ Enhancement Measures	Cost in KES of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
	Employment creation under PELIS	Using human manpower as much as possible		KFS/CFA	Year long	Records of hired manpower and remuneration
	Wealth creation and Improved incomes	Promoting uptake of forestry activities; bee keeping and related economic activities		KFS/CFA	Year long	Records of numbers of locals who have taken up forestry activities and beekeeping
	Improved environment (climate change mitigation, water catchment and regulation, micro-climate and aesthetics )	Continuing with forest rehabilitation		KFS/CFA	Year long	Prevalent weather conditions, state of environment reports
<b>5. Accidents, Health and Safety Plan</b>						
All activities	Accidents	Protective clothing, emergency plan, first aid kits available on site	50,000 per year	Year long	KFS	Records of use of protective gear, purchase of first aid kit, and vehicle availability for emergencies
	Fires	Public awareness campaigns and fire-rating boards; fire fighting equipment and their maintenance	200,000 per year for campaign and maintenance of equipment	Year long	KFS	Number of fire-rating boards and public awareness campaigns held; reports on servicing of fire fire-fighting equipment

**Table 10.3: Framework Environmental Management Plan for Riverine Planting and Springs Protection**

Project Activities	Impact Description	Mitigation/ Enhancement Measures	Cost in KES of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
<b>1. Land Preparation and Planting</b>						
Pegging of riverine/spring by MoA staff	Reduced soil erosion	Adhering to pegging	No extra cost	MOA/Farmer	Once, regular monitoring	Clearly demarcated riverine/spring area; no agriculture on riverine/spring
Pitting	Soil erosion and sedimentation of water bodies	Refill pits using same soils; pitting at onset of rains	No extra cost	Farmers	During planting season	No signs of soil erosion
Transportation of seedlings and implements	Soil erosion, dust, waste soils	Bulk transportation; and sourcing of seedlings from communities	No extra cost	KFS/PMC	Yearly before planting season	Source of seedlings and mode of transportation
Planting	Solid wastes from plastic bags	Collection and disposal of plastic papers	1,000 per kilometre/ha	KFS/Farmer	During planting	Records of persons employed during planting; record of plastic bags collected and disposed.
	Soil erosion	Planting of grasses	KES 2,000 per kilometre	Farmer	During planting	Area planted with grasses
<b>2. Silviculture Phase</b>						
Weeding	Soil erosion while weeding;	Spot weeding by hand around seedlings;	KES per 3000 per Km	Farmer	Twice a year for first three years	Records of areas weeded,
Beating up	Improved vegetative cover	Replace with original tree seedlings planted	KES 1000 per Km	Farmer / KFS	Once after each planting	No. of trees surviving and those replaced
Pruning	Improved tree growth	Use pruned branches for mulching	KES 2000 per Km	Farmer	Yearly	Records of pruning
<b>3. Socio-economic Aspects</b>						
All activities	Income from sale of tree seedlings Wealth creation and Improved incomes	Purchase seedlings locally		KFS	Planting season	Records of tree seedlings purchase
		Promoting uptake of forestry in communities		Farmer	Year long	Records of adoption by communities
<b>4. Accidents, Health and Safety Plan</b>						
All activities	Accidents	First aid kits available on site	1,000 per year	Farmer/KFS	During planting	Records of accidents and how they were attended to

