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ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT FOR THE PROPOSED CHANIA MATAARA SMALL-HYDROPOWER STATION IN MATAARA LOCATION, GATUNDU NORTH DISTRICT

For

Kenya Tea Development Agency, the Power Company

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EXECUTIVE SUMMARY

This report presents the Environmental and Social Impact Assessment (ESIA) for the Chania-Mataara Small Hydropower project of the Kenya Tea Development Agency, the Power Company. The project is one of the twelve projects assessed and proposed by the Ministry of Energy in attempt of developing and promoting renewable energy in the country.

The aim of this project is to achieve greater value and improve energy services that will improve efficiency and productivity of the tea industry and community's livelihoods from sustainable energy provisions, income generation and employment creation. There will be no resettlements as communities are not living within the project's defined boundary, there will be no interference with crops or destruction of properties since not found within the project area. However, there might be minimum interference with biodiversity during construction, operation and implementation of the project. Alternative plans have been put in place to minimize interference with the biodiversity and where appropriate, offsets will be applied to replace or reverse damages incurred during the project's works.

The cumulative nature of impacts from sedimentation has been recognized and an environmental impact assessment recommended frequent monitoring and removal of obstacles as appropriate. The monitoring and evaluation will be reviewed throughout the lifetime of the project to improve the implementation of mitigation measures. The project targets the following geographic area: Thika District, Gatanga Constituency, Kariara division along River Chania.

PROJECT PROPONENT:

The Study was supported by the Government of Kenya through the Ministry of Energy for supporting the tea factories in developing small hydropower resources within their reach. Single or Joint venture proponents may emerge. Although the project site for the hydropower is determined, the potential impacts on the environment and social-cultural aspects of these impacts have been assessed in this Environmental and Social Impact Assessment (ESIA). Appropriate mitigation measures have been proposed in the different components that would reduce the significance of the negative impacts of the project. Important local and international legislation have also been reviewed as well as World Bank and IFC Environmental Safe Guard policies.

ABREVIATIONS AND ACRONYMS

AEZ	Agro-ecological Zones
BOD	Biological Oxygen Demand
DEO	District Environmental Officer
DO	District Officer
DRSRS	Department of Resource Surveys and Remote Sensing
EIA	Environmental Impact Assessment
EA	Environmental Audit
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
EHS	Environmental Health and Safety
GOK	Government of Kenya
KPLC	Kenya Power and Lighting Company
KTDA	Kenya Tea Development Agency
LH	Lower Highland
LM	Lower Midlands
NEMA	National Environment Management Authority
NEAP	National Environmental Action Plan
MoE	Ministry of Energy
NGO	Non-Governmental Organization
NPEP	National Poverty Eradication Plan
OHS	Occupational Health and Safety
PRSP	Poverty Reduction Strategy Paper
PEC	Poverty Eradication Commission
UH	Upper Highland
UM	Upper Midland
TOR	Terms of Reference
KWS	Kenya Wildlife Service
MENR	Ministry of Environment and Natural Resources
MOW&I	Ministry of Water and Irrigation

CHAPTER ONE

1. Introduction

This report is prepared on the basis of environmental and social impact assessment of the Small hydropower plant in Thika District, Gatanga Constituency, Kariara Division along River Chania. The Small-Hydro power plant is projected to supply power to the Kenya Tea Agency, Power Company. The surplus electricity will be supplied to the neighboring communities at a cheaper rate than the current power cost. The ESIA is aimed at determining impacts both positive and negative of the project in the specific project site and providing mitigation measures to minimize damage to the environmental and social life.

The ESIA is in conformity with the Environmental Management and Coordination Act (EMCA) of 1999 and the Environmental Impact Assessment and Audit, Regulations (2003), Legal Notice No. 101, that stipulate such a project is subject to Environmental and Social Impact Assessment (ESIA) before commencement. This is also inline with the Electric Power Act No. 11 enacted in 1997 which deals with generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. In this respect, the following environmental issues should be considered.

The purpose of the ESIA study is to investigate potential impacts of the proposed Small-Hydropower station on the biophysical, social and natural environment in Gachocho sub-location in particular and the country in general. The study has proposed mitigation measures, including an Environmental and Social Management Plan (ESMP).

1.1. Environmental and Social Impact Methods and Techniques

Information upon which this assessment is based was collected using a combination of methods. This included review of literature on appropriate subject areas including environmental management in Kenya and project background documents from Ministry of Energy, National Environmental Management Authority (NEMA), Ministry of Environment and Minerals, Wetlands and Water Department. Consultations with major stakeholders provided additional information with regard to their concerns and possible mitigation measures. The assessment further used checklists for Small hydropower works projects

and professional judgement. During the assessment, constant reference was made to the NEMA Environmental Impact Assessment Guidelines (1999) and Environmental Impact Assessment Regulations (2003) in additional, the consultant also conducted field work through which on- the-spot assessments was done. In addition the following aspects of the environmental assessment undertook the following:

- Review of the literature;
- Discussions with Maragua District Departmental Officer;
- Consultations and Public Participation (CPP) using stakeholders and beneficiaries of the project;
- Focused group discussions (males, females and youth);
- Households socioeconomic survey; and
- Observations and photography of the project site

The field work for the preliminary environmental impact assessment study was conducted in between August 2009 and December 2010. Preliminary data on socio-economic, population, ecological, hydrology, sanitation, land use drainage, and pollution of the existing and proposed site location were collected.

1.2. Data collection instruments

The data collection instruments included the following:

- Checklist (for preliminary survey);
- Discussions guide for district departmental heads;
- Focus group discussion drawn from the community;
- Household, questionnaire for heads of households;
- Questionnaire for Ministry of Energy field officers;
- Observations guide for site walkthrough inspection;
- Data analysis, using SPSS, tabulations and line graphs to facilitate interpretation

There is need to protect, manage and conserve natural resources, hence the ESIA as a tool safeguards the natural resources from overexploitation. The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities is of importance to the development of new projects.

1.3. Terms of reference for the ESIA

- Description of the nature of the proposed project and activities that shall be undertaken in developing the Small-Hydropower station;
- Identifying the possible physical, biological and social impacts of establishing the proposed Small-Hydropower station/project;
- The assessment of project including physical area that may be affected by project's activities; and

- Preparation of the ESIA report with propose mitigation measures for the predicted impacts

1.4. Specific Objectives of the ESIA

The specific objectives of this ESIA for the proposed Small-Hydropower station are as follows:

- Define both positive and negative significant environmental impacts during construction and operation of the proposed actions that can affect the quality of the environment;
- Suggestion of mitigation measures to enhance positive impacts and reduce negative impacts careful design, construction and operation of project features;
- Develop Environmental and Social Management and Monitoring Plan (ESMMP) for the project during construction and after implementation.

1.5. Stakeholder Public Consultation

According to the Guidelines (1999) for Environmental Impact Assessment in Kenya, public involvement in the EIA is an ongoing process and shall be facilitated prior, during and after the EIA exercise. Ideally, the public should have been informed about the project prior to conducting the EIA/SIA, so that during the EIA/SIA exercise focus would be on consulting the public on the acceptability of the project and adverse environmental and social impacts and mitigation measures. The EIA/SIA team found, that major stakeholders/ public were officially informed about the proposed project by the KTDA.

The KTDA involves various stakeholders at different levels a majority the tea farmers situated in the project area and the workers at the tea factory. From the initial project planning stage, stakeholder consultations have taken place at various levels. For this ESIA, stakeholder consultations were undertaken with the Client KTDA and the community extensively at various stages. During the consultations with the Client, their plans and expectations were noted while at the same time the community consultations were used as a mechanism to gather information for the proposed program.

- Stakeholders were consulted to solicit their views about the project in the area and specifically about the likely impacts resulting from the development.
- Interviews with stakeholders were undertaken on formal and informal basis to address issues that arose out of the site inspections and environmental assessment exercise.

- Interviews and discussions played a key role in the environmental assessment and were of particular benefit in cases where documents were not available.
- The objective of the stakeholder's consultations by the Consultant was therefore two-fold: (i) to inform the major stakeholders about the proposed project and (ii) to solicit views on acceptability of the proposed project, possible adverse impacts and practical mitigation measures.

1.6. Discussions with Major Stakeholders

Initial meetings and regular consultations were held with Kenya Tea Development Agency (KTDA), Department of Water and Irrigation, Ministry of Environment and Minerals, tea farmers and the National Environmental Management Authority (NEMA). These meetings where held to discuss the likely environmental impacts and mitigation of the proposed Chania-Mataara Small Hydropower station, scope of the EIS/SIA, and any issues that were to be addressed during the assessment process.

1.7. Physical Inspection of the Proposed Site

During the assessment process, the proposed project site was visited. This was necessary so as to assess the environmental (social-economic, cultural and bio-physical) conditions and identify any issues of concern.

1.8. Documents Reviewed

The following documents that were relevant to the proposed project were reviewed and the results used to interpret findings about the proposed project during the assessment:

- Thika Environmental District Profile;
- Thika District Development Plans;
- Government of Kenya 1999.The National Environment Act;
- National Environmental Management Authority (NEMA) 1999 Guidelines for Environmental Impact Assessment in Kenya;
- National Environmental Management Authority (NEMA) 2003 Environmental Economics regulations for Kenya;

- The Project Area Structure Plan; and
- Feasibility Study Report for Chania-Mataara Small Hydropower Station

For transparent presentation and evaluation, a tabulated evaluation procedure has been applied. On the basis of a points scale, the severity of the particular environmental impact together with its general trend - that is negative or positive - is described. The evaluation scale applied is as follows:

Extent of impact:

■ ■ ■ = high negative
■ ■ = medium negative
■ = low negative
O = nil
✦ = locally positive
✦✦ = regionally positive

CHAPTER TWO

2. Background Information on the Project Area

2.1. The Project Boundary

The Small-Hydro power plant will be developed along River Chania which is located in Thika District, Gatanga Constituency, Kariara Division, Kiarutara Sub-Location, Kamukobini village. The proposed Small-Hydropower project is located about 0.5Km from Mataara Tea factory. Thika District has six administrative divisions which include Gatanga, Gatundu, Kakuzi, Gatundu North, Ruiru (Juja) and Thika Municipality. The Small-Hydro power project is located a bout 40 Km from Thika town. Observation of the physical characteristics of the area shows that, the topography is generally steep and sloppy land to an angle or inclination of about 45 degrees, and with the soil type of rich red loam in nature.

The general topography of the land in Kiarutara sub-location is sloppy and fertile. The soil erosion potential is quite low to minimal level because of good and sound farming systems, contour farming with the use of cover crops (grass, sugar cane) as soil erosion control has been well utilized in almost all farms. This is also because of low levels of deforestation with a lot of trees still intact mostly the indigenous

species; there is also the absence of overstocking and quarrying activities and sparsely populated human settlements. Several streams and Rivers are found to exist including River Karuru, Gura and River Nyakabai and support the drainage system.

The area also enjoys a natural drainage pattern that is still unaffected by human activities with a very high ground water table and high rate of recharge. Currently, there is less/no restriction on drawals of water, available yield is enough and the general quality of the water is good. There are no flood prone areas within Kiarutara Sub-Location, Kamukobini village because of the topographical advantage and most people live on higher grounds too. Surface water location is well distributed with local communities relying on permanent springs and rivers for human consumption and domestic use.

2.2. The General Climatic Conditions

The annual average rainfall varies from an average maximum of 250mm and -1020mm per annum which is well distributed within all areas; at times rainfall is very unreliable and tends to vary from year to year but this does not affect the people of Kamukobini village very much as due to high water table, the soils are always moist and therefore can support agricultural production all through this being a large Tea growing zone. The area is not prone to floods because of the topography and the type of soil, rich red loam soil that absorbs water quickly and is not easily saturated.

2.3. The Altitude and Temperature

The area enjoys a pleasant climate although relatively warmer in most cases, about 1420m above sea level to 1530m above sea level. The temperature also varies with altitude, with mean monthly temperature ranging from 18 degrees centigrade in the coldest months to 25 degrees centigrade in the hottest months.
Wind direction is quite unpredictable and the speed is at times low because of the steepness and the ups and downs of the land (5.8 Km/h. East), hence there is the tendency of blockage unlike the flat-plain land where wind speed is always high. The area also enjoys various types of habitats, little mangroves, wetlands, simple man made forests and riverine habitats with prominent tree cover species as *Pinus sp, Prunus Africana, Avocado, Lantana Camara, Papyrus, Grevillea robusta (mukima).*

There are no fresh water lakes in the area but little fauna –wildlife exists, a few species of birds, Gazelles, wild dogs, foxes and wild rabbits. However the community within this area domesticates cattle, goats, sheep and donkeys to supplement on crop production. The Aquatic life and the Riverine habitats are also dominant with little

fishing being practiced and since there are no other activities that interfere with the flow of the River like diverting water for irrigation. Besides these, there are no endangered species according to the locals in Kiarutara Sub-location, Kamukobini village. Ministry of Environment (MoE) and Kenya Forestry Authority are the only Government departments strongly involved in environmental conservation in the area, although, there are Community Based Organizations (CBOs) also but their strength is low. Generally, the natural environment of this area is still intact; there has been little or no human interference, degradation factors among others.

2.4. Demographic Characteristics of Thika District

The population composition of Thika district is as follows: the District measures approximately 1, 960.2 sq Km with the population of Males estimated at 351,511 and that of Females 350,153 (According to demographic indicators of 2002). The urban population is estimated at 170,000 while the rest resides in rural areas of Gatanga, Gatundu, Gatundu North, Kakuzi, Ruiru (Juja), and Thika Municipality.

2.5. Current Land Use

Kiarutara Sub-location, Kamukobini village and generally Thika District has good agricultural land. The main economic activities include Coffee, Bananas, maize and Tea growing. Horticultural farming is also a major income generating activity in this area. Predominantly land in the area is used for agricultural and human settlement with agricultural production being the main activity. Most of the populations also engage in subsistence farming.

Special features too exist within the area, given the presence of Water falls, camping sights, tourist spots, White water sports, monuments/archeological sites and fishing spots. Kiarutara Sub-Location is not faced with any major environmental problems such as water and air pollution, land degradation by natural and man-made factors, endemic diseases, loss of tree cover, open spaces etc. Hydro power is generated by using electricity generators to extract energy from moving water.

Historically people used the power of rivers for agriculture and wheat grinding. Today, rivers and streams are re-directed through hydro generators to produce energy, although there are pros and cons as far as local ecosystems are concerned. Although not the largest renewable primary source, which is biomass, hydropower is the largest renewable source of electricity. It has been in use for many years and is effectively a conventional form of energy. Hydropower accounts for 6% of primary energy supply and 17% of electricity generation. Although there are hydroelectric projects under construction in about 80 countries, most of the remaining

hydro potential in the world may be found in developing countries, particularly in South and Central Asia, Latin America, and Africa.

Other countries with remaining hydropower potential are Canada, Turkey, and Russia. Canal based small hydro power scheme is one which is planned to generate power by utilizing the fall and flow of water in the canal. These schemes may be planned in the canal itself or in the by-pass channel. If a canal system is under planning, consideration must be given that concentrated drops are available at certain locations for power utilization. In the case of existing canals, two, three or even a greater number of drops can be clubbed together to provide the consolidated single drop in the bye-pass channel for power utilization.

In canal based SHP projects the major components of civil works are diversion channel, spillway and power house building. Spilling arrangement is generally carried out through existing canal. At times it is easier and cheaper/economical to built Small-Hydropower plant while new irrigation channels are being planned or built, civil works of small hydro should be taken up side by side to make works economical.

2.6. Project Implementation Schedule

The Consulting Services are already tendered, and the project area surveyed and work envisaged to start before the end of 2011. The services will include mainly the detailed design of the construction of the Small Hydropower station as well as partly extension of the power to the neighbouring communities. After the detailed design follows the tendering process which will lead to contract qualified companies to carry out the desired works. In the end of 2011 the commissioning of all components to construct the power station will take place. In the end of 2011 the contracted companies will mobilize and start construction.

2.7. Project Justification

River Chania with a continuous water flow throughout the year, and an adjoining catchment of large volume of water, is in great condition and supports a large community. The river ecosystem has undergone substantial, and to some observation a great deal of conservation, which have accelerated regeneration of biodiversity over the years. In the project area, huge forests exist and some farms in the proximity although away from the proposed project site. There will be no displacement of people and no damage to the property or crops during construction works of the project.

Waterborne diseases are not common in the project area. Although the river and its fishery show the evidence of the dramatic changes in the basin over the past century, the river is not a source of the problem.

The problems have arisen in the surrounding basins through human activity and it is also they who suffer the consequences. The Thika Municipality, which serves a dynamic and active industrial zone, draws water from the river. Much of the town, including the Juja, depends on the channel which discharges into the wetlands and into the greater sources of water for the Indian Ocean.

