

Oromia National Regional State

Oromia irrigation development Authority



ENVIRONMENTAL IMPACT ASSESSMENT DRAFT FINAL REPORT

FOR

LEGA KOLU SMALL SCALE IRRIGATION PROJECT

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ABBREVIATIONS AND ACRONYMS

AIDS	=	Acquired Immune Deficiency Syndrome
ASL	=	Above Sea Level
CSE	=	Conservation Strategy Of Ethiopia
CSC	=	Construction Supervision Consultant
EIA	=	Environmental Impact Assessment
EI	=	Environmental Inspector
EMP	=	Environmental Management Plan
EPA	=	Environmental Protection Authority
EPE	=	Environmental Policy Of Ethiopia
EWNHS	=	Ethiopian Wildlife Natural History Society
EMSB	=	Environmental Monitoring And Safety Branch
FDRE	=	Federal Democratic Republic Of Ethiopia
HA	=	Hectare
HIV	=	Human Immune Virus
IEC	=	Information, Education And Consultation
KM	=	Kilometer
LCNRDB	=	Livestock, Crop And Natural Resources Development Bureau
M	=	Meter
MWLSIP		Lega Kolu Scale Irrigation Project
NGO	=	Non-Governmental Organization
NRDCD	=	Natural Resources Development And Conservation Department
NRS	=	National Regional State
OWMEB	=	Oromia Water ,Mineral And Energy Bureau
OWWDSE		Oromia Water Works Design And Supervision Enterprise
PAP	=	Project-Affected-People
RAP	=	Resettlement Action Plan
REA	=	Regional Environmental Agency
RLEPA	=	Rural Land And Environmental Protection Authority
RE	=	Resident Engineer
ROW	=	Right-Of-Way

SLIP	=	Lega Kolu Large Irrigation Project
STDS	=	Sexually Transmitted Diseases
STIS	=	Sexually Transmitted Infections

Executive Summary

Lega Kolu Small scale irrigation Project is located in Arsi zone Shanen Kolu district of Oromia regional national state. The topographic formation of the project corridor, plateau with some rolling and flat. Accordingly, a potentially irrigable area of about 120 hectare of Bayima kebele Shanen Kolu district for about 280 households was identified for the conduction of detail feasibility studies in the near future. Owing to its small scale, the project needs partial EIA according to EPA guideline.

The objectives of the EIA study includes to review the existing policy, institutional and administrative capability related to environmental matters; to identify the current state of the environment of the project area; to examine the major potential environmental impacts induced by the project and to propose mitigation measures for the potential adverse impacts of the project on the environment.

The EIA study was conducted by using both primary data and secondary data. Field observation, interview and collate of documents were the tools used to collect data. As far as field observation is concerned, it provided an imperative insight into potential impacts of the project and forward mitigation measures that might be applicable in the area. Regarding collates or review of reports of other discipline, various policy documents and guidelines were assessed.

The implementation of the project has potential merits and demerits to both the natural and human environments. The foremost potential merits include provision of sustainable irrigation, improvement of health condition of the population, creation of short term employment opportunity during construction, improvement of the productivity of the population as well as attract various investment opportunities to the area. By and large, the project will contribute to improved standard of living of the population and poverty reduction.

Regarding alternative analysis the “without project” scenario is in favour of the environment as there will be no impact induced by the project at all but it is inappropriate for the community that is suffering due to lack of social infrastructure development like modern irrigation. The “With project” scenario will essentially benefit the community with modest tolerable or bearable impacts on the environment. In any case, the “With project” scenario is appropriate for the environment

and the community. In plain words, the positive impacts, short term and long term, of the project prevail over its negative impacts and the project is environmentally friendly and feasible.

1. INTRODUCTION

Before directly rushing into the main body of the study it sounds good to shade light on what environment is in the first place. Of course, various scholars have defined the environment using multitude of words. For this study, let us take one of the popular definitions about the environment. Environment is the physical, biological, social, economic, cultural, historical and political factors that surround human beings. It includes both the natural and built environments. It also includes human health and social welfare.

Considering the basic purpose of agriculture – ensuring of sufficient quantities of food with appropriate quality and unquestionable health soundness, the management of land administrative should not sideline other aspects of land use including environmental and social aspects, so the special attention should be given to non-productive roles of agriculture and land. As an answer to the current challenges of modern agriculture and rural development, until recently the most important role of agriculture – food production, is gradually being replaced by ecosystems sustainability and raising values of landscape and rural space.

The environmental impact assessment (EIA) study is an important component of the feasibility study and design development process of the project. The study assesses fundamental baseline situations and regulatory requirements to be fulfilled, identifies potential impacts of project activities on the environment and the environment on the project, provides suggestion of mitigation/enhancement actions, and provides plan of environmental management to be integrated during the construction and operation phases.

1.1 Background and Location of the Project

Lega Kolu Irrigation Project is located in at Arsi zone Shanen Kolu district of Oromia Regional National State. The Lega Kolu watershed is situated at an altitude of about 875 to 3302 m.a.s.l. It is situated at distance of 360Km from Finfinne/Addis Ababa to east direction. The area comprises of rolling and mountainous, and steep sloping escarpment in most of parts observed. At the upper stream of head work, the area includes Gorge, rolling, hilly and mountainous terrain types are local what they called Dhumuga. The proposed Lega Kolu Irrigation Project was lacks proper accessibility especially at left side and hilly place and the topographic

formation of the route corridor of plateau with high gradient ups and downs at upstream of headwork site.

The existing irrigation, was traditional irrigation was practiced Shanen Kolu that is traditional irrigation was practiced its name was kolu irrigation of Shenan kolu district and river diversion. The topographic formation of the river basin and canal alignment is consisting of mountain, forest, and George terrain.

1.2 Objective

General Objective;

The main objectives of the EIA study of Lega Kolu scale project on Kolu river area and describing the environmental baseline conditions of the project area, identifying negative and positive impacts and recommending possible mitigation measures for the significant adverse impacts and preparing environmental management and monitoring plan.

Specific Objectives Include:

- To describing the existing biological, physical and social environment of the project area;
- To Assessing the existing and potential environmental problems associated with the proposed irrigation project;
- To Studying inherent diseases in the project area and predicting future health problems in relation to water born disease and headwork site development;
- To identification of any sites of historically, culturally or religiously important areas in the project impact zone and finally;
- To Proposed and recommend safeguarding or mitigation measures for the adverse impacts if any; and preparing environmental management and monitoring plan for the adverse impacts.

1.3 Methodology

The findings of this Environmental Impact Assessment (EIA) are based on review of EIA studies previously carried out for similar projects, secondary data and information obtained from local offices, primary data collected through comprehensive field surveys, and

consultations with key stakeholders and with members of the local community including the project affected people.

On the basis of the data obtained from the field surveys, local offices and review of previous studies, a clear description of the existing environmental set up of the project environment was made. The key environmental components or issues were analyzed and described relative to their site specific conditions and importance. This helped to undertake site specific assessment of potential impacts and to determine the magnitude and significance of those impacts as well as to develop feasible mitigation measures.

1.3.1 Environmental Scoping

In line with the EPA guideline, three levels of reports are expected in EIA: screening report, scoping report and detail study. At the feasibility level of the project, scoping report is recommended and accordingly this scoping report covers of the assessment of the baseline conditions of the physical, biological, ecological and socio-economic issues that are prevailing in and around the project area. The positive and negative environmental impacts that are arising due to the project will be identified and analyzed. Moreover, mitigation measures will also be forwarded to minimize the negative impacts of the proposed irrigation project.

1.3.2 Collation and Review of Relevant Documents

Existing documents on relevant policies, legislation, guidelines and previous studies were collated and reviewed for assessing the relevant environmental policies, laws and regulations related to the expected environmental and social impacts of the proposed development. The review also helped to obtain background information for the project area and the project itself.

1.3.3 Field Survey, Data Collection and Stakeholders Consultation

The environmentalist was conducted detailed surveys in the direct impact zones, consultations with key stakeholders and the local community, and secondary data collection from local offices. These field visits helped the environmentalist to have first hand impression of the project environment, collect primary environmental and socio-economic baseline data and identify main potential environmental issues related to the project location, design, construction

and operation. In addition, the concerned local offices were contacted in order to collect relevant data and information on natural and social environment of the project area.