**Table 10.4: Framework Environmental Management Plan for Tree Nurseries**

Project Activities	Potential Impact Description	Mitigation/ Enhancement Measures	Cost in KES of activities	Responsibility	Frequency	Verifiable Monitoring Indicators
Procurement of quality germplasm	Potential to introduce invasive species	All germplasm procured from KEFRI or other known sources	10% more on prices	KFS/CFA	During procurement	Receipts from KEFRI
Soil and manure procurement	Degradation of sourcing sites; noise and dust from vehicles; spillage of manure en-route	Source from known sustainable sources; use small well maintained and covered trucks	10% more on prices	CFA	During procurement	Source of soils and manures
Nursery siting	Pollution to water bodies	Site away from water bodies	5% more on costs	CFA/KFS	Once	Nursery site records
	Pollution to water bodies	Dig terraces if on steep grounds	KES 5,000	CFA	Yearly	Dug terraces
Seed bed preparation	Soil erosion; dust; dirt	Protective clothing;	KES 1,000	CFA	Day-to-day	Protective clothing purchased
Sowing of seeds	Areas for germinating seeds established	Train staff; use quality seeds	KES 1,000 per person per training	CFA	Day-to-day	Growing seeds
Pot filling	Dirt; erosion	Train staff	Covered above	CFA	Day-to-day	Filled pots
Seedlings transplant	Death of seedlings	Train staff	Covered above	CFA	Day-to-day	Transplanted plants
Root pruning & weeding	Death of seedlings Ensure survival	Train staff	Covered above	CFA	Day-to-day	Weeded plants
Irrigation/Watering	Pollution to water bodies	Clean containers; set special drawing area	KES 2,000	CFA	Day-to-day	Healthy plants; no water from nursery to water bodies
Fertilization and pests management	Pollution and solid wastes	Follow spraying instructions; burn solid wastes	KES 1000 per year	CFA	Day-to-day	No solid wastes;
General nursery maintenance	Solid wastes	Burn wastes; compost some for re-use	KES 2,000 per year	CFA	Day-to-day	Clean nursery

**Table 10.5: Framework Environmental Management Plan for Irrigation Projects**

Project Activities	Potential Impact Description	Mitigation/ Enhancement Measures	Cost in KES of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
<b>1. Planning and Construction Phase</b>						
Construction works	Soil erosion	Return and compact soil after laying of pipes	KES 50,000 per Km	Project manager/WRUA	One	Record of pipes laid
	Water pollution at intake	Minimum excavation works, consider temporary diversion during construction	KES 200,000	Project Manager/Contractor	Once	Constructed weir and intake, reports of construction
<b>2. Operations Phase</b>						
Water distribution and use by farmers	Water losses	Repair of bursts; regular maintenance	KES 20,000 per month	Project Manager	Day-to-day	Record of repairs undertaken; records of bursts
	Over-abstraction	Metering of abstraction; considerations to river flow rates	KES 10,000 per month	Project Manager/WRUAs	Day-to-day	
	Water wastage	Ensure water efficiency, ensure only agreed land areas irrigated	KES20,000 to ensure compliance among members	Project Manager/Committee	Day-to-day	Water efficiency by farmers
	Reduced water downstream and water use conflicts	Ensuring there is no over-abstraction by metering and consideration of river flow rates	KES10,000 per month	Project Manager/WRUAs	Day-to-day	Master meter reading and river flow rates
	Water logging and salinization	Installing adequate drainage systems; training	Farmers cost	Project Manager /WRUAs	Day-to-day	Installed drainage systems
	Pollution from agricultural biocides; eutrophication of water bodies	Farmers training on use of chemicals; integrated pest management	KES100,000for training	MoA/Project Manager Manager/WRUAs	Day-to-day	Record of farmers trained, water tests

Project Activities	Potential Impact Description	Mitigation/ Enhancement Measures	Cost in KES of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
	Soil erosion and siltation from intakes	Regular cleaning of intakes	KES 20,000 per month	Project Manager/WRUA	Monthly	Clean intakes
<b>3. Health and Safety</b>						
Operations	Incidence of water-borne and water-related diseases: - malaria, bilharzia (schistosomiasis) and river blindness (onchocerciasis)	Pathogen immunization; vector control by chemical sprays; and reduce human/vector or human/pathogen contact: health education, personal protection measures and mosquito proofing of houses	KES20,000 per annum	Project Manager Ministry of Health	Day-to-day	Training undertaken; reports on incidences of diseases
<b>4. Socio-economic</b>						
All activities	Employment creation  Wealth creation and Improved incomes	Using human manpower as much as possible  Promoting uptake of horticulture activities and building technical capacity forestry and marketing skills	No extra costs  KES50000 per year for capacity building; KES 20,000 for market information and linkages	Farmers/WRUAs  Project Manager	Year long  Year long	Records of hired manpower and remuneration  Records of numbers of locals who have taken up irrigation, rice growing and horticulture; markets and incomes accruing to communities