CHAPTER THREE

3. Institutional, Policy and Legal Framework

3.1. Institutional Analysis

As part of the EIA/SIA a review of the institutional, policy and legal framework was conducted to determine the framework for environmental management of the proposed Chania-Mataara Small Hydro power project**.** It then identifies the main players in the provision of electricity, water and assesses their performance with a view to identifying problem areas which need to be addressed to improve service delivery. The study has been prepared in accordance with the National Environmental, Act, Regulations and Audit.

The provision of electricity is inextricably linked to the provision of water – where water is readily available the range of electricity options is wide; where water is not available or not affordable the range of electricity options is limited. This link between water and electricity has been reinforced in recent years by the inclusion of feeder tariffs policy that encourages Independent Power Producers (IPP) develop and supply electricity at affordable costs.

Responsibility for implementation of policy initiatives on electricity is, accordingly, shared between various government ministries and agencies. In an effort to clarify responsibilities for provision of electricity the Ministry of Planning, Finance and Economic Development in conjunction with the Ministry of Energy coordinate various efforts to meet increasing demand for both domestic and industrial use. In January 2010, the Ministry of Energy enacted a Feeder Tariff Policy supported by the Ministry of Finance.

3.2. National Environmental Management and Coordination Act

The Kenya Government’s environmental policy is geared towards sound environmental management for sustainable development. This is envisaged in the principle of prudent use, which requires that the present

day usage should not “compromise the needs of the future generations.

The Kenya Government’s environmental policy aims at integrating environmental aspects into national development plans. The broad objectives of the national environmental policy include:

- Optimal use of natural land and water resources in improving the quality of human environment;
- Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations;
- Integration of environmental conservation and economic activities into the process of sustainable development; and
- Meet national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

Environmental Impact Assessment (EIA) critically examines the effects of a Project on the environment. An EIA identifies both negative and positive impacts of any development activity or Project, how it affects people, their property and the environment. EIA also identifies measures to mitigate the negative impacts, while maximizing on the positive ones. EIA is basically a preventive process. It seeks to minimize adverse impacts on the environment and reduces risks. If a proper EIA is carried out, then the safety of the environment can be properly managed at all stages of a Project-planning, design, construction, operation, monitoring and evaluation as well as decommissioning.

The assessment is required at all stages of Project development with a view to ensuring environmentally sustainable development for both existing and proposed public and private sector development ventures. The National Environmental (Impact Assessment/Audit) Regulations, 2003 were issued in accordance with the provisions of Environmental Management and Coordination Act (EMCA) of 1999. The Regulations must be administered, taking into cognisance provisions of EMCA, 1999 and other relevant national laws.

Environmental Management and Co-ordination Act No. 8 of 1999, provide a legal and institutional framework for the management of the environmental related matters. It is the framework law on environment, which was enacted on the 14th January 1999 and commenced in January 2002. Topmost in the administration of EMCA is National Environment Council (NEC), which formulates policies, set goals, and promotes environmental protection programmes. The implementing organ is National Environment Management Authority (NEMA). EMCA comprises of the parts covering all aspects of the environment.

The Second Schedule to the Act specifies the projects for which an EIA and environmental audit must be carried out. According to the Act, Section 68, all projects listed in the Second Schedule of the Act must undertake an environmental audit, keep accurate records and make annual reports to NEMA or as NEMA may, in writing, require. The Environmental (Impact Assessment and Audit) Regulations, 2003, provide the basis for procedures for carrying out Environmental Impact Assessments (E.I.A.s) and Environmental Audits (E.A.s). The main objectives of the Act are to:

- Provide guidelines for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya;
- Provide a framework legislation for over 70 statutes in Kenya that contain environmental provisions;
- Provide guidelines for environmental impact assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders.

3.3 National Environmental Action Plan

The NEAP for Kenya was prepared in mid 1990s. It was a deliberate policy effort to integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and the conservation of natural resources are an integral part of the societal decision-making.

3.4. Environmental (Impact and Audit Assessment) Regulations

The Environmental (Impact Assessment and Audit) Regulations, 2003 state in Regulation 3 that "the Regulations shall apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act". Regulation 4(1) further states that: ''…no proponent shall implement a project:

a) likely to have a negative environmental impact; or
b) for which an environmental impact assessment is required under the Act or these Regulations; Unless an environmental impact assessment has been concluded and approved in accordance with these Regulations…''

3.5. National Water Policy

The National Policy of Water which was promulgated in April 1999 as Sessional Paper No. 1 of 1999 calls for decentralization of operational activities from the central government to other sectors, including local authorities, the private sector and increased involvement of communities in order to improve efficiency in service delivery. It also tackles issues pertaining to water supply and sanitation facilities development, institutional framework and financing of the sector. According to the policy, in order to enable sustainable water supply and sanitation services, there is need to apply alternative management options that are participatory through enhanced involvement of others in the provision of these services but particularly the private sector.

The overall objective of the National Water Policy is to lay the foundation for the rational and efficient framework for meeting the water needs for national economic development, poverty alleviation, environmental protection and social well being of the people through sustainable water resource management.

3.6. Water Quality Regulations

Water Quality Regulations (2006) section 8 provides for compliance with water quality standards. It states that all operators and suppliers of treated water, containerized water and all water vendors shall comply with the relevant quality standards in force as may be prescribed by the relevant lead agencies.

Section 9 of the Regulations provides for water quality monitoring. It states that the Authority in consultation with the relevant lead agency, shall maintain water quality monitoring for sources of domestic water at least twice every calendar year and such monitoring records shall be in the prescribed form as set out in the second schedule to these regulations.

3.7. Water Act

According to Water Act (2002) Section 5 stipulates that, the right to use of water from any water resource is hereby vested in the Minister, except to the extent that it is alienated by or under this Act or any other written law. In addition, Section 4 (1) of the same Act states that the Minister shall have and may exercise control over water resources in accordance with this Act. Subsection 2 states that it shall be the duty of the Minister to promote the investigation, conservation and proper use of water resources throughout Kenya

and to ensure the effective exercise and performance by any authorities or persons under the control of the Minister of their powers and duties in relation to water. Subsection 3 further states that the Minister shall be assisted in discharge of his duties under this Section by Director of Water. Section 25 (1) of this Act states that a permit shall be required for any of the following purposes:

- any use of water from a water resource, except as provided by Section 26;
- the drainage of any swamp or other land;
- the discharge of a pollutant into any water resource; and
- Any purpose, to be carried out in or in relation to a water resource, which is prescribed by rules made under this Act to be a purpose for which a permit is required.

Part II, Section 18, of this Act provides for national monitoring and information system on water resources. Following on this, Sub-section 3 of the same Section, allows the Water Resources Management Authority (WRMA) to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may be required to be kept by a facility operator and the information thereof furnished to the Authority. Section 23 (1) of the Act states that the Authority shall not approve any community project unless:

- the proposed project is approved by the persons owning or occupying at least two-thirds of the particular area concerned in the project; and
- Provision is made by the project for adequate alternative supply of water to be supplied to permit holders likely to be adversely affected and unable to benefit from the scheme.

Sub-section 2 further states that no permit for the community project shall be cancelled or verified except with the consent of the Minister. The Water Act, 2002 provides for establishment of 3 levels of institutions for the provision of services. These are:

- Water Services Regulatory Board (WSRB);
- Water Services Boards (WSB); and
- Water Service Providers (WSP).

The Act sets out these institutions based on the principles of:

- Separation of water resources management from water services provision;
- Separation of policy, regulation and implementation functions within the water
- supply and sanitation sector in order to streamline the role of the various actors in the sector;
- Devolution of responsibilities for water services provision to water service providers, who shall include the private sector, communities and companies formed by Local Authorities;
- Human resource redeployment and development leading to more effective and efficient institutions;
- The need to give full autonomy to water service providers to enable them perform without adverse interference or influence; and
- Improved delivery of services to customers.

3.8. The Wayleave Act

According to the Wayleaves Act Cap 292 Section 2, Private land does not include any landsold or leased under any Act dealing with Government lands. Section 3 of the Act states that the Government may carry any sewer, drain or pipeline into, through, over or under any lands whatsoever, but may not in so doing interfere with any existing building. Section 8 further states that any person who, without the consent of the Permanent Secretary to the Ministry responsible for works (which consent shall not be unreasonably withheld), causes any building to be newly erected over any sewer, drain or pipeline the property of the Government shall be guilty of an offence and liable to a fine of one hundred and fifty shillings, and a further fine of sixty shillings for every day during which the offence is continued after written notice in that behalf from the Permanent Secretary; and the Permanent Secretary may cause any building erected in contravention of this section to be altered, demolished or otherwise dealt with as he may think fit, and may recover any expense incurred by the Government in so doing from the offender.

3.9. Electricity Power Act

The Electric Power Act No. 11 enacted in 1997 deals with generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. In this respect, the following environmental issues will be considered before approval is granted:

- The need to protect and manage the environment, and conserve natural resources;
- The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

Under Schedule 3 of the Electric Power (licensing) Regulations 2003, it is a requirement to comply with all safety, health and environmental laws. Moreover, Schedule 2 (regulation 9) of the Electric Power (licensing) Regulations 2003 stipulates that licensing and authorization to generate and transmit electrical power must be supported by the following documents which are approved by NEMA:

- Environmental Impact Assessment Report (EIA) or
- Initial Environmental Audit Report (IEA) and
- Environmental Management Plan (EMP)

3.10. The Factories and Other Places of Work Act (Cap. 514)

This is an Act of Parliament to make provision for health, safety and welfare of persons employed in factories and other places, and for matters incidental thereto and connected therewith.

3.11. Building Operations and Works of Engineering Constructions

The provisions of the Factories and Other Places of Work Act relevant to engineering construction works are contained in the Abstract of the Act for Building Operations, and Works of Engineering Construction Rules.

3.12. The Local Authority Act (Cap. 265)

Section 160 helps Local Authorities ensure effective utilization of the sewages systems. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with kinds of refuse and effluent and where such service is established, compel its use by persons to whom the services is available. However, to protect against illegal connections, section 173 states that any person who, without prior consent in writing from the council, erects a building on; excavate or opens-up; or injures or destroys a sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender.

Section 170, allows the right to access to private property at all times by Local Authorities its officers and servants for purposes of inspection, maintenance and alteration or repairs of sewers. To ensure sustainability in this regard, the Local Authority is empowered to make by laws in respect of all such matters as are necessary or desirable for maintenance of health, safety, and well being of the inhabitants of its area as provided for under Section 201 of the Act.

The Act under section 176 gives powers to Local Authority to regulate sewage and drainage, fix charges for use of sewers and drains and require connecting premises to meet the related costs. According to section 174, any charges so collected shall be deemed to be charges for sanitary services and will be recoverable from the premise owner connected to the facility. Section 264 also requires that all charges due for sewage sanitary and refuse removal shall be recovered jointly and severally from the owner and occupier of the premises in respect of which the services were rendered. This in part allows for application of the "polluter-pays- principle".

3.13. Physical Planning Act

The Physical Planning Act (1999), the Local Authorities are empowered under Section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area. Section 30 states that any person who carries out development without development permission will be required to restore the land to it original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective Local Authority.

Finally, section 36 states that if connection with a development application, Local Authority is of the opinion that the proposed development activity will have injurious impact on the environment, the application shall be required to submit together with the application an environment impact assessment EIA report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by the NEMA and should be followed by annual environmental audits.

3.14. Public Health Act (Cap. 242)

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. Section 116 requires that Local Authorities take all lawful,

necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into the public street or into the gutter or side channel or watercourse, irrigation channel, or bed not approved for discharge is also deemed as nuisance.

Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin. On responsibility of the Local Authorities Part XI, section 129, of the Act states in part "It shall be the duty of every Local Authority to take all lawful, necessary and reasonably practicable measures for preventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or domestic purposes Section 130 provides for making and imposing regulations by the Local Authorities and others the duty of enforcing rules in respect of prohibiting use of water supply or erection of structures draining filth or noxious matter into water supply as mentioned in section 129. This provision is supplemented by section 126A that requires Local Authorities to develop by laws for controlling and regulating among others private sewers, communication between drains and sewers and between sewers as well as regulating sanitary conveniences in connection to buildings, drainage, cesspools, etc. for reception or disposal of foul matter.

3.15. Other Relevant Acts

Land Planning Act (Cap 303), Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the Local authorities submit any plans to then Minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted. This is intended to reduce conflict with the interest such as settlement and other social and economic activities.

Building Code 1967, Section 194 requires that where sewer exists, the occupants of the nearby premises shall apply to the Local authority for a permit to connect to the sewer line and all the wastewater must be discharged into sewers. The code also prohibits construction of structures or buildings on sewer lines.

Penal Code Act (Cap.63), Section 191 of the penal code states that if 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 is dwelling or business premises in the neighbourhood or those passing along public way, commit an offence.

Waste Management Regulations, 2006, Part II of the regulations regulation 4 (1) states that no person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated receptacle. Regulation 4 (2) further states that a waste generator shall collect, segregate and dispose such waste in the manner provided for under these regulations. Regulation 5 (1) provides for cleaner production methods. It states that a waste generator shall minimize the waste generated by adopting the following cleaner production methods

(a) Improvement of production process through:
    (i) Conserving raw materials and energy;
    (ii) Eliminating the use of toxic raw materials; and
    (iii)Reducing toxic emissions and wastes;
(b) Monitoring the product cycle from beginning to end by:
    (i) Identifying and eliminating potential negative impacts of the product;
    (ii) Enabling the recovery and re-use of the product where possible; and
(c) Incorporating environmental concerns in the design and disposal of a product.

Regulation 8 of the regulations provides for the responsibility of waste transporters. It states that any person granted a license to transport waste shall ensure that:

(1) The collection and transportation of such waste is conducted in such a manner that will not cause scattering of the waste;
(2) The vehicles and equipment for the transportation of waste are in such a state that shall cause scattering of, flowing out of waste or emission of noxious smells from such waste;
(3) The vehicles for transportation and other means of conveyance of waste follow the scheduled routes approved by the Authority from the point of collection to the disposal site or plant; and
(4) He or his agent (s) possess at all times during transportation of the waste, a duly filled tracking document as set out in Form III in the first schedule to these regulations and shall produce the same such tracking document on demand to any law enforcement officer.

Other pertinent pieces of law, While the Environmental Management and Co-ordination Act supersede all other environmental legislation, numerous other laws and regulations influence the various aspects and activities of the proposed project. These include the following among others:

- Lakes and Rivers Act;
- Use of Poisonous Substances Act (rev. 1983); and
- Workmen's Compensation Act (rev. 1988).

Licenses and permits, Ideally, the Proponent should demonstrate compliance to the legislation through acquiring of the appropriate licenses and permits. Further all contractors and consultants who will be engaged during the planning and design, construction, operation and maintenance and decommissioning should demonstrate compliance to the necessary pieces of legislation. Those who will be involved should therefore provide the Proponent with all legal documents that shows that they are legally in the business or services that they intend to deliver to the Proponent. These includes: NEMA registration certificates and licenses, trade licenses, etc.

3.16. Institutional and Administrative Framework

There are many organizations involved in environmental management in the country. These organizations include the Ministry of Lands and Housing, Ministry of Water and Irrigation, Ministry of Environment and Natural Resources, National Environment and Management Authority, Forest Department, Local Authorities etc.

National Environment Management Authority (NEMA) The objective and purpose for which NEMA was established is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. However, NEMA's mandate is designated to the following committees:

Provincial and District Environment Committees, According to EMCA, 1999 No. 8, the Minister by notice in the gazette appoints Provincial and District Environment Committees of the Authority in respect of every province and district respectively. The Provincial and District Environment Committees are responsible for the proper management of the environment within the Province and District in respect of which they are appointed. They are also to perform such additional functions as are prescribed by the Act or as may, from time to time be assigned by the Minister by notice in the gazette. The decisions of these committees are legal and it is an offence not to implement them.

Public Complaints Committee, The Committee performs the following functions:

- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any uspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council.
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under Section 9 (3); and
- To perform such other functions and excise such powers as may be assigned to it by the Council.

National Environment Action Plan Committee, This Committee is responsible for the development of a 5-year Environment Action Plan among other things. The National Environment Action Plan shall:

- Contain an analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time;
- Contain an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational and intra-generational equity;
- Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes;
- Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development;
- Set out operational guidelines for the planning and management of the environment and natural resources;
- Identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist;
- Identify and appraise trends in the development of urban and rural settlements, their impact on the environment, and strategies for the amelioration of their negative impacts;

Propose guidelines for the integration of standards of environmental protection into development planning and management;

- Identify and recommend policy and legislative approaches for preventing, controlling or

mitigating specific as well as general diverse impacts on the environment;

- Prioritise areas of environmental research and outline methods of using such research findings;
- Without prejudice to the foregoing, be reviewed and modified from time to time to incorporate emerging knowledge and realities; and
- Be binding on all persons and all government departments, agencies,
- States Corporation or other organ of government upon adoption by the national assembly.