1.3.4 Data Analysis and Report Preparation

The data and information collated from all the sources (literature review, secondary and primary data collection, stakeholder's consultations, and abstraction of relevant data from other studies) were analyzed to describe the existing environmental and social set up of the project area, and to identify the potential positive and negative impacts of the proposed project.

On the basis of the data obtained from the field surveys, local offices and review of previous studies, a clear description of the existing environmental set up of the project environment was made. The baseline description was synthesized in three main environmental components, namely the physical environment, natural/biological environment and socio-cultural Environment. The key environmental components or issues were analyzed and described relative to their site specific conditions and importance. This helped to undertake site specific assessment of potential impacts and to determine the magnitude and significance of those impacts as well as to develop feasible mitigation measures.

The key environmental issues identified include soil erosion, construction of main canal and upstream, downstream, distribution canal, and impacts on water quantity and quality, loss of natural ecosystems that are important for flora and fauna conservation, loss of wetlands, flood hazard, etc. Finally this environmental impact analysis report was prepared.

2. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 The Constitution of Ethiopia

The Constitution of the Federal Democratic Republic of Ethiopia (FDRE), which was adopted in August 1995, has several provisions, which have direct policy, legal and institutional relevance for the appropriate implementation of environmental protection and rehabilitation action plans to avoid, mitigate, or compensate the adverse effects of development actions including agricultural development projects. The concepts of sustainable development and environment rights are entrenched in the rights of the people of Ethiopia through Articles 43 and 44, which state among others the right to development and the right to live in a clean and healthy environment.

Article 44 provides that all persons have the right to a clean healthy environment and further emphasizes that the pollutant shall pay in violating the basic right. Article 92 states that all Ethiopians shall live in clean and healthy environment; no damage or destruction happened to those basic environmental rights. People have the right to full consultation and the community has the right to express its views in the planning and implementation of environment policies and deals with the projects that directly affect them. The Government and citizens shall have the duty to protect the environment and mitigate the affected parts.

2.1.1 Environmental Policy of Ethiopia

The Environmental Policy of Ethiopia (EPE) was issued in April 1997. The EPE supports Constitutional Rights through its guiding principles. The overall policy goal is to improve and enhance the health and quality of life of all Ethiopians, to promote sustainable social and economic development through sound management and use of natural, human-made and cultural resources and their environment as a whole, so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.

The policy seeks to ensure the empowerment and participation of the people and their organizations at all levels in environmental management activities, and to raise public awareness and promote understanding of the essential linkage between environment and development. In addition to its guiding principles, the policy provides sectoral and cross-sectoral environmental policies.

Environmental Impact Assessment (EIA) policies are included in the cross-sectoral environmental policies. The EIA policies emphasize the early recognition of environmental issues in project planning, public participation, mitigation and environmental management, and capacity building at all levels of administration.

The policy establishes the Environmental Protection Authority (EPA) to harmonize Sectoral development plans and to implement an environmental management program for the Country. It also imparts political and popular support to the sustainable use of natural, human-made, and cultural resources at the federal, regional, zonal, district and community levels.

2.1.2 Policies on Land Tenure, Expropriation and Compensation

The constitution of the FDRE states that the right to ownership of rural and urban land, as well as all natural resources. Land is the property of the state/public and does not require compensation. The Constitution gives every person the ownership right for the property he has invested on the land, and in this regard article 40 (7) states that every Ethiopian shall have the full right to the immovable property he builds and to the permanent improvements he brings about on the land by his labour or capital.

If the land that is owned by an individual is expropriated by the Government for public use, the person is entitled for compensation. In this regard, article 44 (2) of the Constitution states that all persons who have been displaced or whose livelihoods have been adversely affected as a result of state programs have the right to commensurate monetary or alternative means of compensation, including relocation with adequate state assistance.

2.1.3 Sectoral Policies

The Government of Ethiopia has issued several sectoral policies, including the following ones.

Water Resource Policy; The Ministry of Water Resources formulated the Federal Water Resource Policy in 1998 for a comprehensive and integrated water resource management. The overall goal of the water resources policy is to enhance and promote all national efforts towards the efficient and optimum utilization of the available water resources for socio-economic development on sustainable bases. The document includes policies to establish and institutionalize environment conservation and protection requirements as integral parts of water resources planning and project development.

Wildlife Policy; The Wildlife Policy was developed in 2006 by the Ministry of Agriculture and Rural Development. The prime objective of the policy is to create conducive environment for the preservation, development, and sustainable utilization of Ethiopia's wildlife resources for social and economic development and for the integrity of the biosphere/biodiversity. It covers a wide range of policies and strategies relating, amongst others, to wildlife conservation and protected areas with four categories from the highest protection ranking 'National Park', followed by 'Game Reserve' and 'Sanctuary' to 'Controlled Hunting Area'.

National Population Policy; This Policy was issued in April 1993 and aims at closing the gap between high population growth and low economic productivity through a planned reduction in population growth combined with an increase in economic returns. With specific reference to natural resources, the main objectives of National Population Policy are:

- Making population and economic growth compatible and the over-exploitation of natural resources unnecessary;
- Ensuring spatially balanced population distribution patterns, with a view to maintaining environmental security and extending the scope of development activities;
- Improving productivity of agriculture and introducing off-farm/non-agricultural activities for the purpose of employment diversification; and
- Maintaining and improving the carrying capacity of the environment by taking appropriate environmental protection and conservation measures.

Policy on Public Health; Ethiopia's health policy was issued in 1993, with the aim of giving special attention to women and children, to neglected regions and segments of the population, and to victims of manmade disasters. The priority areas of the policy are in the field of Information Education and Communication (IEC) of health to create awareness and behavioral change of the society towards health issues, emphasis on the control of communicable disease, epidemics, and on diseases that are related to malnutrition and poor living condition, promotion of occupational health and safety, the development of environmental health, rehabilitation of health infrastructures, appropriate health service management system, attention to traditional

medicines, carrying out applied health research, provision of essential medicines, and expansion of frontline and middle level health professionals.

The Government in its Plan for Accelerated and Sustained Development to End Poverty (PASDEP) document has reaffirmed its commitment to accelerate progress on maternal and child health and to reduce in child and maternal mortality rates by expanding the provision of essential health and nutrition services to the poor. It is planned that by 2010, infant mortality rate will be 45 per 1000, maternal mortality rate 600 per 100,000 and primary health coverage within 10 km radius will reach 100%.

National Policy on Women; This Policy was issued in March 1993 emphasizing that all economic and social programs and activities should ensure equal access of men and women to the Country's resources and in the decision making process so that they can benefit equally from all activities carried out by the Federal and Regional Institutions.

The Policy objectives are:

- Laws, regulations, systems, policies, policies, and development plans that are issued by the Government should ensure the equality of men and women, special emphasis should be given to the participation of rural women.
- Economic, social and political policies and programmes, as well as cultural and traditional practices and activities, should ensure equal access of men and women to the country's resources and the decision making process.
- The central government and regional administrations should ensure that women participate in and benefit fully from all activities carried out by central and regional institutions.
- Development institutions, programmes, and projects should ensure women's access to and involvement in all interventions and activities.

2.2 Environmental Framework Legislations

In order to achieve the environmental protection objectives fixed by the Constitution, Environmental Policy, and Conservation Strategy of Ethiopia, the Federal Democratic

Republic of Ethiopia (FDRE) has issued a number of Proclamations. The major ones include the following:

2.2.1 Proclamation on Establishment of Environmental Protection Organs

The objective of this Proclamation (No. 295/2002) is to assign responsibilities to separate organizations for environmental development and management activities on one hand, and environmental protection, regulations and monitoring on the other, in order to ensure sustainable use of environmental resources, thereby avoiding possible conflicts of interest and duplication of effort. It is also intended to establish a system that fosters coordinated but differentiated responsibilities among environmental protection agencies at federal and regional levels.