**Table 10.6: Framework Environmental Management Plan for Domestic Water Projects**

Project Activities	Potential Impact Description	Mitigation/Enhancement Measures	Cost in KES of Mitigation/Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
<b>1. Planning and Construction Phase</b>						
Construction works	Soil erosion	Return and compact soil after laying of pipes	KES 50,000 per Km	Project manager/WRUA	One	Record of pipes laid
	Water pollution at intake	Minimum excavation works, consider temporary diversion during construction	KES 200,000	Project Manager/Contractor	Once	Constructed weir and intake, reports of construction
<b>2. Operations Phase</b>						
Water distribution and use by farmers	Water losses	Repair of bursts; regular maintenance	KES 20,000 per month	Project Manager	Day-to-day	Record of repairs undertaken; records of bursts
	Over-abstraction	Metering of abstraction; considerations to river flow rates	KES 10,000 per month	Project Manager/WRUAs	Day-to-day	
	Water wastage	Ensure water efficiency,	KES20,000 to ensure compliance among members	Project Manager/Committee	Day-to-day	Water efficiency by farmers
	Water use conflicts	Ensuring there is no over-abstraction by metering/ regular meetings	Farmers cost	Project Manager/WRUAs	Day-to-day	Master meter reading and river flow rates
	Soil erosion and siltation from intakes	Regular cleaning of intakes	KES 20,000 per month	Project Manager /WRUAs	Monthly	Clean intakes
<b>3. Health and Safety</b>						
Operations	Incidence of water-borne and water-related diseases: - malaria, bilharzia	Pathogen immunization; vector control by chemical sprayings; and reduce	KES20,000 per annum	Project Manager Ministry of Health	Day-to-day	Training undertaken; reports on incidences of diseases

Project Activities	Potential Impact Description	Mitigation/Enhancement Measures	Cost in KES of Mitigation/Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
	(schistosomiasis) and river blindness (onchocerciasis)	human/vector or human/pathogen contact: health education, personal protection measures and mosquito proofing of houses				
<b>4. Socio-economic</b>						
All activities	Employment creation	Using human manpower as much as possible	No extra costs	Farmers/WRUAs	Year long	Records of hired manpower and remuneration
	Improved health	Promoting water boiling	KES20,000 per year for capacity building;	Project Manager	Year long	Health records

**Table 10.7: Framework Environmental Management Plan for Boreholes**

Project Activities	Potential Impact Description	Mitigation/ Enhancement Measures	Cost of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Indicators	Monitoring
<b>1. Pre-Drilling &amp; Drilling/Construction Phase</b>							
Siting of borehole,	Improper siting	Hydro-geological survey	KES 150,000	Geologist	Once, beginning of project	Hydro-geological report	
Application of permit	Drilling illegally	Seeking permit from the Ministry of Water	KES200,000	Project manager	Beginning of project	Water permit	
Receiving bids from contractors	Undertaking unprofessional drilling works	Seeking qualified and registered water engineer/borehole drilling contractor	KES 1.5 million	Project manager	Once and when maintenance required	Drilling contract	
<b>2. Operation and Maintenance Phase</b>							
Mobilization of equipment and clearing	Destruction of mother bushes, noise, dust	Replacing with more mother bushes of diverse species	KES 50,000	Project manager	Beginning and when required to replace	Existing mother bushes of different species	
Drilling and tank construction	Dust, solid/liquid wastes, noise, blowout	Watering of borehole area, use of re-circulation equipment,	KES 150,000	Contractor	Once	Records from contractor confirming purchase and use of mitigations measures	
Water abstraction	Over-abstraction of ground water	Abstraction of a Maximum allowed 18.0 m <sup>3</sup> / per day and this will only be during peak periods. Peizometer and water meter.	KES 50,000	Contractor, project manager,	Monthly review	Water meter/ peizometer readings per month	
	Ground water pollution, mud hole around well	Complete sealing from ground level into rock-head. Installing a PVC casing & slotted screen. Constructing a concrete pad around the well to keep contaminated surface water away from the well and keep the	KES 100,000	Contractor	Once	Completely sealed well, clean concrete pad around well	