Standards and Enforcement Review Committee, This is a technical Committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures.

National Environmental Tribunal, This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya.

National Environment Council (NEC), EMCA 1999 No. 8 Part iii Section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA; set national goals and objectives and determines policies and priorities for the protection of the environment and promote co-operation among public departments, local authorities, private sector, non-governmental organizations and such other organizations engaged in environmental protection programmes.

National Environment Action Plan (NEAP), The NEAP for Kenya was prepared in mid 1990s. It was a deliberate policy effort to integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and the conservation of natural resources are an integral part of societal decision-making.

Water Services Regulatory Board, The Board regulates the provision of services by registered Water Services Providers through the proposed Water Services Boards.

Water Services Boards, Water services providers shall enter into an agreement with a Water Service Board in writing for the purpose of providing water services in specified areas.

Ministry of Water and Irrigation, The Ministry of Water and Irrigation has its fundamental goal and purpose as conserving, managing and protecting water resources for socio-economic development. Its aim is to improve the living standards of people by ensuring proper access to available water resources. The Ministry was created in 2003 following a separation or the Ministry of Environment and Natural Resources. The split was aimed at consolidating the responsibility for the management and development of water resources under a single Minister.

3.17. International conventions and treaties

A treaty is a binding agreement under International Law concluded by subjects of International Law, namely states and international organizations. Treaties can be called by many names including; Treaties, International Agreements, Protocols, Covenants, Conventions, Exchanges of Letters, Exchanges of Notes, etc. However all of these are equally treaties and the rules are the same regardless of what the treaty is called.

Treaties can be loosely compared to contracts; both are means of willing parties assuming obligations among themselves, and a party to either that fails to live up to their obligations can be held legally liable for that breach. The central principle of treaty law is expressed in the maxim" pacta sunt servanda", translated as "pacts must be respected."

CHAPTER FOUR

4. Environmental Setting of the Project Area

This section describes the baseline conditions in the study area and provides summarized information on the physical, biological and socio-economic environment. The purpose of this chapter is to facilitate the evaluation of impacts assessed in following stage.

4.1. Socio-Economic Conditions

Only 9 households (5.81%) out of the sampled 155 have access to electricity for lighting. The majority of residents use kerosene for lighting comprising 149 households (96.13%); firewood - 122 households (78.71%); solar 15 households-(9.68%); generators –4 households (2.58%). The equipment used for lighting is mostly the hurricane lamp (91.89%), tin lamp (6.08%) and pressure lamp (2.03%). Decisions on the type of

energy to use for lighting are mainly made women (45.89%), husband alone (33.56%) and both husband and wife (20.55%). The lighting is mainly located in the sitting room, bedroom and kitchen with 58.1%, 85.8% and 78.7% of households respectively. Only 1.94% of the households have outside security lights. The main source of energy for cooking is fuel wood comprising 96.13% of the households; kerosene - 16.13%; electricity – 0.65% and LPG Gas -4.52%.

For respondents who do not have access to electricity, the approximate average distance from the nearest electricity line is 1.1km, with a minimum of 0.03km and a maximum of 3.5km. 84.5% of the respondents are less that 2km from the electricity line. Majority of the residents have basic education having attained Secondary and A-Level comprising 41.8%; followed by Upper Primary (34.8%); Lower Primary (11.9%) and College (3.73%). About 5.2% of the population has no formal education; only 1.2% have university education; Adult Education (0.12%).

Majority of the residents are basically farmers comprising 51.5 % of sampled households while 30.5% are students. The main sources of income are agro-based, most of the residents growing, tobacco, maize, and other foodstuff. They also engage in small business activities such as casual labour (4.1%), running small businesses (5%); formal employment (2.8%); house keeping, carpentry, mechanics, clay work, barbers (2%); self-employment (0.9%). 1.2% are unemployed. The average acreage of land owned by each household is 3.3 acres, with the maximum of 12 acres and a minimum of 0.1 acres. 9.8% of the households sampled own less than 1 acre of land; 19% own1-2 acres; 20.3% own between 2-3 acres; 19% own 3-4 acres; 7.8% own 4-5 acres and 24.2% own above 5 acres.

The survey reveals that households have access to regular incomes from cash and food crops, livestock, as well as off-farm economic activities. The only cash crop cultivated by the residents is tea with a total of 151 households farming tea. The average acreage of land under tea is 1.45 acres; the largest acreage under tea is 8 acres, while the minimum is 0.5 of an acre. The majority comprising 62% cultivates 1-2 acres. Tea cultivation is a collective responsibility for both women and men most of the times (81.9%), while in a few instances only men cultivate (4.03%) and women alone (14.1%).

Tea contributes an average of Kshs. 62,000/= per year for the sampled households and a minimum of Kshs. 1200/=. The highest earnings from tea are up to Kshs. 420,000/= per year. Majority of residents (23.7%) earn between Kshs.30, 000/= and Kshs. 50,000/= per year. Decision making on cash crops income expenditure is mainly a joint responsibility between husband and wife comprising (59.73%). In 23.49% and 16.78% the decisions are made by husband and wife respectively.

The main food crops cultivated by the residents are maize (97.42%); beans (83.23%); potatoes (73.55%); cabbages (60.65%); bananas (14.84); tomatoes (14.19%). Others include *sukumawiki* (5.16%); carrots (3.23%); sweet potatoes (2.58%); cassava (1.29%), pineapples, arrowroots and passion fruits. Both men and women are involved in the cultivation of most food crops.

A relatively larger percentage of women are however more involved in their cultivation. Food crops are mainly grown for subsistence (77.61%). 20.90% are grown for both subsistence and sale and only 1.49% purely for sale. The average annual earnings from food crops are quite low (maize - Kshs. 9,467/=; beans - Kshs. 6,982/=; potatoes - Kshs. 3,921/=; bananas - Kshs. 3,560/=; cabbages - Kshs. 24,008/=; and tomatoes Kshs.11, 631/=; *sukumawiki* only Kshs.1,167/=. Decisions on how income from food crops is spent are mainly made jointly by husband and wife comprising 64.71%.

The major livestock types reared are cattle (83.9% of households), poultry (54.2%), sheep (31.0%) and goats (13.5%). Residents also benefit from animal products including meat, milk, manure and eggs. The average earnings from cattle is Kshs. 20,910/=, the lowest being Kshs. 1000/= and the highest Kshs. 60,000/=. Average earnings from poultry is Kshs 6,179= with a minimum of Kshs. 1000/= and a maximum of Kshs.40, 000/=. Residents earn an average of Kshs. 9.875/= from sheep with the minimum being Kshs. 500/= and the maximum being Kshs. 36.000/=. Very few people keep goats with average earnings of Kshs 10,720/=, minimum of Kshs. 1000/= and a maximum of Kshs.24, 000/=. Animal products are mainly used for subsistence (60.87%); both subsistence and sale (31.88%), sale only (7.25%).

Other sources of livelihood include casual labour (42.42%); retail businesses (31.82%); formal employment (19.70%); agricultural commodity businesses (3.03%); and remittances from relatives (3.03%). Average earnings per year are Kshs. 32,304/=, with minimum of Kshs. 2000/= and a maximum of Kshs. 200,000/=. Majority of residents earn between Kshs. 30,000/= and Kshs.50,000/= (33.8%); below Kshs. 10,000/= (18.31%); between Kshs.10,000/= and 20,000/= (14.08%); between Kshs250, 000/= and 30,000/= (8.45%); between Kshs. 50,000/= and Kshs. 90,000/= (14.08%); Between Kshs.90,000/= and Kshs.130,000/= (2.82%); Above Kshs.150,000/= (8.45%).

With regard to overall annual household income, the majority (41.74%) of the residents earn an average income of between Kshs. 50,000/= and Kshs. 100,000/=; followed by 23.48% earning less than Kshs. 50,000/=; between Kshs. 100,000/= and Kshs. 150,000/= (18.26%); above Kshs.150, 000/= (16.53%). The average number of houses per homestead of the sampled households is 3 houses with a minimum of 1 house and a maximum of 14 houses. The average number of rooms per household is 10 rooms with the lowest being

2 rooms and the highest being 30 rooms. The walls of majority of households (133 households) are made of wood, stones (49 households), iron sheets (27 households), and mud (5 households). All the sampled households are roofed with iron sheets.

Almost all households own a radio (92.26%) with some owning more than one. In 82.9% of the households radios were bought by men and boys; 7.5% were bought by women and girls. 6.8% by husband and wife. In 1.4% of the households, all family members were consulted before purchasing the radio, while in 0.7% of the households, girls and boys made the decision to buy the radio.

Only in very few instances was the radio bought by girls. It is mostly used by all family members comprising 85.1% and is mainly located in the sitting room in 90.1% of the households. Majority of households (70.97%) own a torch with the average number being 1 torch; the minimum being 1 and the maximum being 4 torches. In most cases, torches are bought by men comprising 81.5% but are mostly used by all household members comprising 91.6% of the households. Dry-cell batteries are mainly used in the powering of radios and torches.

Less than 20% of residents own radio cassette players these are mainly used by all family members. Only 25% of households own black and white televisions while 17.42% own colour TVs. Less than 10% of households own a video player. 2.6% of the households own an electric iron while 1.3% owns an electric cooker/coil.

With regard to use of electrical appliances, all family members mainly have access to and use of all appliances. These are mainly located in the sitting room in most households with the exception of the electric cookers which are located in the kitchen. The main source of energy for space warming and water heating is firewood and is used by all households sampled; kerosene (17.42%); 4.52% use electricity and 2.58% use LPG Gas.

19.35% of the sampled households own rechargeable batteries with an average of 1 battery per household, a minimum of 1 and a maximum of 2; while 9.7% own light bulbs (filament type) with the average being 4, minimum of 1 and maximum of 14. 5.2% of the households own light bulbs (fluorescent); the average being 7, minimum of 1 and maximum of 13. All family members have access to and use of most electrical appliances.

The average number of rechargeable batteries bought in the last five years is 2, with a minimum of 1 and a maximum of 4 batteries. The cost range was mainly between Kshs. 4001 to Kshs. 5000/= comprising 42.4%; Kshs. 3001 to Kshs. 4000/= (33.9%); Kshs. 2001 to Kshs.3000/= (10.2%); Kshs. 5000 and above (10.2%) and only 3.4% costing Kshs. 2000/= and below. Most of the batteries were purchased new (85.2%), second hand ones (7.4%), mixed old and new (7.4%). The average distance to the nearest battery charging facility is 1.5 km, with a minimum of 0.25Km and a maximum of 3Km.

Majority of residents obtain wood fuel from trees in their own farms (47.12%); buying from the market

(34.13%); gathering from nearby unused bushes (18.75%). Women are mainly involved in collecting firewood (68.31%); followed by women and girls (21.13%); men (4.93%); casual workers (2.11%), both wife and husband (0.7%); children (1.41%): all family members (1.41%). The average time spent collecting firewood is 1.4 hrs with a minimum of 0.3hrs and a maximum of 3hrs. Majority of households (65.79%) have noticed change in the type and volume of energy they consume in relation to their family needs, while 34.21% have not noticed any change.

The main changes include: shortage of energy sources in the market (41.30%); high cost of energy sources (26.09%); firewood and kerosene are very expensive (13.04%); demand for energy has increased in the household (8.70%); expenses in kerosene reduced after switching to electricity (6.52%); cutting down of trees is prohibited by the government (2.17%); and cost of purchasing kerosene reduced drastically after purchasing a Solar Home System (2.17%). 93.29% of the respondents would like to change to a different form of energy while 6.71% said they are satisfied with the kind of energy they are using comprising those already using electricity and some with Solar Home Systems.

The main reason for not switching to fuel of choice include: high cost of electricity according to 56.82% of residents; lack of electricity connection fees (28.03%); electricity is not accessible/ home is far from the transformers (6.06%); high wiring expenses (5.30%); electricity connection fee is too high (3.03%) and lack of money to purchase the transformer (0.76%).

The average monthly expenditure on electricity for those using is Kshs. 428/= with the minimum being Kshs. 150/= and the maximum Kshs. 800/=. The majority of households spend Kshs. 400/=. The average monthly expenditure on rechargeable batteries is Kshs. 207/= with a minimum of Kshs. 50/= and a maximum of Kshs. 500/=. The majority of households spend between Kshs. 100/= and Kshs 200/=. Expenditure on firewood is Kshs. 881/= with the minimum being Kshs. 100/= and the maximum being Kshs. 3400/=. Majority of households spend between Kshs. 500/= and Kshs. 1000/= on firewood. Average monthly expenditure on kerosene is Kshs. 376/= with a minimum of Kshs. 100/= and a maximum of Kshs. 1400/=. Majority of households spend between Kshs. 200/= and Kshs. 500/=.

Regarding household expenditure on energy for lighting, households using kerosene and firewood spend more than those using electricity and rechargeable batteries. 76.13% of respondents said they are familiar with government funds such as CDF, and LASDAP as financial facilities while another 72.26% said they belong to “merry go rounds” and other social networks; 54.19% have access to credit from cooperatives; and 20.65% have access from(23.0%); boreholes/wells (21.0%); piped water (7.8%); dams (0.8%). Only 14 respondents

pay for water with an average monthly expenditure of Kshs. 400/=, a minimum of Kshs. 150 and a maximum of Kshs.800/=. Majority of residents (90.6%) stated that the local Dispensaries and Health Centres are not well equipped to handle cases of complicated conditions and maternal deliveries. These are not well equipped-(lack of proper structures, equipment and facilities); lack trained personnel to handle the cases; and are not electrified.

Local Primary Schools use electricity (28.17%), generators (4.23%) for lighting with 67.61% not using any energy type. Local Secondary Schools mainly use electricity (33.33%); generators (0.65%); with 66.01% of Secondary Schools not using any energy type. Local churches use electricity (34.21%); generators (1.97%); solar (0.66%) with 63.16% of Churches not using any energy.

There are many businesses that are operated by both women and men that would greatly benefit from electrification. These include general shops (14.0%), butcheries (10.5%), clubs/bars/pubs (10.5%), hotels (9.5%), groceries (6.7%), barber shops (4.9), carpentry (2.6%), health centres and chemists (2.6%), welding and panel beating (2.5%), hardware (2.3%), tailoring (2.2%), vehicle repair (2.2%), grain milling (0.5%), *juakali*. The range would even increase with increased access to electricity.

The residents are aware of the benefits that access to electricity would bring to them. Main benefits envisaged include: creation of employment opportunities; improvement in school performance; reduced energy cost from reduced use of kerosene, charcoal and firewood; improved lighting in homes; increased business opportunities; Hospitals and Dispensaries offering better services; improvement in factory operations; increased working hours since people can work day and night; reduced cost, time and energy spent on accessing these services; reduced stress due to listening to music; improved security in homes and market centres; improving peoples overall economic base; improvement of agriculture; making people more enlightened e.g. through watching TV and using computers; reduced crime rate through increased business opportunities for the youth; environmental conservation/sanitation; improved livestock rearing; and an improved *jua kali* sector.

Average distance travelled to the nearest hospital is 33Km with the minimum of 8Km and a maximum of 60Km. Majority of households travel between 30- 45Km to the nearest hospital. Average distance to the nearest Maternity facility is 33.6Km, minimum of 8Km and a maximum of 50Km. Majority of households travel between 30-45Km to the nearest facility. The Health Centres are closer to most households.

Average distance to the grain mill is 4.9Km with the minimum of 1Km and a maximum of 9Km. Majority of households travel 6Km to the nearest grain mill. During the dry season majority of households rely on rivers

53.7% for water; boreholes/wells (25.8%); piped water (13.7%); rain water (5.3%); dams (1.1%); water vendors (0.5%). During the wet season majority of households depend mainly on rain water comprising 47.3%; rivers.

4.2. Bio-Physical Conditions

The general topography of the land in Kiarutara Sub-location is fairly sloppy. The soil erosion potential is quite low to minimal level because of good and sound farming systems, contour farming with the use of cover crops (grass, sugar cane) as soil erosion control has been well utilized in almost all farms. This is also because of low levels of deforestation with a lot of trees still intact mostly the indigenous species; there is also the absence of overstocking and quarrying activities and sparsely populated human settlements.

A Section of the Chania Falls

4.3. Hydrological System of the Project Site

Several streams and Rivers are found to exist including River Karuru, Gura and River Nyakabai that supports the drainage system of the area. The area also enjoys a natural drainage pattern that is still unaffected by human activities with a very high ground water table and high rate of recharge. Currently, there is less/no restriction on drawal, available yield is enough and the general quality of water is good.

There are no flood prone areas within Kiarutara Sub-Location, Kamukobini village because of the topographical advantage and most people live on higher grounds too. Surface water location is well distributed with local communities relying on permanent springs and rivers for human consumption and domestic use. At the project site, there will be a small dam constructed, with an estimate of one meter in depth

and de-silting of a small section of the river so as to create more volume for water. Besides these, a canal has been created to channel the water from the site to the Power house about 0.5 Km, already the site for the Power House has been identified which is quite suitable for the project.