This Proclamation re-established the EPA as an autonomous public institution of the Federal Government of Ethiopia. It also empowers every competent agency to establish or designate an environmental unit (Sectoral Environmental Unit) that shall be responsible for coordination and follow-up so that the activities of the competent agency are in harmony with this Proclamation and with other environmental protection requirements. Furthermore, the Proclamation states that each regional state should establish an independent regional environmental agency or designate an existing agency that shall be responsible for environmental monitoring, protection and regulation in their respective regional states.

2.2.2 Proclamation on Environmental Impact Assessment

The aim of this Proclamation (Proc. No. 299/2002) is to make an EIA mandatory for specified categories of activities undertaken either by the public or by private sectors and is the legal tool for environmental planning, management and monitoring.

The Proclamation elaborates on considerations with respect to the assessment of positive and negative impacts and states that the impact of a project shall be assessed on the basis of the size, location, nature, cumulative effect with other concurrent impacts or phenomena, trans-regional context, duration, reversibility or irreversibility or other related effects of a project. Categories of projects that will require full EIA, not full EIA, or no EIA are provided. To effect

the requirements of this Proclamation, the EPA has issued a Procedural and Technical EIA Guidelines, which provide details of the EIA process and its requirements.

2.2.3 Proclamation on Environmental Pollution Control

This Proclamation, Proc. No. 300/2002, is mainly based on the right of each citizen to have a healthy environment, as well as on the obligation to protect the environment of the Country and its primary objective is to provide the basis from which the relevant ambient environmental standards applicable to Ethiopia can be developed, and to make the violation of these standards a punishable act. The Proclamation states that the “polluter pays” principle will be applied to all persons. Under this Proclamation, the EPA is given the mandate for the creation of the function of Environmental Inspectors. These inspectors (to be assigned by EPA or regional environmental agencies) are given the authority to ensure implementation and enforcement of environmental standards and related requirements.

2.2.4 Proclamation on Ethiopian Water Resources Management

This Proclamation, Proc. No. 197/2000, was issued in March 2000 and provides legal requirements for Ethiopian water resources management, protection, and utilization. The aim of the Proclamation was to ensure that water resources of the country are protected and utilized for the highest social and economic benefits, to follow up and supervise that they are duly conserved, ensure that harmful effects of water use prevented, and that the management of water resources is carried out properly.

The Proclamation defines the ownership of water resources, powers, and duties of the Supervising Body, inventory of water resources and registry of actions, permits, and professional licenses, fees and water charges. According to the Proclamation, all water resources of the country are the common property of the Ethiopian people and the State. As provided in the Proclamation, the Supervising Body [the Ministry pertaining to water resources at central level, or any organ delegated by the Ministry] shall be responsible for the planning, management, utilization and protection of water resources. It shall also have the necessary powers, for the executions of its duties under the provisions of this Proclamation are;

According to Article 11 (1), no person shall perform the following activities without a permit from the Supervising Body without prejudice to the exceptions specified under Article 12:

- construct water works;
- supply water, whether for his own use or for others;
- transfer water which he/she abstracted from a water resource or received from another supplies; and
- Release or discharge waste into water resources unless otherwise provided for in the regulations to be issued for the implementation of this Proclamation.

As defined in Article 12, any person shall utilize water resources for the following purposes without requiring a permit from the Supervising Body:

- dig water wells by hand or use water from hand-dug wells;
- Use water for traditional irrigation, artisanal mining and for traditional animal rearing, as well as for water mills.

2.2.5 Proclamation on Conservation, Development and Utilization of Forests

Proclamation No. 94/1994, issued in 1994, provides for the Conservation, Development and Utilisation of Forests. The objective of this Proclamation is to provide the basis for sustainable utilisation of the country's forest resources. The Proclamation categorises types of forest ownership (State, regional and private forests). It provides the power for designation, demarcation, and registration of forests to the Ministry of Agriculture (now Ministry of Agriculture & Rural Development/MoARD) and Regional Governments. The Proclamation then goes on to give some specific direction for the utilisation of State and Regional Forests, and lists prohibited activities within protected forests.

2.2.6 Proclamation on Expropriation of Land Holdings and Payment of Compensation

Proclamation No. 455/2005, issued in July 2005, deals with appropriation of land for development works carried out by the government and determination of compensation for a person whose landholding has been expropriated. It includes provisions on power to expropriate landholdings, notification of expropriation order, responsibility for the implementing agency, and procedures for removal of utility lines. According to the Proclamation, the power to expropriate landholdings mainly rests on district or urban administration authorities.

In addition, the Proclamation deals with determination of compensation having articles on the basis and amount of compensation, displacement compensation, valuation of property, property valuation committees, complaints and appeals in relation to compensation. As per this Proclamation, a landholder whose holding has been expropriated shall be entitled to payment for compensation for his property situated on the land for permanent improvements he made to such land, and the amount compensation for property situated on the expropriated land shall be determined on the basis of replacement cost of the property.

2.2.7 Proclamation on Rural Land Administration and Use

This Proclamation, Proc. No. 456/2005, came into effect in July 2005. The objective of the Proclamation is to conserve and develop natural resources in rural areas by promoting sustainable land use practices. In order to encourage farmers and pastoralists to implement measures to guard against soil erosion, the Proclamation introduces a Rural Land Holding Certificate, which provides a level of security of tenure.

The MoARD is charged with executing the Proclamation by providing support and co-ordinating the activities of the regional authorities. Regional governments have an obligation to establish a competent organization to implement the rural land administration and land use law.

According the Proclamation where land, which has already been registered, is to be acquired for public works, compensation commensurate with the improvements made to the land shall be paid to the land use holder or substitute land shall be offered. The Proclamation imposes restrictions on the use of various categories of land, for example wetland areas, steep slopes, land dissected by gullies, etc.

2.2.8 Proclamation on Public Health

Public Health Proclamation (Proc. No. 200/2000) entered into force in March 2000. The Council of Ministers may issue regulations for the implementation of this proclamation, and the Ministry of Health may issue directives for the implementation of the regulations issued under this Proclamation. The objectives of the Proclamation include enhancing popular participation in implementing the country's health sector policy, promoting attitudinal changes through primary health care approach and promoting healthy environment for the future generation.

The Proclamation has five parts. Part one is called ‘General’, and focuses on titles and definitions. Part two and three, deals with establishment of an Advisory Board with powers and duties, and appointment of inspectors with powers and duties respectively. Part four is very comprehensive with 11 articles and other numerous sub-articles on public health. The major articles under part four of this Proclamation include: food quality control, food standard requirements, water quality control, occupational health control and use of machinery, waste handling and disposal, availability of toilet facilities, control of bathing places and pools, disposal of dead bodies, control at entrance and exit ports, communicable diseases and the requirement of health permit and registration before resumption and after completion of construction. Part five is on Miscellaneous Provisions – including obligation to cooperate, penalty, repealed and applicable laws, power to issue regulations, power to issue directives and effective date.

2.2.9 Proclamation on Oromia Rural Land Administration and Use

In line with the powers given to regional governments, the Oromia NRS issued this Proclamation (Procl. No. 55/2002). The main objectives of the Proclamation were to establish systems that promote a sustainable use of rural land and to create a conducive environment for rural land administration. Among others, the Proclamation defines the use right, security and obligation of the land users in accordance with the land use and administration policy, and institutional arrangement for implementation of the Proclamation.

The Proclamation states, among other matters, that:

- Any resident of the region aged eighteen years and above, whose life depends on agriculture, has the right to get rural land free of payment;
- Governmental and non-governmental organisations, private investors and social organisations have the right to use rural land through legal process;
- The customary right of access to land for communal use like grazing, ritual ceremonies and public uses shall be maintained for both peasants and pastoralists.

2.3 Environmental Assessment Guidelines

2.3.1 EPA's Environmental Impact Assessment Guidelines

With a view to implement the environmental laws, environmental guidelines have been issued by the EPA. Among these are the technical and procedural EIA guidelines, which were issued in 2000 and 2003 respectively. They are intended to guide developers, competent agencies and other stakeholders in carrying out EIAs. The Guidelines follow the conventional pattern adopted in many other countries and make provision for screening, scoping, identification and evaluation of impacts, the development of environmental management and monitoring plans, consideration of alternatives, EIA report structure and information requirements, etc.