Project Activities	Potential Impact Description	Mitigation/ Enhancement Measures	Cost of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Indicators	Monitoring
		area around the pump from becoming a mud-hole					
<b>3. Socio-Economic Aspects</b>							
Employment creation	Improved incomes and standards of living	Employment of locals	month (monthly pay bill)	Project manager	Day – to- day	Number of employees employed	
Indirect employment	Improved health from access to clean water	Promote water boiling	KES 20,000 sensitization	Project manager	Day-to-day	No. of trainings	
<b>4. Accidents, Health and Safety Plan</b>							
Pre-drilling and drilling/construction	Accidents from falling objects;	Observing of construction standards, insurance cover for staff, protective clothing, building of perimeter ring	KES 50,000	Contractor	Construction period	Receipts of purchased protective clothing, insurance policy	
Operations phase	Falls, cuts and other accidents	First aid kit, clean working areas, non-obstruction;	KES 30,000	Project manager	Daily check for emergency preparedness	Number of accidents or near accidents reported	
Operations	Capacity building and training	Staff training programmes for health and safety especially in emergencies	KES 50,000	Project manager	Bi-annual	Number of employees trained per year, reports from various institutions where they were trained.	
	Water contamination	Water testing and maintenance of clean pad	KES 50,000	Project manager	Routine		
	Drinking of water	Signage on high fluoride levels	KES 5,000	Project manager	Routine	Water test results, clean pad	

Project Activities	Potential Impact Description	Mitigation/ Enhancement Measures	Cost of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Indicators	Monitoring
<b>5. Abandonment</b>							
Alternative land uses	Waste lands	To be replanted as forest area	KES 200000	Project manager	Once -- end of project	Revert the project back to Forest Department; existing forest	
Borehole	Dilapidation; accidents; ground water contamination	Piping will be removed from the borehole, as well as the pump and all the electric installations. Then it will be sealed	KES 30,000	Project manager	Once -- end of project	Sealed borehole	
Tank	Eyesore, obstruction	Demolition, conversion for other uses - dump.	KES 10,000	Project manager	Once -- end of project	Cleared area, tank used for other uses	

**Table 10.8: Framework Environmental Management Plan for Dams/Water Storage Structures**

Project Activities	Potential Impact Description	Mitigation/ Enhancement Measures	Cost of Mitigation /Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
Storm discharge and change in hydrology	Impended drainage flooding	<ul style="list-style-type: none"> <li>• Ensure efficiency of drainage structures by proper design and maintenance on the dam</li> <li>• Proper installation of drainage structures</li> <li>• Visual checks on drainage channels for any leaks</li> <li>• Repair any blockages immediately on the spill ways and dam</li> </ul>	200,000	The proponent and contractor	Continuous	<ul style="list-style-type: none"> <li>• Construction records</li> <li>• Inspection of all</li> <li>• Construction works through out</li> </ul>
Health	Rise in vector borne Disease & infection i.e. malaria	<ul style="list-style-type: none"> <li>• Educate residents on use of insecticide treated mosquito nets</li> <li>• Disinfect the dam water regularly</li> <li>• Educate residents on need for regular medical check up</li> <li>• Supply clean disinfected water for domestic use</li> <li>• No watering or grazing animals near the dam</li> <li>• Introduce mud fish to control mosquito breeding</li> <li>• Construct bathroom facilities near the site</li> </ul>	20,000 per month	Management committee in conjunction with public health officials and proponent local residents	Continuous – operation stage	<ul style="list-style-type: none"> <li>• Disease incidence records</li> <li>• Water treatment records</li> <li>• Perimeter fence round the dam site</li> <li>• Reduced disease incidents</li> </ul>
Records	Legal documents storage	<ul style="list-style-type: none"> <li>• Display accidents records</li> <li>• Keeping abstraction records</li> </ul>	5,000	Management committee	Continuous – operation stage	<ul style="list-style-type: none"> <li>• Records of abstraction</li> </ul>
Safety	Injuries and shock	<ul style="list-style-type: none"> <li>• Training of community on health and safety issues near the dam site</li> <li>• Develop emergency exit plans and procedures</li> <li>• Provide clear warning signs at</li> </ul>	120,000	Management committee and proponent beneficiaries	Continuous – construction and operation stage	<ul style="list-style-type: none"> <li>• Warning signs erected</li> <li>• Restrict entry of to the dam site training records</li> <li>• Perimeter fence Presence</li> <li>• Reported accident records</li> </ul>