The project is expected to produce 580kW of power with the main intention of supplying power to Mataara Tea Factory, local communities, schools, churches, hospitals and other organizations at a much cheaper and affordable rate. This will also help the factory cut down costs of paying huge electricity bill to KPLC.

Main Project Site

Site for the Power House

4.4 Proposed Project Design

The Small-Hydro power project is located in Thika District, Gatanga Constituency, Kariara Division, Kiarutara Sub-Location, Kamukobini village. The power project will be constructed along River Chania in the following technical specifications:

No.	Item	Specification
1	Tea Factories	Mataara
2	River	Chania
3	Location	Mataara
4	District	Gatundu North
5	Estimated Design Flow (m^3/s)	3.445
6	Head (m)	49.53
7	Proposed Canal Type	ditto
8	Proposed Canal Length	0
9	Penstock Length (m)	66
10	Transmission Distance (km)	1.8 m
11	Indicative Power (kW)	580
12	Designed Firm Flow Rate	65
13	Estimated Number of Factories on Full Load	Part Load

4.5 Analysis of Alternatives

The proposed project design is a result of one year of discussions and negotiations with project partners drawn from ministries of the Government of Kenya and stakeholders from KTDA, tea farmers, NGOs and CBOs. The project preparation involved consultations at various levels with discussions focused on poverty eradication and livelihood options and the foreseen impact of Small Hydropower project. Several scenarios have been considered should there be no project and they are listed below:

If there is no project: The people living in the tea farming area of Gatundu North area are amongst the hard working people in the country with 62% of the people living in rural areas thus making the area agricultural hub and the second to Kericho in tea production. Implementation of sound projects that deliver clear and measurable benefits to rural communities, opportunities for knowledge exchange and capacity building and natural resource management skills would have a significant impact on the livelihoods and quality of life to the communities involved in this project. These things are unlikely to occur without KTDA Small Hydropower project.

The project was initially conceived as a power project with enhanced tea production as its core. However, it was redesigned as a development project with a focus on producing electricity, conservation of Chania river and

development of the local area, reducing poverty along the river through the promotion of connecting households to affordable electricity, training tea farmers to have access to power technology, markets and affordable credit. The alternative of designing a power project was considered and rejected in view of the extreme impact and social issues along the river.

Other alternatives discussed included (a) having a larger number of components, (b) a River tea farming community managed by KTDA or all of its partners. The alternative selected reduced the complexity of the project. The Water Resource Management and Lands Resources Management Project that have been tried and tested as being successful in the delivery of resources to communities and was selected.

4.6. Impacts Associated with the Project

Both negative and positive impacts are associated with the proposed Small-Hydro power project. In general the following are the impacts associated with the project:

4.6.1. Positive impacts

- Power supply to the local community; the local community and surrounding schools, churches, healthy centers, and Mataara Tea Factory Company limited will have access to power which will be cheaper and affordable.

- Employment opportunities to the locals and experts in this field. Employment opportunities are one of the long term major impacts of the proposed project. A number of people will be employed by the project especially the locals in both professional and non professional areas, as caretakers, security personnel, foremen casual labours, plumbers and electricity technicians among others

- Gains to the local and national economy. Through increased revenue to the government for instance KRA and payment of relevant taxes, rates and fees to respective institutions.

- Growth to Jua Kali and other associated sectors

- Improved Security

4.6.2. Negative impacts

- De-silting part of the River.
- Oil and other chemical spills
- Workers accidents and hazards during project installation
- Hydrology and water quality degradation
- Clearance of vegetation
- Disturbance of biodiversity

De-silting of part of the River, A small section of the river will be de-silted in order to provide room for more water however, the de-silted soil will be deposited in the near by neighbors' farms since it is rich in nutrients. Although this will interfere partly with the flow of the river but there is no alternative as its part of the project procedure and its short term.

Oil spills, Several measures shall be put in place to mitigate the impacts that are likely to lead to surface and river water quality degradation. The proponent will prepare a hazardous substance control system and emergency response plans that will include preparation for quick and safe clean up for any accident spills. It will prescribe hazardous materials handling procedures to reduce the potential for any spills during project installation and will include an emergency response programme to ensure quick and safe clean up for accidental spills.

Workers accidents and hazards during project installation, Power installation works inevitably exposes workers and the public to occupational health and safety risks as well as accidents. In particular, working with heavy equipments, handling and use of light tools endanger certain risks. Use of heavy equipment is expected to be limited, though prolonged. However, because of the short duration and non complexity of the project, such activities will be controlled consequently; the associated risks may be minimal. To reduce workers accidents and hazards the proponent is committed to adherence to the occupational health safety (OHS) rules and regulations as stipulated in the Factory and Other places of work Act (Cap 541). The proponent will be required to provide appropriate personal protective equipment as well as ensuring a safe and healthy environment for the works. Safety education and training shall be emphasized too as well as engaging qualified and experienced engineers to foresee the project.

Hydrology and water quality degradation, The project activities will have minor impact on hydrology

and ground water quality of the area, disturbance of the normal flow of the river can also influence ground water hydrology (i.e recharge rates, flow conditions).

Clearance of vegetation / Disturbance of biodiversity, Part of the existing vegetation is likely to be cleared during the site preparation; the existing trees need to be cleared with well thought out selective strategy in that those not interfering with the site layout plans to be left to conserve nature. In addition, some fast growing trees will be introduced to conserve the soil environment after installation of the project. The proponent will also ensure proper demarcation of proposed project area to be affected. This is aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project area and avoid spill over effects on the neighboring areas.

4.7. Summary of Possible Environmental Impacts and Mitigation Measures

The proposed Small-Hydropower station along River Chania may have the following possible environmental impacts. They have been described along with respective recommended mitigation measures in the table below.

IMPACTS	MITIGATION MEASURES
1. Biological Diversity: Negative ecological impacts on the construction site (soil erosion, destruction of flora and faunal interference). Small Organisms may be killed and destruction of grass. Trees and shrubs will be destroyed. Some of the treesto be destroyed are as follows: *Croton megalocarpus,Markhamia lutea, Pinus* p.,*Grevillea robusta* (Mukima),*Eucalyptus* spp. (Mutimbao),*Prunus Africana* (Muiri),*Vitex keniensis* (Meru Oak), *Cupressus* spp. (Cypress), *Juniperus procera* (Cedar), *Ocotea usambarensis* (Camphor), *Casuarina equiselifolia, Calliandra alothyrus, Newtonia buchananii* (Mukui), *Acacia mearnsi* Shrubs: *Lantaria camara, ferns* among others. Grass: Kikuyu grass, nappier grass Fruit trees: Avocado, Guava, Mangoes. Cash crop: Coffee, Tea, Macadamia	• Planting of grass and trees species that would be destroyed, flowers and grass within the Proposed Small- Hydropower station site. • Planting of trees, grass and flowers has been done and will continue to be done to improve on the landscape quality of the Small-Hydropower station compound and also act as windbreakers. • Special attention paid to propagation of the endangered tree species especially *Prunus africana.* • Tree species to be planted to rehabilitate the site and improve the aesthetic value of the Small-Hydropower station compound. • Emphasis to be on indigenous such as *Cordia Africana, Vitex keniensis, Vitex keniensis* (Meru Oak), *Prunus africana, Podo carpus, Olea spp, Croton macrostachyus, Junisperus procera, Milicia excelsa, Ocotea usambarensis* (Camphor), *Casuarina equiselifolia, Calliandra calothyrus, Newtonia buchananii* (Mukui), . • Other recommended fruit tree species along the canal • include: *Carica papaya* (pawpaw), citrus fruits, *Citrus sinensis* • (Orange) Mango (Mangifera indica), *Psidium guava*

	(Guava) among others.
2. Land degradation due to increased soil erosion - Clearing of grass, shrubs and other bushes for construction of Small-Hydropower station, footpaths and parking spaces increases the vulnerability of the land/site to soil erosion	• Terraces to be constructed at appropriate places at the site and suitable plants and grass species planted. • Extra roads to be constructed as narrow as possible and along the contour in consultation with Kenya Forest • Service (KFS) and Ministry of Roads and Public Works as necessary. • Rip-off compacted for planting of trees. • Footpaths to be protected with appropriate grass species, stones or appropriate environmentally friendly measures that would prevent soil erosion. • Avoid use of heavy machinery. • Use water bowsers to Minimize dust pollution • Control earth works.
3. Siltation	• Ensure de-silting is done regularly at a minimal rate.
4. Physical environmental destruction (land scarification)	• Avoid use of heavy machinery • Use water bowsers to Minimize dust pollution • Control earth works • Roads rip-off and re-vegatation after construction.
5. Wastes disposal Types of typical solid and liquid wastes expected at the Small-Hydropower station site would include but not limited to the following: These are as follows: Papers, Polyethylene bags, Plastic containers, broken glasses, foodstuff remains, green leaves from clearing of site, human wastes, dirty water machinery, etc.	• *The proposed Small-Hydropower station is addressing the problem as follows:* • Waste disposal containers will be placed at strategic places where wastes are sorted out into biodegradable, and non-biodegradable. • Solid wastes such as plastics, papers, and bottles will be collected for recycling. While papers and other wastes that cannot be recycled are burnt in the compost pit or incinerator. • Wastes such as green leaves will be used to produce compost manure for flower gardens to improve soil fertility and also planting trees and flowers later at the Small-Hydropower station site. • Waste water to be disposed into water sanitation system and exhausted for disposal as need arises.
6. Environmental Pollution through oil, petrol and diesel spillage	• Minimize accidental spillage of oils, petrol and diesels • Where they occur, immediate collection and treatment of site is recommended. • Dispose wastewater using environmentally sound methods. • Dispose machinery pollutants using environmentally sound methods. • Ensure machinery and equipment are well serviced

	to reduce leaks. • Construct storage fuel tanks away from regular activities in compliance with Energy bill, 2003.
7. Occupational health hazards or issues during construction and after	• Provision of adequate personal protective gear/equipment to workers such as gloves and gum boots to workers during construction work. • Use of water to reduce effect of dust on workers and the environment. • Erect warning signs • Fence where necessary • HIV and AIDS, VCT and Health Support Clinic within the Small-Hydropower station area.
8. Personal Safety such as workforce accidents by unsafe working practices	• Guard all moving parts of machines; provide personal protective clothing and ensure they are used; • Display for all to read health, safety and environmental management policies • Compliance to the provisions of the EHS management plan to safeguard workers • Prepare and print safety manual for distribution to workers. Contract an EHS Consultant to police workers with the view to ensure provisions of the EHS regulations are adhered to. • Provide protective gear for example overalls, hard hats (helmets), and safety boots among others.
9. Accidents from heavy, long trucks	• Assign a vehicle specifically for emergencies. • Put signs at the front and the rear of the trucks e.g. WIDE LOAD-KEEP DISTANCE • Notices at the sites warning people prone to accidents.
10. Water quality: Pollutants may be swept away into the downstream hence endangering human lives and that of aquatic life.	• Provision of potable water within the proposed facility should be as per the WHO Standards (Appendix I) • Ensuring effective discharge of waste water into the septic tank
11. Surface run off into the river	• Terraces and cut-off drain to be done. • Planting of suitable flowers and grass to control surface run-off around the project site.
12. Aesthetics of the project site	• Guard against degradation and pollution of the environment • Landscaping • Tree planting
13. Air, dust and noise pollution	• Dust masks to be provided to workers to limit

	inhalation of the dust. • Contractor will give prior notice of activities and time durations to neighboring households. • Watering dusty ground before excavation begins • Measures will be put in place to ensure use of serviced and greased equipment and earmuffs by operators. • Switch off engines when not being used • Generators to be well insulated or placed in enclosures to Minimize noise levels. • Sprinkling of water on graded routes to reduce dust. • Provide earmuffs to workers. • Use of appropriate devices to filter toxic emissions from the smoke before released to the atmosphere. • Screening/fencing the site to avoid spread of dust and ensuring all noisy work is done during daytime to avoid disturbance to neighbors.
14. Other cultures (personnel who will be posted to work in the area)	• Sensitization and education of communities on other cultures, their potential impacts and coping mechanism
15. Security issues	• Promoting community policing. • Small-Hydropower station to provide adequate security for plant and machinery.
16. Transport access	• Ensure construction does not affect movement of people. • Facilitate proper maintenance of major roads to the Small-Hydropower station.
17. Employment opportunities	• Give preference to local community on employment matters unless skills required are not available.

CHAPTER FIVE

5. PUBLIC PARTICIPATION

5.1. Introduction

This section discusses the involvement of the stakeholders both lead agencies and the Most affected people (MAP) living near the proposed locations of the Chania-Mataara Small Hydropower project. Public consultation raised issues of concern and also helped in identifying likely mitigation measures.

5.2 Community Participation

Community participation and consultation has been undertaken among people living within the project area of influence (AOI). A synopsis of the views of the policy makers, Lead agencies, tea farmers and beneficiaries, likely to be affected, as well as representatives of the Local Authority, who have been interviewed has been presented.

Interviews with stakeholders were undertaken on formal and informal basis to address issues that arose out of the site inspections and environmental assessment exercise. Interviews and discussions played a key role in the environmental assessment and were of particular benefit in cases where documents were not available. The objective of the stakeholders' consultations by the Consultant was therefore two-fold: (i) to inform the major stakeholders about the proposed project and (ii) to elicit views on acceptability of the proposed project, possible adverse impacts and practical mitigation measures.

Meetings and regular consultations were held with Kenya Tea Development Agency (KTDA), tea farmers, Ministry of Environment and Minerals, District Environmental Officer, Department of Water and Local Authority. These meetings were held to discuss the likely environmental impacts and mitigation of the proposed project with site locations for Chania-Mataara.

5.3 Stakeholders Views and Opinions

Stakeholders were consulted to solicit their views about the project in the area and specifically about the likely impacts resulting from the development. Other meetings were held between the Mataara Tea Factory and the tea farmers to facilitate implementation of the project and reduce power costs to the company, and also, provide electricity to the neighbours at a lower cost. According to the public meetings/consultations and interviews with key stakeholders the social acceptability of the proposed project was high considering the water use from the river by all communities. Issues of concern which were raised during the consultations included;

- site location near the river may result in sedimentation and erosion;
- permanent destruction of wetlands and biodiversity;
- inconvenience during construction of the power house;
- compensation of crops and property that could be affected;
- costs of connection by individuals to the electricity;
- prospects for getting employment, the local leaders also urged the Consultant to ensure that the local people were employed during construction of the power plant;

- the tea famers were happy with the proposed development as they would be served by the electricity at a lower cost and also, productivity of the tea will increase making the farmers achieve financial gains;
- Technology options and cost implications and the capacity to generate electricity could be passed on to the tea farmers and reduce their earnings; and
- Whether appropriate mitigation and management measures have been incorporated into the proposed design and overall project

5.3 How Concerns were addressed

During the consultation process with the public on the criteria for selection of the sites were determined and explained so as to determine preferred options of construction with minimum interference on the site. These were site constraints like water flow, land availability, distance from crops, and limitations in acceptable operating cost and requirements in transportation of materials and technical equipment to the site.

Possible alternative sites were discussed and one was found acceptable and has been agreed upon through this process. This was in the case for Chania-Mataara which had originally been proposed up stream away from farms and crops and with less impact on water flow downstream.

It was explained to the participants that a sequence of meetings will be held and that construction will take place when there are no crops in the farms or vicinity. Stakeholders generally hold the view that with appropriate mitigation measures these impacts can be minimized. Stakeholder Consultation issues raised and responses for the Environmental Information System (EIS) for selected Chania-Mataara power station.