The procedural guideline details the required procedures for conducting an EIA, the permit requirements, the stages and procedures involved in EIA process, and the roles and responsibilities of parties involved in the EIA process. It also includes the categories of projects (schedule of activities) concerning the requirement of EIA, and list of project types under each category.

The technical guideline specifies tools particularly standards and guidelines that may be considered when engaging in the EIA process, and detail key issues for environmental assessment in specific development sectors. The Guideline provides the categories, the relevant requirements for an EIA and lists project types under each category. In accordance with this Guideline, projects are categorized into three schedules:

Schedule 1: Projects, which may have adverse and significant environmental impacts and therefore require a full Environmental Impact Assessment

Schedule 2: Projects whose type, scale or other relevant characteristics have potential to cause some significant environmental impacts but are not likely to warrant a full EIA study

Schedule 3: Projects which would have no impact and do not require an EIA.

Lega Kolu water fed irrigation projects covering more than 120 hectares would fall into Schedule 2. Therefore, the proposed irrigation Project area should be subjected to partial EIA. The EIA laws and guidelines of Ethiopia require the preparation of environmental impact

statement (EIA report) and its submission to the EPA or REA for projects requiring EIA. The legal documents also state that an EIA report should contain sufficient information that enable the determination of whether or under what conditions the project should proceed. Furthermore, they included a list of contents that should be in the report as a minimum requirement.

2.3.2 Administrative and Institutional Framework

2.3.2.1 Federal and Regional Administration

The Federal Democratic Republic of Ethiopia (FDRE) comprises nine member States and two administrative councils with their own legislative, executive, and judicial powers. The FDRE has a parliamentary system of government, with two councils: the Council of Peoples' Representatives and the Federal Council.

Each of the nine States and two councils has powers under the State Council for planning, determining, and implementing social and economic programmes within its own region, and each is responsible for the development and protection of its natural resource base. For administrative purposes, the States are divided into Zones, which are in turn sub-divided into District's. Each District is again sub-divided into Kebeles, which provide local level organization and administration.

2.3.2.2 National Environmental Protection Authority

The National Environmental Protection Authority (EPA) was re-established under Proclamation No. 295/2002 as an autonomous public institution of the Federal Government of Ethiopia entrusted with the protection and conservation of natural resources in Ethiopia. The general role of the EPA is to provide for the protection and conservation of the canal environment, through formulation of policies, strategies, laws and standards, which foster social and economic development in a manner that enhance the welfare of humans and the safety of the environment sustainable.

All project proponents and executing bodies (agencies) in the country should operate in close cooperation with the EPA to ensure that proper mitigating measures are designed and implemented especially for projects with significant adverse impacts on the environment. That

is, an Environmental Impact Study Report should be prepared by project proponents and examined, commented and approved by the EPA. However, for projects under the supervision of the Regional State, this mandate is transferred to the Regional Environmental Agency (REA) or the institution designated by the Regional State.

The EPA is the Competent Agency at the Federal level in Ethiopia. It is, therefore, the responsibility of this authority in the EIA process to:

- Ensure that the proponent complies with requirements of the EIA process;
- Maintain co-operation and consultation between the different sectoral agencies throughout the EIA process;
- Maintain a close relationship with the proponent and to provide guidance on the process; and
- Evaluate and take decisions on the documents that arise from the EIA process.

2.3.2.3 Sectoral Environmental Units

According to the Proclamation No. 295/2002, every competent agency shall establish or designate an environmental unit that shall be responsible for coordination and follow up so that the activities of the competent agency are in harmony with this Proclamation and with other environmental protection requirements.

2.3.2.4 Regional Environmental Agencies

As per the Proclamation No. 295/2002, each Regional State shall establish an independent regional environmental agency or designate an existing agency that shall, based on the Ethiopian Environmental Policy and Conservation strategy and ensuring public participation in the decision making process, be responsible for:

- Coordinating the formulation, implementation, review and revision of regional conservation strategies, and
- Environmental monitoring, protection and regulation.

The Proclamation also states that regional environmental agencies shall ensure the implementation of federal environmental standards or, as may be appropriate, issue and implement their own no less stringent standards. Finally, the Proclamation states that regional

environmental agencies shall prepare reports on the respective state of the environment and sustainable development of their respective states and submit them to the EPA.

For the Oromia NRS, the regional environmental protection authority is responsible for environmental protection matters in the Region. The authority is responsible for the review and approval of EIA of development proposals under the mandate of the Regional Government and follows up of the implementation of EIA recommendations of such proposals. Therefore, project proponents in the Region should operate in close cooperation with the Authority to ensure that the adverse environment effects of development proposals are properly identified and their mitigation or management actions incorporated in the project design or planning and implemented at the right time. Similar to the federal level, an Environmental Impact Study Report should be prepared by the project proponents and examined, commented and approved by the Authority.

3 Project Description

The proposed project, which known as ‘Lega Kolu-small Scale Irrigation Project is located in Shanen Kolu district of Arsi Zone in Oromia Regional State at a distance of about 360km from Finfinne; of which, about 315 km is asphalt road and the rest graveled (all-weather road) that has great in-accessibility problems especially during rainy seasons. Besides this, the road which takes from Dhumuga to the command areas and headwork sites of the project has also great challenge of inaccessibility even during dry seasons (approximately, about 16 km).

Lega kolu small scale Irrigation project is a project identified in the Lega Kolu diversion Weir irrigation is under Wabe shabele river basin. The name of the project is *Lega Kolu small Scale Irrigation Project*; specific project area is located at Bayima of Shanen Kolu district.

The project implementation would provide irrigation facilities in about 120ha of land in the command area. This report presents the results of the environmental impact assessment (EIA) of the feasibility study to implement the Lega Kolu-small scale irrigation project. At present, this water fed irrigation Project is required to secure a food self sufficiency resource for the targeted Shanen Kolu rural kebele. The consultant has tried to study and analyze the current status of existing environment in Lega Kolu catchment area or Lega Kolu command area and its vicinity along the proposed main canal & weir area and to predict the environmental.

During the site visit, both the existing route alignment and any realignment option would be recorded using a hand-held GPS instrument. This will allow the mapping of the route and their marking onto existing topographical maps and aerial photographs to an accuracy of 7m in X, Y. Such mapping will provide a useful basis for the discussion and review of the realignment options (if any) within the route location study and for presentation of the options.