Project Activities	Potential Impact Description	Mitigation/Enhancement Measures	Cost of Mitigation/Enhancement	Responsibility	Frequency	Verifiable Monitoring Indicators
		<ul style="list-style-type: none"> <li>the site</li> <li>Fencing the dam site</li> </ul>				
Capacity building	Environmental education	<ul style="list-style-type: none"> <li>Develop in house guidelines on the environmental, health and safety for the area residents</li> <li>Maximize on use of available donated land for tree nurseries</li> <li>Educate the residents on need for environmental conservation</li> <li>Consult the local NEMA office regularly on need-basis</li> </ul>	35,000	NEMA, Public health officials, the general public	Continuous – operation stage	<ul style="list-style-type: none"> <li>Meeting records</li> <li>Tree nursery presence</li> </ul>
The wall structures	Structural stability	<ul style="list-style-type: none"> <li>Build the structure to approved standards</li> </ul>	1,000,000	Contractor and proponent	Construction stage	<ul style="list-style-type: none"> <li>Stable structure</li> <li>Certification records</li> </ul>
Legal aspects	Non- compliance with environmental and other applicable laws	<ul style="list-style-type: none"> <li>Conduct appraisal on new legislations affecting the operations of the dam</li> <li>Conduct EA on a yearly basis</li> </ul>	100,000 per year	Proponent	Construction and operations	<ul style="list-style-type: none"> <li>EIA certificates displayed prominently together with licenses</li> </ul>
Water	Use conflicts between upstream residents and the down stream community	<ul style="list-style-type: none"> <li>Regular meeting</li> <li>Provide a piped gravity supply to down wind</li> </ul>	20,000	Proponent dam management committee community	Continuous – operation stage	<ul style="list-style-type: none"> <li>Meetings records</li> <li>Piped supply</li> </ul>

### 10.3 Environmental and Social Monitoring Plan

The proposed monitoring plan for environmental and social monitoring is shown in Table 11.1. It is intended to monitor the impacts of UTaNRMP interventions on critical environmental and social indicators of project impacts. The environmental/NRM indicators include water resources (i.e. quantity and quality), soil resources (i.e. fertility, erosion, compaction) and forest cover. The social indicators include social cohesion (i.e. community groups/organizations), public health (i.e. incidence of water-related diseases) and improvements in livelihoods of rural households of project beneficiaries. The monitoring of these indicators will be integrated into the overall project monitoring framework:

- **Water resources:** The monitoring of river flows and groundwater levels in sub-project areas is critical to assessing the impact of the project on water resources available to project beneficiaries. Much, if not all, of this water quantity monitoring is already being performed by MWI district stations. Also critical to understanding project impacts is the monitoring of water quality indicators (e.g. mineralization, pH, turbidity, and contamination with chemicals, pesticides or pathogens) at sub-project sites. This may require additional water sampling and laboratory analysis. The UTaNRMP will support the strengthening of the MWI laboratories in the project area for this purpose.
- **Soil resources:** The monitoring of project results with respect to improving soil fertility, reducing soil erosion and preventing soil compaction in the project area will be essential to assessing the project's impacts on this critical natural resource. The MOA provides extension services and monitors soil conservation in the project area from its district offices and should be further encouraged to assist the UTaNRMP in monitoring the impacts of its interventions.
- **Forest cover:** The monitoring of forest cover in sub-project areas is critical to assessing the impact of the project in arresting and reversing the degradation of forests in the project area. Project-supported CFAs, with the support of KFS, should monitor the number of trees planted, the number of ha covered and the tree survival rate in order to evaluate the impacts of project activities in forest restoration.
- **Social cohesion:** One of the critical outputs of the Community Empowerment Component of the UTaNRMP is the formation and strengthening of community groups/organizations (i.e. FDACs, WRUAs, CFAs) that will take charge of their community development activities. The PCT, in its role of fostering and supporting these groups/organizations, will monitor their progress.

- **Public health:** One of the intended benefits of the project's community water development activities is the improvement of community public health as a result of clean and safe drinking water sources. The MWI, perhaps in collaboration with the MOH, should attempt to monitor improvements in public health following community water development sub-projects.
- **Livelihoods improvement:** The final social monitoring indicator is to measure the project's results in improving the livelihoods of poor rural households. This should include increases in incomes of beneficiaries but also improvements in the quality of their lives (e.g. housing, access to potable water, sanitation, etc.).