Issues and Responses from Public Consultations

Issues	Responses
1. Farmers noted with great concern the issue of water flow in the flow not to be interfered with the project.	The Consulting team informed the farmers not to have fear because the technology going to be applied is different and more advanced than that of the previous application hence water will continuously flow in the river.
2. What is the impact of the Small Hydropower station on water availability in the river?	According to the design of the project, the Hydropower will not hold much water in the dam since the flow of water by natural gravity will be used to run the turbines.
3. Will residents be allowed to connect to the electricity system?	This project is going to be implemented in the tea farming area and excess electricity not required by the tea factory will be made available to the local community at low cost.
4. What is the impact of the consultations in regard to people's views about this project or Government already made a decision as regards site location.	The consultations have an impact otherwise government would not have wasted money to hire consultants to carry out this work if a final decision had been reached.
5. Harm caused by the Hydropower to the fish and other water species.	Its true the power plant may affect some water species in particular salmond that travels upstream for breeding. But the fish is hardly found in the project area as the location is a distance away from the shores and fish habitats.
6. More sensitization to the community so as to evaluate the good and bad effects of the project.	This has been one of the consultations to discuss effects of the project on the environment, but there have been many meetings among stakeholders and communities discussing the importance of the project to the local development.
7. People using the water from River Chania, what guarantee of safety is there before the water reaches downstream community.	When you look at the design of the project, at each stage that the water goes down, there is a back-up of water stored in the reserve to maintain continuity without overdrawing of the water from the river. But however, when in the process of implementing and operation, continuous supervision by WARMA and NEMA officials will be done so as to test the water levels and quality that measure up to the required degree of safety.
8. How are people of Mataara benefiting apart from describing the area as power project?	People will get employment opportunities during construction and operation of the project. Minimize on the cost of electricity once connected to the project.
9. Government may contract a contractor during implementation, then a contractor does not implement as per the set standards hence the negative effects turn to the local community.	Government is we the people you and i, but in any case KTDA will hire a consultant to supervise the contractor during implementation. NEMA will also send a team of specialists to supervise and monitor the project during implementation and operation.
10. Alternative site for the project.	KTDA with consultation from WARMA, Ministry of Energy and NEMA looked at different wetlands in Mataara to serve this purpose but since one of the aims of this project is to increase productivity of the Mataara Tea Factory, and benefit local farmers, the team of experts considering many factors came up with this site and there is no alternative site for Mataara Tea Factory.
11. There is a problem of over flooding in the area, so won't the project just increase and worsen the problem.	No, the flood levels of the area have been tested and therefore the design of the project caters for that factor, meaning that the project is not going to affect flooding

	of the area.
Any plan by government to build more Small-Hydropower stations?	YES. This is one of the 12 commissioned Small Hydropower stations all over the country in accordance with providing reliable, cost-effective and efficient energy to the people in rural areas
12. Are we expected to finance operations of the Small Hydropower station?	NO, That is a private arrangement or an administrative issue by the KTDA to ensure that each tea farmer has access to a productive factory.
13. We want to know the exact location of the plant on the ground not on paper.	Since the meeting was adjacent to the project site, the consulting team showed the community the point where the project would be sited using the plan and the beacons marked on the site.
14. What do we loose as residents of Mataara if we do not welcome the project	All the good factors associated with the project as we have discussed them in this meeting will be of no use and poverty will persist.

CHAPTER SIX

6. ENVIRONMENTAL MONITORING

6.1 Introduction

Monitoring of environmental conditions has always to have a reason. Monitoring only for the purpose to have data is never enough. There are two principle possible scenarios: either a good environmental condition shall be maintained or deterioration shall be hindered (in this case monitoring data would trigger actions) or an environmental situation shall be improved. In the latter case the effect of actions set up by e.g. decision makers shall be supervised by monitoring. The monitoring data then show whether there is really an improvement of the environmental conditions or, if not, new actions are needed. For this a sophisticated processing of the data and a convincing visualization of data for decision makers are necessary.

6.2 Monitoring Programme

Ten basic rules for a successful water monitoring and assessment programme can be set up:

- The information needs must be defined first and the programme adapted to them and not vice versa (as was often the case with multi-purpose monitoring in the past). Adequate financial support must then be obtained;
- The type and nature of the water body must be fully understood (most frequently through preliminary surveys), particularly the spatial and temporal variability within the whole water body;
- The appropriate media (water, particulate matter, biota) must be chosen;
- The parameters, type of samples, sampling frequency and station location must be chosen carefully with respect to information needs.;

- The field equipment and laboratory facilities must be selected in relation to the information need and not vice versa;
- A complete and operational data treatment scheme must be established;
- The monitoring of the water quality of the aquatic environment must be coupled with appropriate hydrological monitoring;
- The quality of data must be regularly checked through internal and external control;
- The data should be given to decision makers not merely as a list of parameters and their values, but interpreted and assessed by experts with relevant recommendations for management action. Probably the weakest link within the data management chain is the proper storage of data. If data are not accessible and complete with respect to the conditions and qualifiers pertaining to their collection and analysis or properly validated, the data will never be able to satisfy any information need; and
- Pogramme must be evaluated periodically, especially if the general situation or any particular influence on the environment is changed, either naturally or by measures taken in the catchment area.

6.3 Institutional Settings

At present, the monitoring network at Chania river is run by Department of Water as a standard requirement and additional initiative as a kind of self-monitoring could be undertaken by the KTDA Power Company.WARMA, however, should be the responsible authority for monitoring of the water level and quality. WARMA is the authority dealing with water matters while NEMA is addressing environmental affairs on the national level and all environmental data should be merged there. NEMA should publish the data in a yearly report. All data should be collected in a centralized GIS/MIS, where all relevant institutions/authorities could input their data. The same institutions/authorities should also have access to these data. Precondition is a unified and a data input/output format agreed between all stakeholders.

6.4 Monitoring Stations and Parameters

In principle, the number of monitoring stations in Chania-Mataara run by Department of Water can be considered to be sufficient. Unfortunately, monitoring actions have been reduced to a minimum due to inadequate capacity and insufficient resources. It has to be stated that at present a proper monitoring of the water level and quality of Chania does not exist mainly due to lack of money. This is why we recommend graduated monitoring actions starting with a basic (and cheap) monitoring that allows assessing of some principle characteristics of the water level, quality and

ending with a highly sophisticated programme.

6.5. Reporting

The documentation of monitoring data shall be carried out both as text and in graphical form. With comprehensible tables and drawings the actual status of the Chania River shall be presented. Trends of the development of the trophical status of the river shall be shown in figures and maps. Concerning the drinking water supply it is important to visualize the hygienic status of the raw water. Moreover, statements shall be made, whether and to what extent the biocoenosis of the river changes as a result of a discharge from the power station.

The assessment of the water quality can be done in comparison to existing guidelines/regulation/laws and objectives set before commencement of the measuring campaign. Evaluation of the river's trophical state can be made by using a trophical classification. The evaluation of the water quality as raw water for drinking water can be carried out according to WHO Guidelines for Drinking Water Quality (2006).

In order to describe and to visualize the efficiency of measures taken to improve the water quality, beside chemical and physical parameters of the water of river Chania additional data should be recorded:

- Amount of all (natural and artificial) inflows with some general parameters as conductivity and temperature by means of permanently installed measurement devices;
- Morphology of the river Chania;
- Vertical profiles of temperature, O_2 concentration, pH values, conductivity etc.

6.6. Training Requirements

A comprehensive training of highly educated staff should be undertaken to cover the specific requirements of supervising the water level and quality of the Chania River. Preferably hydrologists, chemists and biologists should be employed and especially trained how to measure water level, how to take water samples and how to treat the water samples specified according to the type of analyses to be done, how to handle samples on the transport, how to take measurements on site, how to maintain stationary measurement devices etc. The same is valid for the staff who will process and construe the data and who will be responsible for preparing the reports. These people should have some international experience, if possible, to ensure that the data presentation is comparable to international practices.

6.7. Provision Budget for Environmental Management and Monitoring Costs

Item	Quantity	Unit Cost	Total Cost (Kshs.)
Grassing/Re-vegetation	2 Ha	10,000 per Ha	20,000

Soil Erosion control measures	Lump sum	120,000	120,000
Personal Protective Equipment(PPE) Ear muff, Dust protector, Helmets etc	20 people	2,000	40,000
Provision of road safety measures during construction of vehicle speed control, accident reduction etc	Lump sum	120,000	120,000
Awareness and sensitization on Small-Hydro power programmes	Lump Sum	50,000	50,000
HIV/AIDS Campaign	Lump Sum	200,000	200,000
Environmentalist-Intermittent	6 Months	60,000	360,000
Tree planting activities and conservation measures	Lump sum	1,000,000	1,000,000
Land Acquisition and compensation	No resettlement	0	0
Training on monitoring, water level and quality	Lump Sum	500,000	500,000
Pollution Control	Lump Sum	100,000	100,000
Grand Total Costs			**2,510,000**

CHAPTER SEVEN

7. Conclusions and Recommendations

The proposed Small-Hydro power project along River Chania is projected to have numerous positive impacts including gains to local national economy, cheap power supply to the local community, creation of employment, improved security and growth to informal sector (Jua Kali) among others. The few negative environmental impacts of the project which include de-silting part of the river, disposal of de-silted soil, vegetation clearance, accident to workers and associated hazards, (hydrology) water quality degradation, oil/ chemical spills among others can however be rightfully mitigated.

The proponent of the proposed project shall be committed/ and has promised to put in place several measures to mitigate the negative environmental, safety health and social impacts associated with the life cycle of the entire project. Based on the above analysis of both positive and negative environmental impacts of the project's development, we, the Experts found no significant negative impacts that could pose adverse effects to the extent that the proposed project (along River Chania) cannot be implemented.

However, there is an overwhelming support from the local community for the project and they are very well informed. There is a high expectation of employment for the youths and improvement in the

household incomes, infrastructure and general delivery of social services as well as security within the area. The community expects the proposed Small-Hydropower station to reduce losses related to power blackouts at the nearby Mataara Tea Factory too.

In the past years, Tea factories have used heavy fossil oil/fuel for the boilers. However, in recent times due to escalating power rates, there has been a rise in power bills beyond factory and other production firms' expectation and means. In this respect, Ministry of Energy has commissioned a feasibility study on several Small-Hydropower stations in the country about 12.

It is also recommended that the positive impacts that emanate form such activities shall be maximized as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

CHAPTER EIGHT

8. References

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CHAPTER NINE

9. Annexes

9.1. NEMA Receipt of the of the EIA/SIA Scoping Report

K.T.D.A. LTD.
RECEIVED
21 DEC 2010
GENERAL MANAGER TECHNICAL SERVICES

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

Tel: (254-020) 605522/3/6/7, 601945
Mbl: 0724-253398, 0733-600035
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P.O. Box 67839 00200
Popo Road
Nairobi, Kenya
Website: www.nema.go.ke

NEMA/PR/5/2/ 8061 Date 21/12/10

REA INTERNATIONAL
P. O. Box 15953 - 00100
NAIROBI
- MATAARA -

RE: ACKNOWLEDGEMENT OF ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT

The National Environment Management Authority (NEMA) acknowledges receipt of 10 copies of Environmental Impact Assessment Project Report Number PR/8061 prepared by DR. PATRICK KARANJI (EIA/Audit Lead Expert/Firm of Experts). We have also received 50% of the 0.05% EIA Licence processing fee. The other 50% will be paid on issuance of the EIA Licence.

The reference number for the EIA Project report is NEMA/PR/5/2/8061 for any future correspondence.

The report will be reviewed in accordance with Environmental/Impact Assessment and Audit Regulations 2003; and NEMA will communicate its assessment/findings to you in due course.

In the interim, please do not commence or proceed with any development of the proposed project until you receive communication from NEMA on the same.

NAOMI GITAU
HEAD EIA SECTION

RECEIVED
21 DEC 2010
ENVIRONMENTAL IMPACT ASSESSMENT

9.2. Minutes of Stakeholders Meetings

MATAARATEA FACTORY CO. LTD.
P.O.BOX107,THIKA.
Tel:254 067-26034/020-3542372

MINUTES OF HDRO POWER MEETING HELD ON 25.07.2007 AT THE FACTORY CANTEEN.

DIRECTORS PRESENT

1. John Matheri - V/chairman
2. Samuel m. Mwangi - Director
3. Paul k. Ngaruiya - Director
4. Samuel ndonga - Director
5. George w. Kabuga - Director
6. K. M. Tinega - Ag. Fum

MEMBERS

1. Peter Njoroge Mwaura
2. Peter Wachira Githuku
3. Joseph Mbogo Wainaina
4. Serah Wangari Githuku
5. Mwangi Wainaina
6. Miriam Wakaba Muiruri
7. Naomi Wairimu Munene
8. John Kamau Muiruri
9. Muhia Kahora
10. Zakary Kinya Kweri
11. Wilson Gichinga
12. William K. Mwaura
13. Agnes Njeri
14. Joshua Kariuki
15. Joseph Kariuki
16. Samuel Gicharu
17. John Kamau Kimani

IN ATTENDANCE.

1. Chief - Mataara
2. Sub-Chief - Mataara
3. P. Ndumia - Orina & Partners

1

AGENDA.

1. Hydro power project.
2. No objection letters.

The meeting started at 11.40a.m by a word of prayer from Zackary Kinya Kweri.

INTRODUCTION.

The V/chairman introduced member of management present, administration and the directors.

MIN 01/2007/2008 – MATTERS ARISING.

The V/Chairman addressed the meeting by requesting the members to be willing to assist one another when in need giving examples of government & factories.
He explained that the project visibility has been done by Orina & Partners and being the reason for inviting the members to discuss the project.

MIN 02/2007 SPEECHES.

1. ENGINEER.

The engineer explained about the issues affecting the members of public giving examples of, when constructing roads & factories. He advised the members to utilize the surrounding resources properly. He further explained how the factory is consuming a lot of money through electricity bills and this cost can be controlled by utilising the surrounding resources.

- The engineer informed the members that they have discovered Chania river can be beneficial to the factory. They have surveyed the river and found that they can install a machine at the lower part the river and connect a pipe line which will pass through the farms of the members and for the company to get a permit from the registrar to construct the dam.

- He further informed them that he has compiled a list of the affected members.

ii. CHIEF.

- He briefed the members about his catchment (i.e Gituamba , Kiriko & Mataara.). He also told them that he works on behalf of the public and he is available to assist them.
- He explained the need to minimise the cost of power, eg Firewood.
- He stressed on the point of assisting each other especially this time the factory needs their support.
- He told the members before the project starts the members have to allow their farms to be used by giving details of the affected portion.

iii. DIRECTOR – SAMUEL NDONGA.

- He told the members that the company has to consult the members before any implementation.
- He requested the members to give a go head for the engineer to get the permit.

iv. DIRECTOR – GEOGRE KABUGA.

- He informed the members that he has been earlier involved in such a project where the same mentioned steps has to be followed for the permit to be processed.

v. DIRECTOR – PAUL KAHIGA.

- He addressed on the importance of coming together and discuss the issue.
- He assured the members that no body can use their land before their consent.

vi. DIRECTOR – SAMUEL MUKIRI.

- He told the members that its good to be offering, giving examples of where people offer land for church construction and later marked as remembrance.
- He insisted members to ask question on areas they don't understand.

MIN 02/2007/2008 - QUESTIONS.

- Whether there is a record of farm details? **ANS.** The survey team has noted the names.

- Requested for project's map? **ANS.** The engineer informed them that it's preliminary stage where they cannot get a map before attaining the project's permit.
- Would like to known whether working together with Ngere Tea Factory who has the same project? **ANS.** Two catchments with the same problem and no harm to assist one another.
- Is there any assurance for their signature not to be used else where? **ANS.** The format of the contract form cannot be used else where it is addressed water project and the chief has to counter sign for the same.
- What will happen if anything happens after signing the contract? **ANS.** The engineer assured them nothing can lead to the cancellation of the permit because the factors which determine the procession of the permit are there citing examples like, the size & the speed of the river, distance: Electricity in long distance is very costly and cheap in short distances.
- What if another party comes after signing the contract? **ANS.** After the paper has been taken to the registrar who ever will come after can not get permit before the registrar has done the recruitment of the same.
- Whether it is possible to sell the land to the company before the title deed's detail transferred? **ANS.** The plot no. to be noted and the next of kin to sign the contract form.

There being no other business the V/Chairman thanked all the members. The meeting ended at 3.00 p.m. with a word of prayer from Zackary kweri kinya.

SECRETARY..... DATE.....

CHAIRMAN..... DATE.....

9.3. Surveyor's Report

ZAVERIO K GITONGA
P.O BOX 127
MURANGA

30[TH] oct. 2010

THE FACTORY UNIT MANAGER
MATAARA TEA FACTORY
P. O. BOX 107 – 01000
THIKA

RE: SURVEY FOR PROPOSED CHANIA-MATAARA SMALL HYDRO POWER PROJECT .

Reference is made to your letter ref: No. mat/hyd/10 of 10th May,2010. The survey is now complete and below is the report.

Surveyor's report

The data used are the registry map No. LOC16/kiarutara, sheet number 3and5, chania/mataara sheet 4.