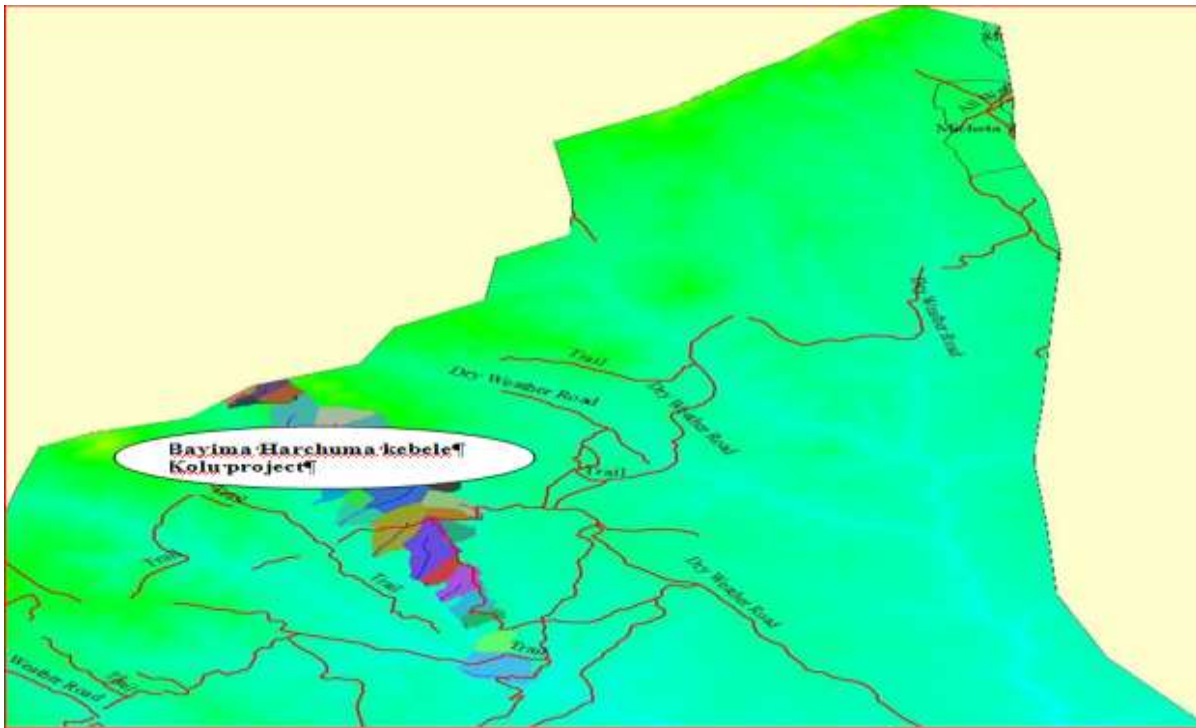
3.2. Key Project Data

Table 1 Key Project Data and Project Name

Project name	Consultancy services of Detailed Engineering Design and Tender Document Preparation of Lega Kolu Small scale Irrigation Project	
Client	OIDA/IFAD Tel. +251- P. O. Box. Finfinne, Ethiopia	
Consultant	OWWDSE Tel: + 251 11 439 2162/11 439 2467 E-mail: owwdse@ethionet.et Finfinne, Ethiopia	
Type of service	To carry out detailed engineering design and tender document preparation of the irrigation projects	
Agreement		
Project Location	Oromia, Arsi zone Shanen Kolu district	
Irrigation type	Micro- irrigations project (Lega Kolu Small scale irrigation(LKSSI))	
Consultancy contract	Signature Date	
	Commencement date	
	Planned duration	-
Currency of Payment	Ethiopian Birr	
Contract Amount		

3.3. Location and Accessibilities

The proposed project, which known as ‘Lega Kolu river is a small scale irrigation project is located in Shanen Kolu district of Arsi zone, Oromia regional state at a distance of 360km far from Finfinne, at east direction. Generally, Shanen Kolu district is located in the Arsi Bale Mountain massive in Shanen Kolu district Arsi zone of the country. The road network which takes from Addis Ababa to the project command areas was more or less good. As described in the introductory part of this report, the proposed project area is agricultural area.



4 Description of the Baseline Condition Of The Environment

4.1 Biophysical Environment

The existing environmental conditions of the project area and its environs such as the physical environment (soils, water, geology, topography, and climate), biological environment (fauna and flora), as well as the socio economic environment (administrative setting, population, ethnic groups, social infrastructure and economic base of the area) will be briefly described under this section. Generally, the project area prevailing environment presented and discussed categorizing it as the biophysical and socioeconomic aspects.

4.1.1 Topography

The project area has various land forms. Moderate to high relief hills, severely dissected side slopes and plateau and high to mountainous relief hills and plains, the altitude ranges from 2280-1600 m.a.s.l.

The specific command area is found at the hill bottom in dissected, rugged and undulating landforms at slope range between 2-5% and an average altitude of 1552m.a.s.l at the assumed center of the command area. This area is surrounded by mountainous and hilltop areas in all directions, especially in the eastern, northern and western parts. Some indigenous scattered big trees and bushes and shrubs are observed in the command area as well as on the hill surfaces surrounding the command area.

Figure 1 various land forms of project area



Figure 2 Proposed project area image taken from Google earth



4.1.2 Water Sources and Drainage

In general, due to its relief configuration and proposed project area is divided in to two main drainage basins. These are Wabishebele drainage basin, drains every areas of the entire zone except the northern limited portion of Cholle, Aseko, Ancher, Gololcha and Darolebu district.

The major perennial river draining around proposed irrigation project area. These drainage includes Harchuma, Kolu, Michata, Dhumuga and Golocha rivers that are the prominent rivers that start flowing from the Arsi Bale mountain massive high land of the zone to the south eastern part that finally drain to Wabishabele river; valleys of these rivers have large areas of potentially irrigable land. The rivers mostly used for traditional irrigation, drinking for livestock sanitation purpose, many rivers found in the district are seasonal.

4.1.3 Climate

The command area is located in Bahima kebele of Shanan Kolu District, Arsi Zone of Oromia National Regional State at about 360km (at weir axis) East of Finfinne (Addis Ababa) city, about 315km east of Asella town (zone capital), about 15km (headwork) west of Dhumuga town, the capital of this district, and about 220km away from the main asphalt road that runs through Adama to Asella. The area is found in the hot dry tropical midland agro-ecological zone at an average altitude of 1552masl (assumed center of the command area) with crops having 90 to 150 days of growing period (LGP) based on type of crops and varieties to be produced. All necessary climatic data for crop water requirement computation were obtained from this station. The project area is located in south west highland of Ethiopia, Which receives the highest rainfall in the Ethiopia. The following table shows the five traditional climatic zones in Ethiopia.

Table 2: Five Climatic Zones

Climatic Zone		Elevation in meter
Local Name	Scientific name	
Berha	Desert	Below 800m
Kola	Tropical	800 to -1500
Weinga Dega	Subtropical	1500 - 2300
Dega	Temperate	2300 - 3000
Kur	Alpine	Above 3000

Source; National atlas of Ethiopia

4.1.4 Soil of the District

A soil survey describes the characteristics of the soils in a given area, classifies the soils according to a standard system of soil classification, plots the boundaries of the soils on a map and makes predictions about the behavior of soils.

The different uses of the soils and how the response of management affects them are considered. The information collected in a soil survey helps in the development of land-use plans and evaluates and predicts the effects of land use on the environment. During soil survey activities the physical and chemical characteristics of the soils in the study area which used to evaluate the suitability of the area for surface irrigation and selected crops was assessed.

Soil survey and land evaluation of the Kolu micro irrigation Project will be conducted at feasibility level to assess in detail physical and chemical characteristics of the soils in the project area and to assess the suitability of crops for irrigation. Based on our extensive experience detailed soil survey will be carried out at feasibility level and the land evaluation exercise for the suitability of crops. Proposal describes the conditions of the physical environment of the area and the review of previous reconnaissance study of soil conducted in the area.

4.2 Biological Environment

4.2.1 Fauna and Flora

Vegetation cover of an area helps to minimize water loss or soil degradation through conserving the soil and water that is lost through surface run off and flood, helps as a source of food and shelter for natural fauna. It also helps as a source of raw material for industries, construction and fuel, and retains the natural beauty of a lands scape.

The distribution of vegetation in and proposed project area varies from place to place depending on the variation in altitude, climatic conditions and population density. Types of natural vegetations like woodland, reverie plants, shrub, bush land, and others. Natural and man-made forests protected by the government, communities, cooperatives and other organizations (if any with their area coverage in hectares) by names and locations. This thorn savanna is found in arid, semi arid and bush formation that are found in semi-humid areas at an altitude between 1500 to 1800 meters above sea level. Different types of dry savannahs, which

are mostly found at altitude, range between 800 to 1500 meters above sea level, mountain Savannah that is found at an altitude ranging between 2,400 to 3,400 meters above sea level, this vegetation consist of grass with scattered trees. While the other type of vegetation coverage is a gallery (riverside) forest that is found along the banks of river like Michata, Kolu, Hrachuma, Dhumuga , Gololcha rivers.

Figure 3; Type of vegetation distribution in and around proposed project



4.2.2 Flora

As the natural environment of the potential command area has been completely modified and transformed into intensive land uses mainly for agricultural activities and, little natural habitats are left to support wildlife. However, the natural environment and habitat of wild life have faced a great destruction because of high population pressure on the existing natural resource. Hence, the rapid destruction of the wild life habitats has reduced the size, species and distribution of wild life significantly. At present some of the wild life that are present in the zone are Baboon, Bush buck, Monkey, Duiker, Fox, Hare, Laser kudu, Leopard, Hyenas, warthog, and wild pig. However, the number of these animals is diminishing from time to time in a significant rate, it were not free from human activates that devoid the wild life from protection.