**Table 10.9: Monitoring Plan**

UTaNRMP Indicators	Parameter	Location	Method/ Equipment	Frequency	Purpose	Institutional Responsibility
<b>Environmental monitoring:</b>						
River/ground water quantity for water sub-projects	River flows, groundwater levels	Several sites on rivers in project area, water table at sub-project sites	River gauges, groundwater wells	Monthly	Measure seasonal changes, impacts of sub-projects	MWI, MEMR
River/ground water quality for water sub-projects	Mineralization, pH, turbidity	Above/at/below sub-project intake	Field sampling equipment	Regularly before and after sub-project	Measure quality at intake, impacts of sub-projects	MWI, MEMR
	Chemicals, pesticides, pathogens	Above/at/below sub-project intake	Sampling for MWI laboratory analysis	Regularly before and after sub-project	Measure quality at intake, impacts of sub-projects and agricultural practices	MWI, MEMR
Soils (fertility, erosion, compaction)	Soil salinity, humus content	Problem agricultural areas	Field equipment for soil sampling/ analysis	Monthly	Measure soil fertility	MOA, MEMR
	Erosion, compaction	Sub-project sites	Visual inspection	Monthly	Gauge soil loss, damage as result of sub-project	MOA, MEMR
Forest cover	Ha of trees planted, survival rate	Sub-project sites	Visual inspection	Monthly	Measure forest restoration	CFAs, KFS MEMR
<b>Social monitoring:</b>						
Social cohesion	Number of community groups formed and registered (FDA, WRUA, CFA)	River basins and forests of project area	Site visits, consultations	Quarterly	Determine project engagement of local communities	PCT

UTaNRMP Indicators	Parameter	Location	Method/ Equipment	Frequency	Purpose	Institutional Responsibility
Public health	Incidence of water-related and energy use related diseases	Sub-project sites	Site visits, consultations, health statistics	Quarterly	Gauge project impact on public health	MWI, PCT
Livelihoods improvement	Incomes, quality of life (type of homes, access to potable water, etc.)	River basins and forests of project area	Quantitative and qualitative analysis	Yearly	Gauge impact of project on livelihoods	PCT

## **APPENDICES**

### **APPENDIX 1: TERMS OF REFERENCE**

**APPENDIX 2: LIST OF PARTICIPANTS FOR INSTITUTIONAL  
STAKEHOLDER'S WORKSHOP**

**APPENDIX 3: LIST OF PARTICIPANTS FOR COMMUNITY  
STAKEHOLDERS' WORKSHOPS**

## APPENDIX 4: ESMF PROJECT SCREENING CHECKLIST

<b>PROJECT SCREENING CHECKLIST FOR UTANRMP PROJECTS</b>	
Sub-project name:	
Implementing Group: (WRUA, CFA, CIG)	
Location:	
Estimated cost (KES) :	
TYPE OF PROJECT OR ACTIVITY	
<b>CATEGORY A</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Dam project (larger than 200 cubic metres)</li> <li><input type="checkbox"/> Large or Medium-scale irrigation scheme (more than 100ha)</li> <li><input type="checkbox"/> Large or Medium-scale water storage structure (larger than 200 cubic metres)</li> <li><input type="checkbox"/> Rehabilitation of large or medium-scale water storage structure (larger than 200 cubic metres)</li> <li><input type="checkbox"/> Forestry concession with the private sector</li> <li><input type="checkbox"/> Construction of roads, bridges in sensitive ecosystems</li> <li><input type="checkbox"/> Electric Fencing</li> </ul>
<b>CATEGORY B/C</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Farm forestry or agro forestry,</li> <li><input type="checkbox"/> Small-scale woodlots</li> <li><input type="checkbox"/> Tree nurseries</li> <li><input type="checkbox"/> Small-scale irrigation scheme (less than 100ha)</li> <li><input type="checkbox"/> Small-scale water storage facility</li> <li><input type="checkbox"/> Spring capping or rural water supply scheme</li> <li><input type="checkbox"/> Small-scale dam (less than 200 cubic metres)</li> <li><input type="checkbox"/> Check-dam</li> <li><input type="checkbox"/> Forest infrastructure</li> <li><input type="checkbox"/> Participatory forest management or re-forestation</li> <li><input type="checkbox"/> Riverbank stabilisation</li> <li><input type="checkbox"/> Terracing of farmland</li> <li><input type="checkbox"/> Agricultural interventions</li> </ul> <p style="margin-left: 40px;">Please give more details:</p> <p style="margin-left: 40px;">Support to income generating initiatives Please give more details:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Other Please give more details:</li> </ul>
<b><u>CATEGORY A PROJECTS</u></b>	
For all Category A projects, an Environmental and Social Management Plan (ESMP) will be required.	
Will this Category A project affect Indigenous People? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, an Indigenous People's Plan will be required.	
Will this Category A project require land for its development, and therefore displace individuals, families or businesses from land that is currently occupied, or restrict people's access to crops, pasture, fisheries or forests, even, whether on a permanent or temporary basis. <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, a Resettlement Action Plan will be required.	
Will this Category A project involve the use of pesticides? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, a pest management plan will be required.	
<b><u>CATEGORY B &amp; C PROJECTS</u></b>	
Please describe the project activities:	