Survey marks were placed along the proposed cannel route. The width of the proposed cannel is 9 meters. The acreage for the canal is computed for each parcel of land affected. These computed areas of the canal are provisional and may change when the actual design of the project is done. At total of 29 parcels of land will be affected which include:

S.No	Parcel Number	Acreage to be affected in hectares	Acreage to be affected in acres
1.	Chania/mataara/161	0.539	1.332
2.	Chania/mataara/1141	0.119	0.293
3.	LOC16/kiarutara/445	0.085	0.210
4.	LOC16/kiarutara/231	0.220	0.544
5.	LOC16/kiarutara/489	0.121	0.298
6.	LOC16/kiarutara/300	0.176	0.436
7.	LOC16/kiarutara/855	0.036	0.089
8.	LOC16/kiarutara/856	0.036	0.089
9.	LOC16/kiarutara/226	0.076	0.187
10.	LOC16/kiarutara/861	0.088	0.218
11.	LOC16/kiarutara/862	0.034	0.084
12.	LOC16/kiarutara/530	0.027	0.067
13.	LOC16/kiarutara/506	0.022	0.054
14.	LOC16/kiarutara/507	0.029	0.071

15	LOC16/kiarutara/508	0.033	0.082
16	LOC16/kiarutara/665	0.028	0.069
17	LOC16/kiarutara/831	0.032	0.079
18	LOC16/kiarutara/511	0.030	0.073
19	LOC16/kiarutara/200	0.025	0.062
20	LOC16/kiarutara/190	0.010	0.024
21	LOC16/kiarutara/196	0.023	0.057
22	LOC16/kiarutara/499	0.072	0.178
23	LOC16/kiarutara/500	0.065	0.161
24	LOC16/.kiarutara/501	0.062	0.153
25	LOC16/kiarutara/502	0.062	0.153
26	LOC16/kiarutara/503	0.176	0.436
27	LOC16/kiarutara/140	0.059	0.145
28	LOC16/kiarutara/224	0.045	0.111
29	LOC16/kiarutara/222	0.164	0.405

Z. K GITONGA
SURVEYOR

9.4. List of Public Consultation Participants

BEA International
Bureau of Environmental Analysis

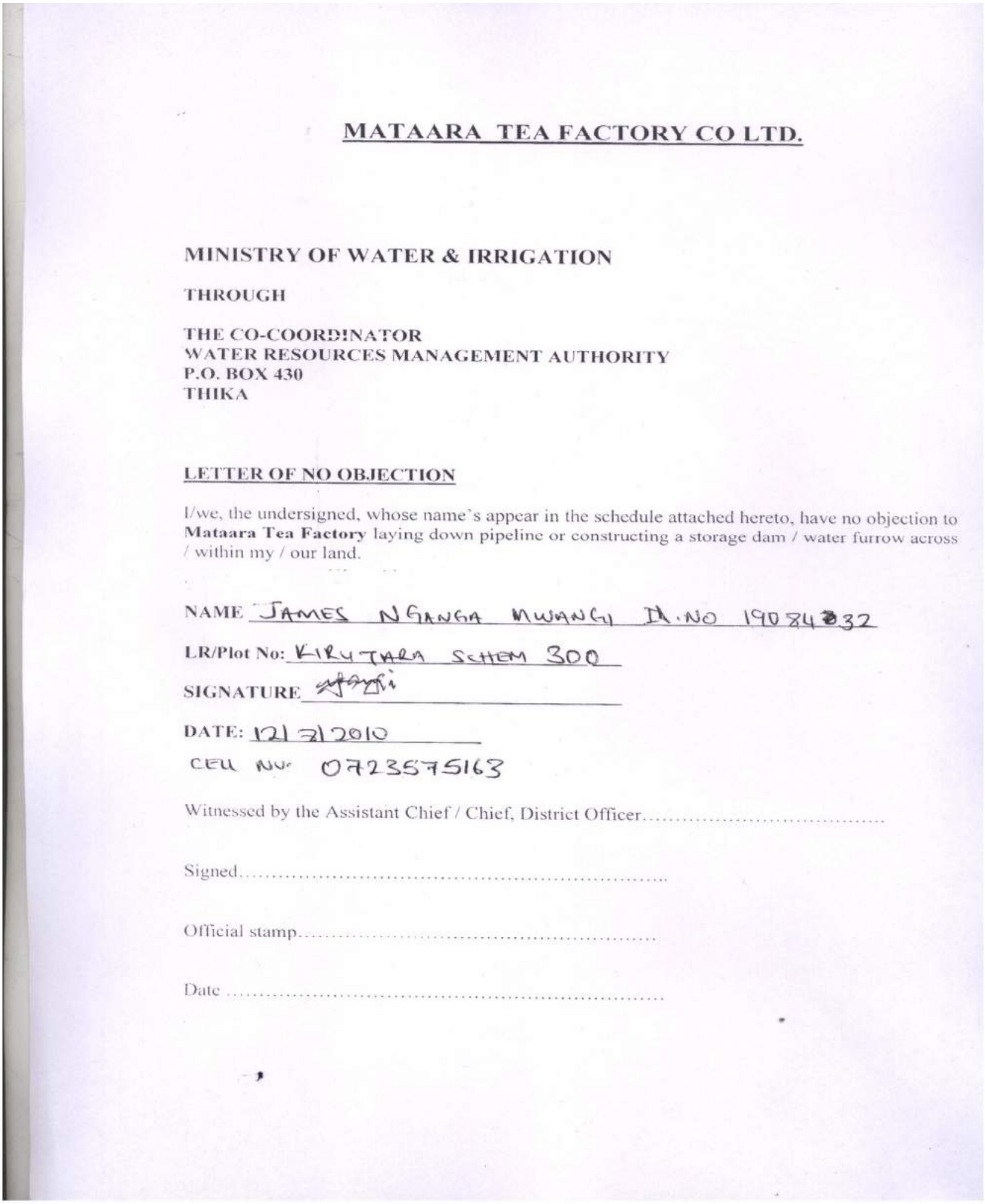
P.O Box 15953- 00100 G.P.O, Nairobi, Kenya
Telephones: + (254) 715 899 237 or 020-476-5265,
Cell phone: + (254) 733-320 181.
Fax: + (254) 20-631421
E-Mail:info@beainternational.org
Website: www.beainternational.org

MATAARA TEA FACTORY.

LIST OF PARTICIPANTS

	Name	Address	Tel/Cell	E-mail	ID/Passport	Signature
1.	PAUL NDUNGU GICHIA	71 THIKA	0712592700		21874990	
2.	JAPHETH KAMAU	107 THIKA	0721362216	jthananga@mataara-kuda teas.com	14637572	
3.	G. NDUNGU	107 THIKA	0722437749	gichuhi.jeff@yahoo.com	25680251	
4.	J. Ngea	107 THIKA	0724757620		13443932	
5	D. Kariuki	107 THIKA	0720321795	kingdavid456@yahoo.com	22153198	
6.	B. Muriuki	107 THIKA	0723707070		8075401	
7.	M. Kathatu	107. THIKA	0724 044 926	mkathatu@mataara-kuda teas.com	27082462	
8.	GEORGE M[illegible]	〃	0721 537566		14595712	

9.5. WRMA Letter of No Objection



MATAARA TEA FACTORY CO LTD.

MINISTRY OF WATER & IRRIGATION

THROUGH

THE CO-COORDINATOR
WATER RESOURCES MANAGEMENT AUTHORITY
P.O. BOX 430
THIKA

LETTER OF NO OBJECTION

I/we, the undersigned, whose name's appear in the schedule attached hereto, have no objection to **Mataara Tea Factory** laying down pipeline or constructing a storage dam / water furrow across / within my / our land.

NAME JAMES NGANGA MWANGI ID.NO 19084832

LR/Plot No: KIRUTARA SCHEM 300

SIGNATURE

DATE: 12/2/2010

CELL NO. 0723575163

Witnessed by the Assistant Chief / Chief, District Officer.....

Signed.....

Official stamp.....

Date .....

9.10. WRMA Authorization to Conserve Water

WATER RESOURCES MANAGEMENT AUTHORITY
TANA CATCHMENT AREA

Tel: +254 68 31271
Fax: +254 68 31315
E-Mail: wrma@tana.co.ke

REGIONAL OFFICE
P.O. BOX 1930
60100 EMBU

MATAARA TEA FACTORY Co. LTD.
RECEIVED
26 JUN 2008
P. O. Box 107-01000 THIKA
SIGN:.....

WRMA/TC/07798/11

6TH JUNE, 2008

Mataara Tea Factory
P O Box 107
THIKA

Dear Sir/Madam

AUTHORIZATION TO CONSTRUCT WATER WORKS

This is to inform you that you have been issued with an authorization **Ref. No. WRMA/TC/07798** of **6TH JUNE, 2008** to enable you construct water works as per attached authorization. In this connection, your attention is drawn to all the conditions which are indicated at the back of the authorization under reference.

Please ensure that **Water Resources Management Authority-Sub-Regional Office-Murang'a /Water Office** is informed on completion of the works so that an inspection can be carried out and comprehensive report is filed for reference to this office for further action.

Please take the necessary action accordingly.

Yours faithfully

D. M. KIOKO
REGIONAL MANAGER

cc:

The Sub-Regional Manager
P. O. Box 304
MURANG'A

The Chief Executive Officer,
Water Resources Management Authority,
P.O. Box 45250 – 00100
NAIROBI

Form: WRMA 010
Catchment: TANA
WRMA ID: _____
File: WRMA/TC/07798

Water Resources Management Authority

AUTHORISATION TO CONSTRUCT WORKS

FOR THE USE OF WATER

Dear Sir/Madam; *(Rule 33)*

I have the honour to inform you that the Water Resources Management Authority has given you approval to construct the proposed works based on your application dated 17th September, 2007 for a Water Permit.

Authorization No. WRMA	***WRMA/TC/07798***	*Dated*	*6TH JUNE, 2008*

Type of Water Use	Surface Water				Groundwater		Effluent Discharge	Swamp Drainage
	Diversion	Abstraction	In-stream Works	Storage	Shallow well	Borehole		
Tick Box	√							

PARTICULARS OF APPLICANT		DETAILS	
1. Full name of applicant(s) (In Block Letters)		MATAARA TEA FACTORY CO. LTD	
2. Category of Applicant - Individual, Group [Association, Society], Company, Institution		COMPANY	
3. ID Number of Applicant (Individual) or Certificate of Incorporation or Registration for Groups or Companies		CERTIFICATE OF INCORPORATION	
4. PIN Number (where available)		N/A	
Physical Address where water is to be used		**Contact Address of Applicant**	
5. L/R Number(s)		6. Box Number	107
7. Village(s)/Ward(s)	MATAARA	8. Town	THIKA
9. Sub-location(s)	MATAARA	10. Post Code	
11. Location(s)	GITUAMBA	12. Telephone Contact (Landline)	
13. Division(s)	KAMWANGI	14. Telephone Contact (Mobile)	
15. District(s)	GATUNDU	16. Email Contact	

WATER RESOURCE DETAILS

17. Name of Body of Water or Aquifer where water is to be diverted, abstracted or stored	CHANIA RIVER
18. Is the point of abstraction or storage in a Protected Area or a Groundwater Conservation Area? (yes/no)	NO
19. Sub-catchment Number	4CA
20. Class of Water Resource	
21. Name of Body of Water or Aquifer where effluent is to be discharged	
22. Sub-catchment Number (Effluent)	
23. Class of Water Resource (Effluent)	
24. Category of Application (Class of Permit)	D

25. Brief Description of Project and Intended Use for Water				
Type of Water Use	Groundwater (m^3/day)	Surface Water (m^3/day)		
		River - Normal Condition	River - Flood Condition	Dam
26. Public				
27. Domestic				
28. Livestock				
29. Subsistence Irrigation				
30. Commercial Irrigation				
31. Industry/Commercial				
32. Hydropower		**172,800**		
33. Others				
34. Sub-total		**172,800**		
35. Quantity Returned		**172,800**		
36. Water Abstracted (row 37-row 36)		**NIL**		
37. Effluent Discharge				

*Having filed the necessary application, maps and plans, and having complied with the provisions of the Water Act 2002, and the Rules there under relating to the applications for Water Permits *is/are hereby authorized to construct, subject to the acquisition of the necessary rights of way or easements therefore, if any, the works shown by the said applications, maps and plans in accordance with provisions of the Water Act 2002, the Rules there under, and the following conditions: -*

1. The construction of the works hereby authorized shall commence within a period of ***7(Seven)*** *days/months/years and shall be completed within a period of* ***18(eighteen)****.months/ years from the date of this authorization.*

2. (a)Any person who erects or constructs temporary works shall be entitled to divert, abstract, impound, obstruct, store or use water to such extent only as may be necessary for the construction or erection of the works, and whenever it shall be necessary to divert, abstract or impound water during the erection or construction of the works authorized, such diversion, abstraction, obstruction, impounding, or use of water shall be made at such time and in such manner that the works of other operators are interfered with as little as possible and that no damage will be caused to property of another landholder. Provided that if any damage is caused it shall, failing agreement between the parties concerned, be settled by arbitration under the Arbitration Act.

(b)Unless empowered thereto by the Water Resources Management Authority in writing, all temporary works shall be removed within a period of three months from the date of completion of the works authorized or from the date of determination of the authorization (whichever be the earlier) and where any temporary works exist, such as quarries, burrow-pits, excavations, cuttings, tunnels or things of a like nature which cannot be economically removed, efficient precautions to the satisfaction of the Water Resources Management Authority shall be taken, by the person named in the authorization, to render and to maintain all such temporary works safe in the interest of life and property.

The Water Resources Management Authority reserves the right to inspect the works authorized by this authorization, and attention is drawn to section 90 of the Act.

3. Any changes between the original proposed design and final as-constructed arrangement have been documented and such documentation submitted to the Authority.

3. CONDITIONS OF AUTHORISATION	DETAILS
Measuring device	
Controlling device	CONTROLLING DEVICE TO BE INSTALLED
Water Quality Report	LABORATORY ANALYSIS FROM COMPETENT LABORATORY
Evidence of EMCA Compliance	
Soil and Water Conservation Plan	
Compensation Flow (m^3/day)	
Inspection Milestones	
1	TO INSPECT THE WORKS AFTER COMPLETION OF WORKS
2	
3	
4	
Notification Requirements	
1	
2	
3	
4	
Storage	
Pipeline	
Test pumping	
Other Technical Details	THE INTAKE WILL BE BY WEIR GRID REF. 37M 0255838 UTM 9905717 MAP SHEET NO. 134/4
Effluent Discharge Requirements	

4. This Authorization will be automatically cancelled, when the authorized period expires, without any further reference to you unless extension of time limit is applied for prior to date of expiry.

5. The following details/documents/fees are required to complete your application before a Permit may be issued:

(a) Form **WRMA 008** must be returned dully signed when works have been installed.

(b) To Submit Permit fess of **Kshs.50,000**

SIGNATURE

Yours faithfully,

Signature of WRMA Officer	
Name of Officer	**D. M. KIOKO**
Position	**REGIONAL MANAGER**
Date of Signature	**6TH JUNE, 2008**

This Form to be submitted in triplicate.

W.A.B. 13

REPUBLIC OF KENYA

APPLICATION FOR A WATER PERMIT (SURFACE WATER)

(Issued Under the Water Act)

NOTES.—1. This form is applicable only for applications for Water Permits involving the diversion or use of water and is not applicable for application for Water Permits involving reclamation or drainage.

2. Parts I and IV must be completed by all applicants. Only the appropriate sections of Parts II and III need be completed.

3. Instructions for filling in this form are given on page 8.

PART I

TO THE CHAIRMAN OF THE WATER APPORTIONMENT BOARD, P.O. BOX 49720, NAIROBI.

1. Full name of applicant(s) (In Block Letters)	MATAARA TEA FACTORY CO. L
2. Residence	P.O Box 107
Postal Address	Thika
3. Occupation	FACTORY
4. Number(s) and locality of applicant's holding(s) *or* area	Mataara Village, Makuyu Sub Loc
of mining location or mining lease	Gitaraba Loc, Kamwangi Div
or other description of the applicant(s) holding	Gatundu North District
5. (*a*) Land reference number of farm or other description of land where water is to be used	CHANIA/MATARA/758(L) 2
(*b*) Is land freehold or leasehold? If leasehold state date of expiry of lease	LEASEHOLD
(*c*) Hectare of farm	
6. Name or description of body of water from which the water required is to be diverted, stored or used	CHANIA RIVER
7. Is the body of water described above situate in or does it abut upon or flow into a Special Area?	ABUT UPON
8. Describe:	
(*a*) The point of abstraction or diversion; and/or ..	
(*b*) The point of storage; and	
(*c*) The point of use	CHANIA/MATARA/758(L) 2

INFORMATION TO BE SUPPLIED IF KNOWN TO THE APPLICANT(S)

9. Flow of river, stream, spring or other body of water which is to be diverted or in which water is to be stored.	WHEN FLOW OF BODY WATER IS		
	Low	Normal	In Flood to be stated where possible
A. (1) Breadth of water surface in metre			
(2) Average depth of water in metre			
(3) Surface velocity in metres per second			
(4) Estimated discharge in cumecs			
or B. If stream has been gauged by other method, state:			
(1) Discharge in cumecs or litres per day			
(2) Method of gauging			
C. How many months (if any) in the year is the river dry?		NIL	Months

PART II—PURPOSE(S) AND QUALITY OF WATER FOR WHICH APPLICATION IS MADE

		Quantity of Water Required (Cumecs or Litres per Day)	
		Of Normal Flow	Of Flood Wat
10. Domestic Purpose. State whether water is required for—			
(a) Household and sanitary use	(i) No. of persons using water-borne sanitation		
	(ii) No. of persons not using water borne sanitation		
(b) Watering stock	(i) No. of large stock		
	(ii) Type of large stock		
	(iii) No. of small stock		
	(iv) Type of small stock		
(c) Cattle and sheep	No. of dips		
(d) Other essential requirements of farming operations which are not of an industrial nature. State use(s) to which water will be applied			
	Total (Domestic Purposes)		

11. Public Purpose.

Fill in appropriate space if water is required for:	Quantity of Water Required in Cumecs			
	Normal Flow		Flood Water	
	Present Time	*..... Years Hence	Present Time	* Years He
(a) Municipal, Township and community use or supply of water to persons other than the operator, in consideration of payment therefor				
(b) Steam raising on railways				
(c) Other use (not (a) or (b) above or for power)				
(d) Total water applied for, for public purposes				

*Fill in the number of years hence upon which your estimate is based.