4.2.3 Land Use and Land Cover

Regarding land cover, the proposed irrigation area is used extensively for annual crops cultivation. The other important land cover is remnant trees that are conserved by farmers on their individual holdings and eucalyptus plantations around villages and on the boundaries of crop lands. The major land use types in the command area include cultivated land, grazing land, riverine forests, and scattered settlement. Among the use types, cultivated land takes the largest proportion (70%) followed by riverine forest & bush land (15), grazing land (10%), and settlement land (5%). On the cultivated lands chat is the dominant crop, and other crops such as sorghum, maize, sweet potato, H. bean, sugarcane, and other lowland oil crops are cultivated under traditional way of farming practices. The eucalyptus trees provide important economic functions for the local people including provision of fuel wood and construction materials and sources of cash income. Average landholding size per household is 0.25ha in the project kebele

Table 3: Landuse pattern of the Project area(ha) & percent(%) district and Bahima kebele

S/N	Types of Land Use	Shanan Kolu District		Bahima Kebele	
		(ha)	(%)	(ha)	(%)
1	Arable land	36,498	51.58	790	68.28
2	Cultivated	28,554	78.23 of arable land	696	88.10 of arable land
3	Grazing land	14,107	19.94	85	7.35
4	Settlements	6412	9.06	185	15.99
5	Forest lands (bushes & shrubs)	2833	4.00	86	7.43
6	Rock land	10,901	15.41	10	0.86
7	Other land	2	0.003	1	0.09
	Total	70,753	100	1157	100

Source: District Agriculture Office, and Bahima kebele DAs office

Regarding land use, most part of the catchment including the project area has been left undeveloped due to the influence of human skills and animal diseases. However, since recently this trend area had can be changed due to large number of people and expansion of farm land since present of natural vegetations

Figure 4: land use and land cover around proposed project area



Data on land use pattern of district, in which the proposed irrigable area, weir area are situated, was obtained from the respective district water and irrigation development office & district agriculture development offices.

4.2.4 Aquatic Life

Around the project area, there is no water bodies that support aquatic life at area. The faunistic composition of the water resources yet studied well. According to the information obtained from local offices and some previous surveys, the water bodies have some fish, crocodile, Arjeno fauna, Snake, and the main species being. Some other species found in these areas include Crucian Carp ('Bilcha'), *Carassius carassius*, and *Barbus* species.

4.3 . Socio - Economic Aspect of Environment

Agriculture is the dominant economic activity of district in the rural areas in particularly. It is basic for livelihood and main source of income. The agriculture sector is predominated by livestock production. Livestock rearing is the second most important economic activity in the district where cattle, goat, sheep and equine rearing is common. Farmers in and around project areas undertake their agricultural activities in its traditional form except some who use modern input such as fertilized and selected seeds to increase their crop production.

In farming activity it is very common to use human and animal labour Ploughing is carried out by two oxen that is usually managed by men. However the household head takes the highest responsibility, all the family members who reach the working age have the responsibility to contribute to their capacity including women even who have the highest responsibility at home. Detailed description of the socio-economic features of the study area is given in a separate the Socio-economic Study Report. The descriptions given in this EIA Report is brief and focuses on the issues most relevant for the environmental impact study.

4.3.1 Population and Demographic Characteristics

Even if, the more exact data on the population size of proposed project district is available, data obtained based on the census from different sources shows that the total population size of district is estimated as follows;

According to the data obtained from district, the total population of shanen kolu district the estimated to be 118,393, of which 58,584 were male and. 59,809 were female about 96.2 percent of which lives in the rural areas depending on subsistence agriculture; which commonly known as agro-pastoralist activities.

Table 4: Total population data in the District

Description	Projected Population			Population Density/km ²	
	Male	Female	Total	Area (km ²)	Density(pp./area)
Rural	56,434	57,480	113,914		
Urban	2150	2329	4479		
Total			24		

Source: Oromia Finance and Economic Development Bureau

With regards to household size of the district, reliable and consistent data could not be obtained from anywhere else of the study areas. Therefore, applying appropriate PRA methods such as Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), etc. with some community members (DAs, HEWs, School Teachers, Elders, Religious Persons, Kebele Officials, etc.) in order to estimate average family size of the project district; and, finally found that 6 persons per household as the average family size.

Project Kebeles and Beneficiaries; As per the data from respective project kebele population, 60 percent of the beneficiaries; and, totally, 240 households are expected to be direct beneficiaries of the project- the majority of whose livelihoods depend upon livestock rearing activities table below.

4.3.2 Ethnic Groups and Cultural Aspects

The settlement population in proposed project area is Arsi and Harerghe Oromo, Amhara, few number of Somale and other populations were found, the project influence area in general is dominantly composed of the Oromo Ethnic group. Afan Oromo language is the largely spoken language in the area. Muslim religious belief is dominating and followed Christian religious the array of practices specific to the project CA. Although another minor religion has found.

Among the project influence area or proposed irrigation project, although there is no quite or distinct culture, all people are using the culture of Oromo peoples such as holiday, marriage, costumes, foods and clothes research result ensures.

4.3.3 Farming and Crops Production

Agriculture is the mainstay of the community at the project area. Traditional crop-livestock mixed farming practices, subsistence type of farming and high dependence on very erratic and unreliable natural rainfall dominate the sector. Out of the thirteen kebeles of the district nine are food insecure and totally rely on food aid as safety net programme. There is continuous crop failure experienced due to shortage of rainfall and this has been observed on the field as sorghum dried before reaching the grain physiological maturity. However, at a specific project area crops such as tomato, sweet potato, chat, and pepper are intermittently produced using small scale traditional irrigation on some part of the command area.

As witnessed by the local farmers the use of improved agricultural technologies such as improved seeds and fertilizers is not adequately well practiced on both irrigated and rain-fed crops production. The supply of improved seeds and fertilizers to farmers in the district for rain-fed crop production is not adequate because the area is in the gorge, not easily accessible, less or no road network and very far away from the main road. The following table shows the supply and distribution trend of these improved agricultural technologies in the district for the last three years.

Table 5: Chemical fertilizers, Improved seeds(qt) and Agro-chemicals(lt) used by Farmers

S/N	Items	2009		2010	
		Supplied	Distributed	Supplied	Distributed
1	Fertilizer				
	NPS	458.5	457	1.5	---
	Urea	1230.5	1122	2725	2353.5
	NPSB	5107	4182.5	6174.5	5294.5
	Total Fertilizer	6796	5761.5	8901	7648
2	Seed				
	Maize- BH-540	110	110	138	138
	-BH-140	10	10	---	---
	Teff- Quncho	8	8	6.3	6.3
	Sorghum- Melkam	---	---	1	1
	Total Seeds	128	128	145.3	145.3
3	Agro-chemicals				
	2,4-D	1195	1195	1320	1320
	Total Agro-chemicals	367	316	506	428

Source: Lega dhumuga irrigation draft agronomy study report

4.3.3.1 Farmers Cooperative Association of Specific District

Around proposed irrigation project area, district is different cooperative farmers associations. They provide different types of services for the society for example they provide agricultural inputs like fertilizers & improved seeds, pesticides & herbicides, food for livestock's & they also provide various shop goods.

4.3.3.2 Crop Production around the Proposed Irrigation Project Area

I. Existing Rain Fed Crop Production

Rain fed crop production is widely practiced during the main rainy season (Meher) in the kebeles in which the project area is found whereas; it is not practiced in the proposed command area. Bone (crop production by residual moisture) is practiced on the cultivated part of the proposed command area in during dry season.

Table 6: Major staple food crops of Shanan Kolu District and the project kebele

S/N	Major crops (rain-fed)	Shanan Kolu District			Bahima Kebele		
		Area Coverage		Yield, (qt/ha)	Area coverage		Yield, qt/ha
		ha	(%)		ha	(%)	
1	Maize	3524	21.20	21.75	195	37.43	19.97
2	Sorghum	2150	12.94	19.83	170	32.63	25.79
3	Teff	1500	9.02	13.97	101	19.39	4.69
4	H. bean	174	1.05	15.1	15	2.88	10.0
5	S. potato	150	0.90	80.0	15	2.88	126.7
6	Coffee	9122	54.88	8.0	25	4.80	5.0

Source: *Lega dhumuga irrigation draft agronomy study report*

II. Existing irrigation

The following crops have been harvested with traditional irrigation development in Shanan Kolu district for the period of 2009 - 2010 cropping seasons, which could be used as baseline for the proposed irrigated agriculture.