<p>Does the sub-project require, or lead to, the disposal of wastewater, solid waste or any other solids or liquids into streams, rivers or lakes? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details (specify types, and location):</p>
<p>Adversely affect natural habitats nearby, including forests, rivers or wetlands? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Is the project sited within a strictly protected area, national park, nature reserve or natural/historical monument? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does the project involve any land acquisition? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details (e.g. how much land, by plot and size?):</p>
<p>Does the project reduce people's access (via roads, location etc) to the pasture, water, public services or other resources that they depend on? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details:</p>
<p>Does the sub-project have human health and safety risks, during construction or later? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details:</p>
<p>Does the project require large volumes of construction materials (e.g. gravel, stones, water, timber, firewood)? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details (specify types and amounts):</p>
<p>Does project use water during or after construction, which will reduce the local availability of groundwater and surface water? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project lead to soil degradation, soil erosion or soil salinity in the area? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project create pools of water that provide breeding grounds for disease vectors (for example malaria or bilharzia)? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project involve significant excavations, demolition, and movement of earth, flooding, and other environmental changes? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project affect historically important or culturally important sites nearby? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>

<p>Does project require land for its development, and therefore displace people, or businesses from land that is currently occupied, or restrict people's access to crops, pasture, fisheries, forests or cultural resources, whether on a permanent or temporary basis?</p> <p><input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project involve inward migration of people from outside the area for employment or other purposes?</p> <p><input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project result in conflict or disputes among communities?</p> <p><input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project affect indigenous people, or is located in an area occupied by indigenous persons? <input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project result in a significant change/ loss in livelihood of individuals? <input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Does project adversely affect the livelihoods and/or the rights of women?      <input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Will the project adversely affect the livelihoods and or rights of the youth, and other vulnerable groups in society? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Will the project employ local labour? <input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p>Will the project make use of local knowledge held by local individuals? <input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If 'Yes', give details</p>
<p><b>MITIGATION MEASURES</b></p> <p>If you have answered Yes to any of the above, please describe the measures that the project will take to avoid or mitigate environmental and social impacts :</p>
<p>If you have answered No to any of the above, please describe the measures that the project will take to mainstream meaningful community participation in the project :</p>

What measures will the project take to ensure that it is technically and financially sustainable?
<b>ALTERNATIVES</b>
Is it possible to achieve the objectives above in a different way, with fewer environmental impacts? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe these alternatives.
<b>For Official Use only: To be filled by CPC or Designated CPFT officer</b>
<p><b>CONCLUSION</b> Which course of action do you recommend?</p> <p>Category A</p> <p><input type="checkbox"/> ESMP; <input type="checkbox"/> IPP; <input type="checkbox"/> RAP; <input type="checkbox"/> PMP</p> <p><b>Category B/C</b></p> <p><input type="checkbox"/> There are no environmental or social risks</p> <p><input type="checkbox"/> Community to be given full responsibility to mitigate environmental risks</p> <p><input type="checkbox"/> WRUAs/FDACs/CFAs/CIGs to provide detailed guidance on mitigation of risks to the project</p> <p><input type="checkbox"/> Specific advice is required from County Environment Officers in the following area(s):</p>
<p>Completed by:</p> <p>Name:</p> <p>Position / Community:</p> <p>Date:</p>