(e) When the water is required for (a) above, the following information should be supplied as far as possible:

Residents

Estimated population at present

Estimated population 5 years hence

Estimated population 10 years hence

Estimated population 20 years hence

(f) When water is to be used for (c) above, state use to which water is to be applied, and give details — (f)

(g) State if water is to be supplied to any person, other than the applicant, in consideration of payment therefor answer "Yes" or "No" — (g)

12. Minor Irrigation Purpose (0.8 Hectare)

State the following:

(a) Area to be irrigated — (a) ..... hect

(b) Crops to be irrigated — (b) .....

(c) Quantity of water required — (c) ..... cumecs or litres per day of normal fl

(d) How disposal of drainage, seepage and surplus water is to be effected. — (d) ..... cumecs or litres per day of flood wa

PART II—(*Contd.*)

13. INDUSTRIAL PURPOSE.
State the quantity required in the appropriate space:

		WATER REQUIRED IN CUMECS OR LITRES PER DAY	
		Normal Flow	Flood Water
(*a*)	Steam raising, cooling and condensing water ..	(*a*)	
(*b*)	Fibre treatment—		
	(1) Decoraticating *only*	(*b*) (1)	
	(2) Sluicing away refuse, excluding (1) above ..	(2) N/A	
(*c*)	Coffee pulping and washing	(*c*)	
(*d*)	Other purposes	(*d*)	
(*e*)	Total water required for industrial purpose ..	(*e*)	
(*f*)	If water is required for (*d*) above, give details ..	(*f*)	

(*g*) State in the appropriate spaces opposite the area under:

	AREA PLANTED IN HECTARES	
	At Present	Estimated five years hence (Answer if possible)
(1) Coffee		
(2) Sisal		
(3) Other crops for which water for industrial purposes is required—State crop		

(*h*) State the periods during the year when the water will be required .. .. From ..... To .....
From ..... To .....

(*i*) The normal and maximum number of hours per day the factory will be run .. .. .. Normal .....
Maximum .....

(*j*) Give a brief description of the machinery and plant, stating the number and size, pressure, evaporative capacity of the boilers (if any), the number, size and description of the motive power units and the size, number and description and capacity of any special machinery used.

14. POWER PURPOSE.
(If a hydraulic ram is to be used fill in paragraph No. 21).

State the following:

(*a*) Purpose for which power is required .. .. (*a*) FACTORY USE.

(*b*) Brake horse-power to be developed—
Maximum .. .. (*b*) 800 KW (maximum) B.H.P.
Minimum .. .. 600 KW (minimum) B.H.P.

(*c*) The gross fall or head available for power production in the power reach of the river—
(1) At low stage of the river .. .. .. (*c*) (1) ..... metres.
(2) At normal stage of the river .. .. (2) ..... metres.
(3) At high stage of the river .. .. .. (3) 60 metres.

NOTE.—(*c*) (1) and (*c*) (3) need be answered (only when the maximum brake horse-power to be developed is in excess of 100.)

(*d*) The net fall or head to be utilized in (*b*) above .. (*d*) 60 metres.

(*e*) The water required to develop (*b*) above .. (*e*) 2.0 cumecs of normal flow.

(*f*) Description and number of machines to be installed, e.g. Pelton wheel, overshot water wheel, etc. (*f*) 1 NO FRANCIS TYPE TURB. WZ cumecs of flood water.

PART II—(*Contd.*)

14. POWER PURPOSE—(*Contd.*)

(*g*) Is it proposed to develop the full amount of power available at the suggested site, including all falls and rapids in the power reach of the river. — (*g*) YES

(*h*) How water after utilization in power generator is to be returned to the river. — (*h*) VIA TAIL RACE CHANNEL.

State length of return channel (if any) .. .. — Max 50 metres.

(*i*) If electrical energy is to be derived from the power above state:

(1) Does the applicant propose to supply any electrical energy to any person other than himself, in consideration of payment therefor. — (*i*) (1) NO. Factory Use only.

(2) Details of any generating and distributing licences issued under the Electric Power Act (Cap. 314), and held by the applicant. — (2) None Available at this Stage

(*j*) (i) Will the prime mover and its accessories be situated entirely on the property of the applicant (State "Yes" or "No"). — (*j*) (i) NO.

(ii) If not, give details of land (L.R. No. and name of owner) on which works will be situated. — (ii) See Letter of No Objection ATT

15. GENERAL IRRIGATION PURPOSE.

State the following:

(*a*) Crops to be irrigated and area of each crops .. — (*a*) (1) Crop N/A area hectare

(2) Crop ..... area ..... hectare

(3) Crop ..... area ..... hectare

(4) ..... area ..... hectare

(*b*) The quantity of water required is .. .. .. — (*b*) .....cumecs or litres per day of normal flow.

.....cumecs or litres per day or flood water.

(*c*) Describe the class of soil to be irrigated .. .. — (*c*)

(*d*) Describe nature of sub-soil with particular reference to its drainage possibilities. — (*d*)

(*e*) Describe in detail the works (if any) to be constructed to drain the irrigated lands. — (*e*)

(*f*) Where is residue of used and unused water to be disposed of? State name of body of water to which it will be returned. — (*f*)

16. OTHER PURPOSES.

State the following:

(*a*) Nature of purpose .. .. — (*a*)

(*b*) Quantity of water required .. .. — (*b*)

.....cumecs or litres per day of normal flow.

.....cumecs or litres per day of flood water.

(*c*) Make such statement of facts as will show that the quantity of water applied for is reasonable and show how water is to be utilized.

PART II—(*Contd.*)

17. SUMMARY OF PURPOSES AND QUANTITIES OF WATER APPLIED FOR.

PURPOSE	QUANTITY OF WATER APPLIED FOR			
	Normal Flow		Flood Water	
	Cumecs or Litres per Day	*Hectare Metre*	*Cumecs or Litres per Day*	*Hectare Metre*
N/A				
Domestic				
Public				
Minor irrigation				
Industrial				
Power (including drive water required for ram) ..	172800 M³/H			
General Irrigation				
Other				
TOTAL	172800 M³/H			

18. POLLUTION.

Would the water now applied for be used for any purpose or in any process that will foul it or that will increase its burden of silt, gravel or boulders or cause it to be injurious directly or indirectly to public health, to stock, to fish or to crops or gardens irrigated with such water.—Answer "Yes" or "No"

If the answer is in the affirmative, describe fully what steps are proposed to render the effluent and the residue of it innocuous and pure before returning it to the stream.

No

PART III—METHOD OF DIVERSION

19. DIVERSION BY GRAVITATION.

(By means of a canal and/or pipe)

(*a*) Details of canal Trapezoidal Section ..

(NOTE.—If canal is long and has any changes in cross section, the details required are to be given for each cross section— these should be given on a separate sheet of paper if not shown on the plan(s) accompanying this application).

(*a*) Canal — Metre — cm.

Width at bottom Approx 2.0 m

Width at full supply level Approx 4m

Depth of water at full supply level ≃ 1·2 – 1·6m

Length ≃ 1 Km. (km./metre).

Gradient, fall in 30 metre 1:1000 metre.

Average velocity in metres per second ≃ 0.5m/s

Estimated discharge at full supply depth 2.0m³/s

Material(s) in which canal is to be constructed Earth Cut/face.

(*b*) Details of pipe line Steel pipe .. .. ..

(NOTE.—If the pipe line is long and has any changes in size give the details required for each size of pipe or for each change in the hydraulic gradient). .. .. ..

(*b*) Pipe

Internal diameter ≃ 1.0 (max) cm.

Length ≃ 350m. metre.

Hydraulic gradient fall in 30 metre metre.

Description of material of pipe and thickness thereof 6 – 10 mm thick steel pipe

(*c*) Details of any other structure such as syphons, flumes, tunnels, escapes, etc. .. N/A .. ..

N/A

(*d*) (i) Will any of the above canals, pipes and/or structures be situated on the holdings of other landholders?

(ii) If so, state full details of land or lands affected.

Yes/No Yes

See Attached re Objection Letters

PART III—(*Contd.*)

20. METHOD OF DIVERSION

Diversion by pumping (including by means of a ram*)

Fill in particulars of the plant in the appropriate spaces opposite.

(*In case of a ram answer only (*a*), (*c*), (*f*), (*g*), (*h*), (*i*), (*j*), (*k*), (*l*), (*m*), (*n*).)

N/A

(*a*) Type of pump ..... N/A

(*b*) Type of driving machine and fuel used .....

(*c*) Brake horse-power (at sea-level) of (*b*) above ..... B.H.P.

(*d*) Approximate elevation of pump above sea-level ..... metre.

(*e*) How is pump driven from driving machine .....

(*f*) Internal diameter of suction pipe ..... cm.

(*g*) Height of suction ..... metre.

(*h*) Length of suction pipe ..... metre.
In case of a ram (*f*), (*g*) and (*h*) refer to the drive pipe.

(*i*) Height to which water is to be lifted above pump. ..... metre.

(*j*) Internal diameter of delivery pipe ..... cm.

(*k*) Length of delivery pipe ..... metre.

(*l*) How many hours per day will pump work? .. (*l*) ..... hours.

(*m*) Quantity of water to be pumped when pumping plant is working (*m*) ..... litres per hour.
or N/A ..... cumecs.

(*n*) Will the pump and its accessories be situated entirely on applicant's land (State "Yes" or "No"). (*n*) .....
If the answer is in the negative, state L.R. Nos. of farms and names of registered holders of the land that might be affected .. ..

21. IF A DAM IS REQUIRED.

State whether a dam is necessary—"Yes" or "No" ..

If a dam is necessary, state:

(*a*) Nature of a stream bed at site, e.g. "sound rock" "fissured rock", "soil", "sand", etc. .. .. .. (*a*) Weir

(*b*) Nature of walls of river channel at site, e.g. "soil", "rock", etc. (*b*) N/A Sound rock

(*c*) Will dam be founded on sound rock? ("Yes" or "No") .. .. (*c*) Fissured rock

(*d*) Will dam be founded on any material which may be eroded by any underflow? ("Yes" or "No") (*d*) .....

(*e*) Description of dam, such as, earth, earth with core wall (stating kind), concrete, masonry, etc. (*e* Concrete Weir

(*f*) Fill in dimensions in space opposite .. .. (*f*)

	Metre	cm.
Length of dam	.....	
Thickness at crest	.....	
Thickness at base	.....	
Greatest height of dam ..	.....	

(*g*) Estimated area of reservoir at spillway level .. (*g*) ..... Hectare

(*h*) Whether the submerged area at high flood level will be wholly within applicant's holding(s). If not, state L.R. Nos. and names of owners of the land affected. (*h*) No. on L.R. No. 503, 507, 186, 499, 2249, 2248, 2247, 2246, 2245, 16/200 and [illegible]

PART III—(*Contd.*)

21. IF A DAM IS REQUIRED—(*Contd.*)

(*i*) Whether one or both banks of the stream at the proposed site of the dam are on applicant's holding. If not, state L.R. Nos. and names of owners of land, etc., affected. — (*i*)

(*j*) Will any other works including weirs, already constructed or being constructed, be affected by the head and/or tail water levels of the proposed works. Answer "Yes" or "No". If "Yes" give full details of works affected. — (*j*) N/A

(*k*) The following information is required if the dam exeeeds 62,000 m³ in capacity or 5 metres in height— — (*k*)

Catchment Area:

(i) Area of surface catchment .. .. Hectare.

(ii) Maximum length of catchment .. .. km. or metre.

(iii) Average breadth of catchment .. .. km. or metre.
(Supply sketch of shape of catchment with dimestions, on separate sheet).

(iv) Ruling slope of catchment .. .. In degrees or expressed as 0.3 metre in metre.

(v) Nature of ground in catchment, (e.g. rocky, stony soil, clay soil, etc.) .. ..

If soil, state whether this is deep or shallow .. ..

(vi) Vegetation in catchment (e.g. forest, scrub, pasture, crops or fallow) .. ..

22. DISPOSAL OF FLOOD WATER PAST DAM.

State if flood water is to be disposed of by means of:

(*a*) The dam acting as a weir .. .. — (*a*) Lined Gopral

(*b*) By-pass(es) or waste weir(s) on one or both flanks — (*b*) N/A

(*c*) State width and depth of by-pass(es) below crest level of dam. — (*c*) ..... width. ..... depth.

(*d*) If by-pass(es) or waste weir is to be constructed, state nature of material in which the waste weir channel will be excavated. — (*d*) .....

(*e*) Gradient of waste weir channel .. .. .. — (*e*) ..... fall in 30 metre.

PART IV—GENERAL

23. State the licences, sanctions or permits already issued in respect of the land described in paragraph 5. (If Nil, state "Nil"). — 23. Nil

24. State the estimated period of construction of the works — 24. 18 No. months.

25. State the period after the completion of the works when all the water now applied for will be beneficially used. — 25. Immediately after Completion.

26. The General Map No. 13414 and the following plans Nos. 2 Copies See Attached Copies Position 37M0255638 UTM 9905717 which have been prepared in accordance with the Water Act and the Rules thereof, and which are sent herewith are hereby declared to be a part of this application.

27. State the period for which the permit is required .. — 27. 1 year

PART IV—(*Contd.*)

28. The address(es) of the owner(s) of the land(s) which may be affected by the proposed works and whose name(s) and holding(s) is/are shown on the General Map referred to in paragraph 26 above is/are given in the Schedule attached hereto. (If no lands are affected state "Nil" on Schedule referred to).

29. The following report and/or documents are sent herewith in support of my application.

(Here give Titles or Reference Nos. title deed, Letter of no objection Maps

30. I attach hereto verification of the names of the registered owners of the lands mentioned in paragraphs 4 and 28 above.

31. (*a*) Attached hereto is/are statements signed by the landholder(s), over whose lands it is required to construct works, that the said landholders have granted permission for the proposed works to be constructed on their lands.

(*b*) Attached is/are certified copy (copies) of the deeds which grant me the easement(s) to construct works on

(Description of property or properties)

32. I agree to supply any further information which may be required by the Water Appointment Board.

33. I enclose herewith Cheque for Shillings 23200 cents to cover the prescribed fee for the Water Permit applied for, and I understand that, if any, between the above amount and the prescribed fee will be returned to me.

MATAARA TEA FACTORY CO. LTD.
P.O. Box 107 - THIKA
TEL: 020/3542372, 067/26034

Date 19/9/2007

FACTORY UNIT MANAGER
Applicant or duly Authorized Agent

SCHEDULE REFERRED TO IN PARAGRAPH No. 28

LANDHOLDER	ADDRESS

INSTRUCTIONS FOR FILLING IN THE FORM

(Please write distictly)

PARA. 1.—State the names of all persons having an interest in the application. In the case of an association of a company, corporation, municipality, etc., the name of the association, company, corporation, municipality, etc., as the case may be, should be stated.

PARA. 2.—If a company, state the registered office of the company in Kenya.

PARA. 4.—Give an accurate description, the land registration number, and the area of the land on each holding or farm where the water is to be used.

PARA. 6.—The name, or if unnamed, a sufficient description of the spring, river or other body of water to identify it and state the name of the body of water (if any) to which it is tributary.

PARA 8.—Describe as accurately as you can, the various points mentioned, for example 8 (*a*) "At a point on the left bank of the river 70m. downstream of the point where the south-west boundary of farm L.R. 21967 intersects the left bank of the Simba River".

PARA 9.—In order to gauge roughly the flow of stream select in the vicinity of the proposed point of diversion, a length of the stream where the flow is steady and not turbulent. About the middle of this length select a site and measure the breadth of the surface of the stream at right angles to the directions of flow, say this is "a" metres. Then measure the depth of the water in metres at regular intervals (such as 0.1m. 0.2m. or 0.5m. etc., depending on the size of the stream across the line where the breadth has been measured. Sum up all depths and divide by the number of times the depth has been measured: the result will be the average depth, say "b" metres. Mark a point 20m. (or some other convenient distance) downstream of the point where the breadth was measured and mark a similar point 20m. up-stream from the point where the breadth was measured. Throw some object which will float into the centre of the stream and note the time in seconds it takes to cover the *total* distance between the two marks set out as above. The distance in metres divided by the time in seconds gives the central surface velocity say "c" metres per second.