Table 7: Crop production with Irrigation around the project area

S/N	Crops harvested	2009		2010	
		Area (ha)	Total prod. (qt)	Area (ha)	Total prod. (qt)
1	Cereals				
1.1	Maize	18	714	18	399
1.2	Sorghum	1	25	3	50
2	Roots & Tubers				
2.1	Beetroot	4	568	20	1194
2.2	Carrot	2	211	9	408
3	Vegetables				
3.1	Tomato	54	10,62	55	14,979
3.2	Onion	16	2156	39	5561

3.3	Cabbage	14	3222	31	6718
3.4	Pepper	6	132	8	184
4	Fruits				
4.1	Banana	120	21,558	121	43,228
4.2	Mango	18	3785	12	4870
4.3	Papaya	15	2615	10	4810
4.4	Orange	4	1073	4	1274
5	Others				
5.1	Sugarcane	154	11,513	157	70,375
5.2	Chat	3180	437,547	3299	569,394
5.3	Coffee	1328	9726	1219	9556

**Source: Lega dhumuga draft agronomy study report and district irrigation office*

4.3.4 Livestock Production

Livestock production is a major component of the farming system. It is also one of the economic activities for traction powers, provision of dairy products, transportation and for household income generation. Oxen are selected for speed and endurance in pulling traditional ploughs. Small ruminants and chickens are generating additional incomes for the community. Traditional beekeeping is also normally known in the area. Modern beekeeping is not as such significantly practiced, but small scale activities are there in few pocket areas. Equines serve as means of transport for human beings and agricultural products. The major type and quantities of livestock in Shanan Kolu district and the project Kebele (where the proposed irrigation project is located) are indicated in the table below.

Figure 5: livestock at feeding around proposed project area



Table 8: Trends of Livestock Population and Bee-keeping Activities of the project area

S/N	Shanan Kolu District		Bahima Kebele
	Type of livestock	Qty	Qty
1	Cattle	65,387	4462
2	Sheep	8925	605
3	Goats	32,514	2104
4	Horses	150	---
5	Donkeys	7012	280
6	Mules	450	34
7	Camels	250	---
8	Poultry	56,784	5210
9	Beehives		
	-Traditional	4320	25
	-Transitional	574	6
	-Modern	92	2

Source: District Livestock Development Agency

Diseases of the area: Foot & Mouth disease (FMD), Anthrax, Lumpy Skin Disease, Black legs, Newcastle, fowl typhoid, Bovine and Ovine Pasturellosis, Senoryosis, Trypanosomiasis (Tryps), endo and ecto parasites (Faciolla), Coccidiosis, sheep pox, etc.

4.4. Social Infrastructures, Institutions and Facilities

In order to secure sedentary livelihoods of agro-pastoralists, accessing of necessary social services such as potable water supply, health institutions, education facilities, marketing services, transportation, communication services and facilities, etc. are pre-conditions.

The provision of basic facilities, services and infrastructure has not kept pace with the rapid growth in population. Stagnant water, improper sanitation facilities and inadequate health facilities and services are posing health hazards on the communities. Low income communities suffer most from the lack of services.

4.4.1. Water Supply Services

The development of potable water supply increases the health sanitation and generally the welfare of a society. Arsi zone is characterized by excess of potable water. There are so many

springs in the highlands of the zone, where the primary concern of the community not becomes the availability of water regardless of its quality. In the mid and farmland areas, the existing springs were drying up from time to time. That intimately aggravated the water shortage not as such at Arsi zone. Anyway, there is poor access to water supply almost in half kebeles of the district; most households depend upon ponds and temporary rivers see table below.

Development water supply schemes was 91 in number 52,109 number of population was getting potable water supply services. In the water supply services coverage 45.74 in percentages.

Table 9: Water supply status and service coverage by type of schemes

S/n	Water supply sources	Functional	Nun functional	Total
1.	Development pond	72	6	78
2.	Deep well	4	0	4
3.	Hand dung well	7	2	9
Total		83	8	91

Source: Shanen Kolu Water, and Energy

In rural areas of the proposed irrigation project area, according to their importance, spring and pond, rivers, deep well occupy the first and the second position. In the project area, according the type of skim and the number, people served figuratively shown below.

Table 10: Source of Drinking water and its ranking in the District

N/s.	Sources of drinking water	Ranking according to their importance		Remarks
		Urban	Rural	
1	Deep well	Deep well	spring	
2	Hand Dug Well	pond	pond	
3	pond	river	Deep Well	
4	River	spring	River	

Source: Data collected from district Water and sanitation office

4.4.2. Energy Supply services

In urban areas, firewood and charcoal are the major source of Energy followed by fuel and electric energy. Electric energy is used mainly for light while in rural areas fire wood and crop residue are the major source of Energy.

As stated above, firewood, charcoal and crop residues are the major source of Energy source. This situation shows that there is major dependence on natural forest and crop residue that aggravates the destruction of environment and depletion of soil fertility. In order to enhance environment the natural resources efforts should be made to introduce fuel saving devices and promote alternative energy supply.

4.4.3. Health Facilities and Services

It is important to consider the general health conditions of the population and the implications with regard to the increased labor demand which will accompany irrigation development. Development of irrigation may risk increasing the incidence of waterborne diseases. Such risk can, however, be reduced by appropriate design to minimize vector breeding environments and operating regimes should aim to minimize human contact with irrigation water. A baseline indication of prevalence of water-borne disease is important for monitoring the impact of irrigation.

However, as the rate of population growth and the expansion of the service could not match each other and these resulted in low health coverage in the district.

Table 11: Proportion of health facilities and services to the existing population

S/n	Health facilities and service	Existing facilities	Remarks
1.	Health Center	2	
2.	Health Post	12	
3.	Clinic	5	Only 1 was gov't
	Total	16	

Source: district Health Office

Table 12: Proportion of health personnel in terms of people received

S//n	Health Personnel	Existing personnel	Proportion of served people	Remarks
	Nurses	15	1:88,800	
	Health officer	1		
	Midwifery	3		
	Health extension	19	1:29,600	
	Laboratory	1		
	Supportive	12		
	Total	44	25,381	

Source: district Health Office

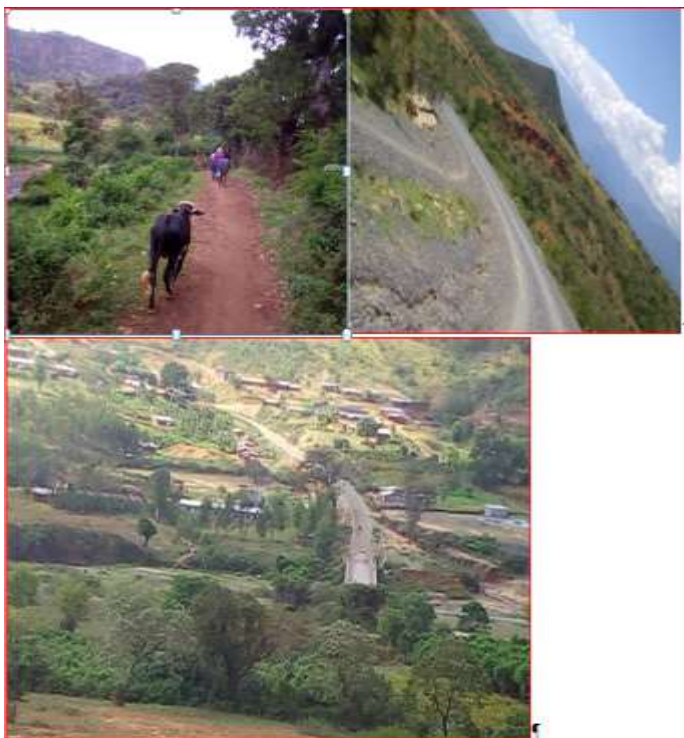
4.4.4. Education Facilities and Services

Education is an instrument for facilitating the progress of development creating an educated and more productive society in general and particularly by creating a trained and skilled labor that contributes great to the development of a country. In order to produce such type of society and labor, the existence and efficiency of Educational Institutions are the prerequisite factors.