## APPENDIX 5: ESMF SCREENING CHECKLIST REVIEW FORM

<b>ESMF SCREENING CHECKLIST REVIEW FORM FOR UTANRMP PROJECTS</b>
<p>Sub-project name:</p> <p>Implementing Group: (WRUA, CFA, CIG)</p> <p>Location:</p> <p>Estimated cost (KES) :</p>
<p>Has the project proponent selected the correct type and category for this project?            Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'No', please select the correct type of project or activity below:</p>
<p>Has the project proponent selected the correct type and category for this project?            Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'No', please select the correct type of project or activity below:</p>
<p><b>CATEGORY B PROJECTS</b>            Based on the location and the type of project, please explain whether the Proponent's responses are satisfactory:</p>
<p>Their description of the activities of the project?            Yes <input type="checkbox"/> No <input type="checkbox"/>            If 'No', please explain:</p>
<p>Their responses to the questions on environmental and social impacts?            Yes <input type="checkbox"/> No <input type="checkbox"/>            If 'No', please explain:</p>
<p>Their proposed mitigation measures?            Yes <input type="checkbox"/> No <input type="checkbox"/>            If 'No', please explain:</p>
<p>Their proposed measures to ensure sustainability?            Yes <input type="checkbox"/> No <input type="checkbox"/>            If 'No', please explain:</p>
<p><b>REVIEWER'S CONCLUSION : Copied to Screening Checklist Forms</b>            Which course of action do you recommend?</p> <p>Category A:  <input type="checkbox"/> ESMP; <input type="checkbox"/> IPP; <input type="checkbox"/> RAP; <input type="checkbox"/> PMP</p> <p>Category B:  <input type="checkbox"/> There are no environmental or social risks</p> <p><input type="checkbox"/> Community to be given full responsibility to mitigate environmental and social risks, as set out in the screening checklist</p> <p><input type="checkbox"/> WRUAs/FDACs/CFAs/CIGs to provide detailed guidance on mitigation of risks to the community</p>

<input type="checkbox"/> Specific advice is required from County Environment Officers in the following area(s):
<input type="checkbox"/> Preparation of a Project Report, based on field appraisal by District Environment Officer, is required to investigate further, specifically to investigate:
<input type="checkbox"/> Approve <input type="checkbox"/> <input type="checkbox"/> Reject
Review form completed by: Name:  Position :  Date:

## APPENDIX 6: PROJECT REPORT FORM

<b>PROJECT REPORT FORM for UTANRM PROJECTS</b>
Name of Project:
Location
Estimated cost (KES) [type here]
Proponent/Implementer:
<b>TYPE OF PROJECT OR ACTIVITY</b>
Project objective and activities:
Approximate size of the project in land area:
Approximate size of the project in terms of affected individuals :
How was the site of the sub-project chosen?
How does the project comply with the most relevant planning documents, for example the District Development Plan or the Sub-catchment Management Plan?
Will the project adversely affect natural habitats nearby, including forests, or water bodies? Yes <input type="checkbox"/> No <input type="checkbox"/> If 'Yes', give details:
Is the project sited within a strictly protected area, national park, nature reserve, natural/ historical monument or area of cultural heritage? Yes <input type="checkbox"/> No <input type="checkbox"/> If 'Yes'. give details:
Will the project require large volumes of construction materials (e.g. gravel, stones, water, timber, firewood)? Yes <input type="checkbox"/> No <input type="checkbox"/> If 'Yes', give details:
Will the project use water during or after construction, which will reduce the local availability of groundwater and surface water? Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes', give details:
Will the project lead to soil degradation, soil erosion or soil salinity in the area? Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes', give details:

<p>Will the project create waste that could adversely affect local soils, vegetation, rivers and streams or groundwater? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details: [type here]</p>
<p>Will the project create pools of water that provide breeding grounds for disease vectors (for example malaria or bilharzia)? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project involve significant excavations, demolition, and movement of earth, flooding, or other environmental changes? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project affect historically-important or culturally-important sites nearby? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project require land for its development, and therefore displace individuals, families or businesses from land that is currently occupied, or restrict people's access to crops, pasture, fisheries, forests or cultural resources whether on a permanent or temporary basis? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project result in human health or safety risks during construction or later? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project involve inward migration of people from outside the area for employment or other purposes? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details: [type here]</p>
<p>Will the project result in conflict or disputes among communities? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project affect indigenous people, or be located in an area occupied by indigenous people? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project involve the construction of a dam or weir, or depend on water supplied from an existing dam? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project result in a significant change/ loss in livelihood of individuals? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>
<p>Will the project adversely affect the livelihoods and/or the rights of women? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', give details:</p>

--

**Mitigation measures**

If you have answered Yes to any of the above, please propose adequate mitigation measures.

--

**Alternatives**

Is it possible to achieve the objectives above in a different way, with fewer environmental and social impacts? If yes, describe these alternatives, and state why they have been rejected.

--

**Other Observations and Comments**

Please describe any other observations[type here]

--

Completed by:

Name:

Position:

Date:

--

**NEMA OFFICAL (S) Response**

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Completed by:

Name:

Position:

Date:

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