Then the discharge of the stream in cumecs equal "a" × "b" × "c" × 0·7 approximately.

One cumecs equals one cubic metre per second, equals 86,400 cubic metres per 24 hours.

In the case of a small spring or stream, the time noted to fill a vessel of known capacity should be observed, e.g. a 20 litre petrol tin. filled in 20 seconds, therefore discharge of spring equals 20/20 × 60, equals 60 litres per minute, equals 0.06 cumecs approximately.

PARAS 14 AND 20.—The brake house-power obtainable from the use of water is to be determined as a product of the following factors:

(*a*) Flow of water utilized expressed in cubic metres per second.

(*b*) The average available static head in metres.

(*c*) The factor 0.09.

PARA. 31.—Delete (*a*) or (*b*) or both if inapplicable to the application.

GPK (L)

9.11. NEMA Environmental Certification of the Expert

FORM 5 (r. 14(4))

Application Reference No: 1534
Registration: 2137
FOR OFFICIAL USE

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT
CERTIFICATE OF REGISTRATION AS AN ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT EXPERT

This is to certify M/s DR. PATRICK KARANI
of P.O. BOX 15953-00100 NAIROBI (Address)
has been registered as an Environmental Impact Assessment Expert in accordance with the provisions of the Environmental Management and Coordination Act and is authorised to practice in the capacity of a Lead Expert/Associate Expert/Firm of Experts (Type) LEAD EXPERT

Dated this 8TH Day OCTOBER of 20 09

Signature.....

(Seal)

Director General
The National Environment Management Authority

FORM 5 (r. 14(4))

Application Reference No: 1548
Registration: 2151
FOR OFFICIAL USE

THE ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT
CERTIFICATE OF REGISTRATION AS AN ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT EXPERT

This is to certify M/s BEA INTERNATIONAL
of P.O. BOX 15953 - 00100 NAIROBI (Address)
has been registered as an Environmental Impact Assessment Expert in accordance with the provisions of the Environmental Management and Coordination Act and is authorised to practice in the capacity of a Lead Expert/Associate Expert/Firm of Experts (Type) FIRM
EXPERT

Dated this 22ND Day OCTOBER of 20 09

Signature .....

(Seal)

Director General
The National Environment Management Authority

9.12. NEMA Approved TOR

BEA International
Bureau of Environmental Analysis

P.O Box 15953- 00100 G.P.O, Nairobi, Kenya
Telephones: + (254) (0) 715 899 237 or +254 20-476-5265,
Cell phone: + (254) 733-320 181.
Fax: + (254) 20-631421
E-Mail:info@beainternational.org
Website: www.beainternational.org

TERMS OF REFERENCE

FOR THE

ENVIRONMENTAL IMPACT ASSESSMENT PROJECT OF THE PROPOSED CHANIA MATAARA SMALL-HYDROPOWER STATION IN MATAARA LOCATION, GATUNDU NORTH DISTRICT

SPONSORED BY THE KENYA TEA DEVELOPMENT AGENCY (KTDA) POWER COMPANY

The Lead Firm: BEA International; **NEMA Reg. Number: 2151**

Lead Expert: Patrick Karani; **NEMA Reg. Number: 2137**

Date: 3rd December 2010

TABLE OF CONTENT

1. INTRODUCTION AND BACKGROUND

Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) are necessary requirements for development projects that are likely to induce partial and or adverse irreversible environmental damage and increase in social marginal costs incurred during construction and operational phase of the project. The requirements are in accordance with the country's Environmental Impact Assessment Regulation (1999); National Environmental Management and Environmental Impact Assessment and Audit Regulations, 2003, Legal Notice No. 101. ; National Water Policy 2000; Water Act 2002; National Water Quality 2006; Fossil Fuel Emission Control Regulations 2006; The Way-leaves Act (Cap. 292); The Registration of Titles Act (Cap. 281); The Land Titles Act (Cap. 282); Electricity Power Act No. 11 of 1997; The Factories and Other Places of Work Act (Cap. 514); Other Places of Work Act (Cap 514) with reference to Medical Examination Rules and Noise Prevention and Control Rules described in Legal Notice No. 25 of the Kenya Gazette Supplement No. 22 of April 2005; Land Adjudication Act (Cap. 284); Public Health Act (Cap 242); Local Authority Act (Cap. 265); Physical Planning Act, 1999; Land Planning Act (Cap. 303); Building Code 1967; Penal Code Act (Cap.63); Waste Management Regulations, 2006; Other pertinent pieces of law including: Lakes and Rivers Act, Use of Poisonous Substances Act (rev. 1983); and, Workmen's Compensation Act (rev. 1988); Wetlands, River Banks, Lake Shores Management Regulations (2000) (Ramsar Convention); Biodiversity Management and Conservation Strategy; Protection of Fisheries and Forestry; and the African Development Bank (AfDB 2008) Environmental and Social Safeguard policies, guidelines and procedures. In addition, the country is signatory to major international treaties not limited to the 1992 United Nations Framework Convention on Climate Change (UNFCCC); the 1997 Kyoto Protocol on mitigation and adaptation to Climate Change, the 1987 Montreal Protocol on Ozone Depletion Substances.

The Kenya Tea Development Agency (KTDA) Power Company in collaboration with the Ministry of Energy, the Republic of Kenya, in 2009, commissioned a Feasibility Study for Chania Mataara Small-Hydro Power Station in Thika District, Gatanga Constituency, Kariara Division, Mataara Location along River Chania. The study was fully supported by the Ministry of Energy over a period of 10 months. KTDA and the Ministry of Energy appointed Q-Energy Limited a local private company to prepare the feasibility study. The feasibility study indicates that the selected project location along River Chania is suitable with low environmental and social impacts. The study notes that the continuous river flow and experience in large volumes of water with natural elevated gradient establishes potential for mini-hydro exploitation. Over the years the existing power shortage has affected the productivity and quality of tea resulting into huge losses of income and unemployment. This is in terms of protection of local tea farmers and local employment has become costly in the tea industry. For example, the Chania-Mataara tea farmers are currently not capable of coping with high tea production costs that are energy related. The Small-Hydro power plant is projected to supply power to the Factory Company and to the neighboring communities at a cheaper rate than the

current cost.

The exploitation of small-hydro potential is in conformity with the the Electric Power Act No. 11 enacted in 1997 which deals with generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes, and the January 2010, Feed-in-Tariffs Policy on renewable energy including mini-hydro resource generated electricity. In practice the small or mini-hydro power generation has become a modest way of sustainable use of the natural resources in a cost-effective and efficient approach. Much of the rest of the large power hydros dam huge volumes of water that drain the river exposing river banks to degradation and sedimentation resulting into flooding. The potential of the small and mini-hydro provide some suitability to minimizing flooding and maintaining the course of the river in its natural state.

The proposed Small-Hydropower project is located about 0.5Km from Mataara Tea factory. Thika District has six administrative divisions which include Gatanga, Gatundu, Kakuzi, Gatundu North, Ruiru (Juja) and Thika Municipality. The Small-Hydro power project is located a bout 40 Km from Thika town. The physical characteristics of the area, in particular the topography is generally steep and sloppy land to about 45 degrees, the soil type is of rich red loam and the general topography of the land in Kiarutara Sub-location is gentle.

The soil erosion potential is quite low to minimal level because of good and sound farming systems, contour farming with the use of cover crops (grass, sugar cane) as soil erosion control has been well utilized in almost all farms. This is also because of low levels of deforestation with a lot of trees still intact mostly the indigenous species; there is also the absence of overstocking and quarrying activities and sparsely populated human settlements. Several streams and Rivers are found to exist including River Karuru, Gura and River Nyakabai that supports the drainage system of the area. The area also enjoys a natural drainage pattern that is still unaffected by human activities with a very high ground water table and high rate of recharge. Currently, there is less/no restriction on drawal, available yield is enough and the general quality of water is good. There are no flood prone areas within Kiarutara Sub-Location, Kamukobini village because of the topographical advantage and most people live on higher grounds too. Surface water location is well distributed with local communities relying on permanent springs and rivers for human consumption and domestic use.

2. PROJECT COMPONENTS

The Small-Hydro power project will be located in Thika District, Gatanga Constituency, Kariara Division, Kiarutara Sub-Location in Kamukobini village and the power project will be constructed along River Chania.

At the project site, there will be a small dam constructed, with an estimate of one meter in-depth and de-silting of a

small section of the river so as to create more volume for water. Besides these, a canal has been created to channel the water from the site to the Power house about 0.5 Km, already the site for the Power House has been identified which is quite suitable for the project.

The project is expected to produce 580kW of power with the main intention of supplying
the power to Mataara Tea Factory, local communities, schools, churches, hospitals and other organisations at a much cheaper and affordable rate. This will also help the factory cut down costs of paying huge electricity bill to Kenya Power and Lighting Company (KPLC).

3. OBJECTIVES

The particular objectives of the project are:

- The construction of a Small-Hydropower Station with a capacity of 580kW to feed the Tea Factory;
- Reduce current electricity bills and costs incurred by using power from the grid connection supplied by the KPLC;, and
- Provide excess power to local communities in the surroundings of the Tea Factory and improve quality of life through better lighting systems

It is with the above background that the Kenya Tea Development Agency Power Company on behalf of the tea farmers has prepared this Terms of Reference (TOR) for National Environmental Management Authority (NEMA) to consider them for approval so as a detailed EIA and SIA to be carried out. An initial feasibility environmental assessment (scoping report) under the feasibility study has been carried out which has been a basis for this TOR.

4. THE RATIONALE FOR EIA AND SIA

The Local Authorities are empowered under Section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area. Section 30 states that any person who carries out development without development permission will be required to restore the land to it original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respective Local Authority. Finally, section 36 states that if connection with a development application, Local Authority is of the opinion that the proposed development activity will have injurious impact on the environment, the application shall be required to submit

together with the application of an environment impact assessment EIA report.

The rationale and requirements for EIA and SIA are in accordance with the country's Environmental Impact Assessment Regulation (1999); and the National Environmental Management and Environmental Impact Assessment and Audit Regulations, 2003, Legal Notice No. 101.EMCA, that echoes the same Local Authority Act by requiring that such an EIA is approved by NEMA and should be followed by annual environmental audits, and sub-sections of an environmental impact assessment shall be undertaken by the developer when the project being undertaken;

a) May have an impact on the environment,
b) Is likely to have a significant impact on the environment
c) Will have significant impact on the environment.

According to the Kenya EIA Guidelines (1999), the Environmental Impact Study process starts with the **scoping** exercise which identifies areas and issues which should be included and addressed in the EIA study process. It is also contained in the EIA Guidelines (1999) and Regulations (2003) that the issues identified through the scoping process should be developed into Terms of Reference (TOR). The TOR is submitted to NEMA and to other stakeholders (Lead agencies) for review so that any other areas and issues deserving to be included are identified before the study commences. In principle, the EIA and SIA assist with providing guidance on:

- Assessing and quantifying both positive and negative impacts of the construction and operation of the above specified project components on the environment and social aspects;

- Identifying options and determining mitigation measures necessary to reduce the negative impacts and increase the positive benefits of the project

- Preparing an Environmental and Social Management Plan (ESMP) that will be utilized in effective implementation of the project, guiding as appropriate for necessary adjustments in project implementation in order to enhance efficiency, cost-effectiveness and better environmental performance;

- Assessing and analyzing institutional roles, responsibilities and capacities to comply with Environmental Regulation

Under the EIA Regulations (2003), it is a requirement that all projects included in the Third Schedule to the National Environment Act (2003) Legal Notice 101 undergo an Environmental Impact Assessment (EIA). The Environmental

(Impact Assessment and Audit) Regulations, 2003 state in Regulation 3 that "the Regulations shall apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act". Because the proposed development falls under the category of "some infrastructure development" which is listed under Schedule 3 of the National Environment Act (1999) under Part 1(General) and also under Part 4 (dams, rivers and water resources) among the projects requiring mandatory Environmental Impact Assessment before implementation, an Environmental Impact Study is required before the proposed Small-Hydro power station along River Chania can be approved by NEMA for implementation.

5. METHODOLOGY AND SPECIFIED TORS

The Terms of Reference therefore elaborate the basis upon which KTDA Power Company intends to undertake the assessment. The following general approach will be adopted for the assessment.

i. The study will address potential environmental impacts at various phases of the project (land preparation, construction, operation, future decommissioning and post-closure). Notable among these will be impacts from land clearance, demolition of existing structures at the present Tea Factory, wastes generated during construction, increased run-off from paved parking yards and rooftops and landscaping;

ii. Description of the socioeconomic baseline(present and projected population; present land use; planned development activities; community structure; present and projected employment by industrial and household category; distribution of income, goods and services; public health; cultural properties; indigenous peoples; customs, aspirations and attitudes etc);

iii. Description of biophysical baseline, geology (general description of the overall study area and details for land application sites); topography; soils (general description for overall study area); monthly average temperatures, rainfall and runoff characteristics; description of receiving waters as to how it affects the project activities;

iv. Identification and review Kenyan policy, legal and institutional framework and requirements. These will be reviewed in order to ensure that necessary measures be included in the design and implementation of the project, in particular those which could have implication on environmental issues;

v. Identification of key stakeholders and consultations with lead agencies i.e NEMA, Wetland Department, Water and Irrigation, Local Municipal Council, Department of Fisheries, Ministry of Agriculture, Local communities etc;

vi. Conformity of the proposed projects to planning provisions for the site as provided in the plans of Local Government;

vii. Analysis of alternative options and the" do nothing" scenario and comparison of environmental consequences associated with each;

viii. Identification of socio economic impacts i.e odour, aesthetic, land values, cultural perceptions;

ix. Identification of biophysical environment to include; incidences of water and sanitation related morbidity; environmental problems in the project area; wetland degradation and water pollution; project design parameters and impacts on soil, air and water resources for River Chania;

x. Evaluation of the biodiversity resources in Kamukobini village area, especially presence of any species of conservation value or special conservation;

xi. Determination of the current and anticipated environmental baseline conditions through review of existing information as well as field survey to establish site-specific issues and sensitivity;

xii. Examination of engineering proposals of construction requirements, maintenance and operation activities (including those taking place off-site) associated with the project, in particular those which could have implications on environmental resources;

xiii. Where potential impacts are identified, evaluation of both their positive and negative environmental effects will be undertaken;

xiv. Determination of the potential impacts of the proposed project. In this analysis, distinguish between significant positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. Identify impacts which are unavoidable or irreversible. Wherever possible, impacts will be described quantitatively, in terms of costs and benefits. Special attention will be given to: the extent to which receiving water quality standards and/or beneficial use objectives will be achieved with the proposed type and level of treatment. The length of expanse of lake which will be positively or negatively affected by the discharge, and the magnitude of the changes in water quality projected quantitative changes in beneficial uses, such as fisheries, industrial use etc. Sanitation and public health benefits anticipated;

xv. Where impacts can be reduced to acceptable levels through incorporation of practical and cost-effective measures they will be identified. Where appropriate, opportunities for enhancement during construction or operation of the project will also be identified;

xvi. Measures for safety and protection of workers during construction, including protection against dust, excessive noise and accidents;

xvii. Sample and test pollution levels in proposed project sites and compare results with best practices i.e ISO 14001 BOD and COD levels;

xviii. Identifying any issues areas of potential conflict to be evaluated in greater detail during the Environmental Impact study;

xix. Conduct public consultations and stakeholders workshops to explore a range of options and prioritize necessary mitigation measures and or options;

xx. An environmental management and monitoring plan will be developed for the proposed project (construction and operation) phase and costing. As a requirement in the National Environment Act, (1999), developers of projects are required to carry out periodic monitoring to ensure that the mitigation and environment management measures identified and recommended through the EIA are adhered to and implemented. It is further required, under the law, that such developers keep and maintain monitoring records which should be made available during inspections and that monitoring reports should be submitted to the appropriate authorities on an annual basis; and

xxi. Under certain circumstances that might pertain in the future, the project may have to wound up and close its operation. The Environmental Impact Study should involve an environmental management plan that will in addition prescribe the procedures for closure and post-operation procedures so that the environment is almost restored to the 'No Project' as much as possible.

6. OUTPUTS

i. EIA and SIA (ESIA) and ESMP

7. TIME FRAME

The proposed study will be done in an estimated 2 man-months comprising of different specialists as indicated below.

8. TEAM COMPOSITION

In order to address the issues identified above, it is proposed that the following expertise should be included in the study team:

i. Team Leader/EIA Specialist- Patrick Karani BEA International;
ii. Water Resource Quality Expert;
iii. Biodiversity/ Wetland Ecologist Expert; and
iv. Socio-Economist- Specialist/Analyst

9. BUDGET

The total Project Cost is estimated at US$1.478 million equivalent to KES118.24 million. The environmental mitigation cost as a standard procedure will cost not more than 1% of the total project cost.

10. ANNEX