4.4.5. Road and Communication Services

Access road and transportation services are some of the important and basic factors for development. Communication involves the transmission of words and messages from one place to another and from one person to other, using different media. Telecommunication service plays decisive roles in the social, political and economic activity of the district. It facilitates symbiotic and efficient relationship among various economic sectors of the district. In the district there is a great limitation in telephone density in the district.

Figure 6 Access road and transportation services



4.4.6. Cultural Aspects and Tourism

Arsi zone is endowed with diverse topography and landscape that provides a wide range of opportunities for the existence of diverse natural resources of both plants and animals. In addition, the zone is rich in various traditional, cultural assets and values. These resources create an opportunity for the development of tourism in the zone. The unique feature of michata valley nurhusein in amigna district, kolu, and Golocha, are among the others.

But specifically, there were no any tourist site / tourist attraction center around the proposed Irrigation command area (CA) or/and to the irrigation of Lega Kolu project area of Shanen district. Also all the stated tourist attraction centers are out of command area.

5. ENVIRONMENTAL IMPACT ANALYSIS AND MITIGATION MEASURES

Irrigation projects can bring substantial economic and social benefits to the beneficiary communities in particular and the nation in general. Conversely, they usually cause considerable adverse environmental impacts. They can affect the quality and quantity of surface and groundwater resources and soils, landscape, biodiversity, public health, etc. The overall environmental sustainability, and precise environmental impacts an irrigation scheme

depend on the local environmental setting like water availability and water uses, the type of irrigation systems, and on the particular characteristics of irrigation practices used.

Implementation of the proposed irrigation development is expected to bring a number of important socio-economic benefits as well as negative environmental impacts. The source of irrigation water for the proposed irrigation development would be surface water and the type of irrigation system is weir diversion river. Environmentally and socially, this is very advantageous as it would avoid construction of dam and storage reservoir, bridge, etc. that usually cause major adverse environmental consequences. The main potential environmental impacts and their enhancement or mitigation measures are discussed below.

5.1. Potential Positive Impacts

The main positive impacts likely to result from implementation of the proposed irrigation project include the following:

- Improved economic status and access to health care;
- Improved domestic water supply and hygiene;
- Creation of employment opportunities and more productive labour;
- Increased institutional capacity for coordinated management of Kolu River Basin;
- Improved sustainable use of water resources in the Kolu River Basin;
- Improved catchment management and protection;
- Improved protection of human settlements and infrastructure through a limited set of adaptation measures including flood zone demarcation;
- Improved income generation at household level within the CA;
- Improved livelihoods through enhanced food security, nutrition and availability of disposable income;
- Improved weed management and reduced handlings costs; and
- Reduction of poverty

5.1.1. Increase of Agricultural Production and Income Levels

Implementation of the proposed irrigation project is expected to bring substantial increase in crop production. In addition to the existing rain-fed cereal crops production, the local farmers

will be able to produce high value crops such as vegetables and fruits. As the area is very accessible and nearby to major market centre's like Machera, Galemso, Gololcha, and Cholle, they can earn significant income benefits from agricultural produces.

Application of irrigation with improved farming system and agricultural inputs such as improved crop varieties, fertilizers and pesticides is expected to enable the farmers to produce a larger quantity and more valuable or more varied crops. This will help the farmers to generate a higher income. Improved incomes should positively affect health status and living standard by enabling the people to spend more money on clothing, housing, health and balanced diets.

5.1.2. Improved Domestic Water Supply

The design and development of the river diversion for the irrigation project will consider the human and animal water supply requirements within the project influence area. Therefore, implementation of the project is expected to provide adequate domestic water supply for the communities in the project area. This situation will ultimately improve public health and sanitation in the area.

5.1.3. Creation of Job Opportunities and Reduction of Poverty

Implementation of the project will provide substantial job opportunities for the unemployed people and for the people engaged in rain-fed agriculture during the idle periods. This will help the people to increase production or generate income benefits that will support their livelihood. Thus, it will contribute to reduction of poverty in the country.

5.1.4. Improve Social Infrastructure

Among the potential benefits are improvements in physical and social infrastructure. Implementation of the project may include development/improvement of access road, water supplies, and health center, etc. Improvement in road access, health services, potable water supply, and sanitation will greatly improve health status and standard of living of the local population and access to markets.

5.2. Negative Impacts on Biophysical Environment

5.2.1. Degradation of Biodiversity

Biodiversity refers to the variety of life on earth. This variety provides the building blocks to adapt to changing environmental conditions in the future. As indicated in proposed irrigation project significant segment of lands woodland, shrub land and others converted to other land use types; mainly for farming. The land allocated for irrigation from the conversion of the existing bush/shrub and others ecology could have negative environmental implication if not properly managed. Bush encroachment and shrub clearing give rise to loss of biodiversity, exposing soil surfaces to solar radiation and run off, which result in serious socio-economic problem. Bushes and Shrubs consist of various life diversities that range from small and microscopic flora and fauna to tall woody plants and numerous insects, birds and reptiles. Therefore, as bushes and shrubs are of diverse species and have different physiological nature, their management in converting to grass lands requires due care.

5.2.2. Deforestation

Around proposed irrigation project areas, is endowed with diverse forest cover. As indicated in the existing land cover report of the area, significant part of the area is covered with forest with under shade coffee, natural and plantation forests.

Deforestation is one the major existing environmental problem imposing severe pressure and with possible potential to increase in the future. Similar to other parts of the country the rural population of Arsi and Harerghe was growing rapidly and results in scarcity of farm land for the young generation. Beside this, the available land holding reach the level to which further sharing cannot be made. On the top this, the soils of the area are highly degraded to support crop and pasture regeneration.

In proposed irrigation project, this expansion of cultivated land might be at the expense converting woodland, shrub land, and other lands. This action involves clearance of vegetation cover (Woodland/bush/Shrub) which increases the pressure on the available forest cover; and eventually leading to deforestation.

Figure 7; Cutting indigenous tree and expansion of farm land around lega kolu irrigation project area



Gradually, such conflicts might bring over exploitation and misuse of the available forest and forest products. As the trend of deforestation indicates, the problem probably increases in the next few decades unless corrective measures are taken in advance. Therefore the proposed land use should incorporate means of averting such adverse environmental problems in order to address the question of sustainability.

5.2.3. Soil Erosion

Proposed Lega Kolu small scale irrigation project area there is a significant run off (during the rainy season) from the surrounding hills, which has caused much sheet, rill and in some part gully erosions, where the main causes of this erosion are deforestation, bush clearing and overgrazing. The degree of soil erosion will depend on the extent of disturbance, slope of the land and inherent characteristics of the soils. Therefore, mechanical and biological conservation measures are very decisive to control the severe erosion hazard permanent and temporary erosion control provision, particularly in the areas of heavy textured soils. Measures to reduce soil erosion will include the following.

Mitigation measures

- Scheduling the construction program for dry season;
- Refilling the exposed or excavated soil soon after completion of works;
- Proper disposal of wastes and used oils in recognized local authority approved sites;

- The design engineer should ensure that provision is made for suitable and adequate permanent drainage facilities ;
- Unnecessary movement of heavy machinery at excavation sites should be prevented;
- Providing proper drainage system to remove excess rainwater or irrigation water from kolu small scale irrigation command area; and
- Use of local labour in preventive and first responsible maintenance to erosion problems.

5.2.4. Mitigation Measure for Noise Position

Where machinery passes in towns and villages with narrow passages, or where the access roads are in the vicinity of noise sensitive facilities such as school, hospital and Worship places, attention of construction activities related to noise may be desirable. These techniques are;

- Constructions that produce nuisance level should be minimized or rescheduled near places of Worship so as to occur on locally recognized religious days;
- Avoid disturbance noise sites from school, hospital, settlement and noise sensitive areas;
- Activities that produce more noise levels should be restricted to the day time;
- Equipment that produces high level of noise should be suppressed and screened from any sensitive noise receptors; and
- All machinery and plants should conform to the applicable noise standards.

5.2.5. Impacts on Air Quality

The haulage of construction material increase dust during period canal construction and access road. In the area that transports through settlements, raised dust can cause considerable noise and can result in increased incidence of respiratory diseases. In the following the major mitigation measures were recommended to protect air quality:

Mitigation Measures

- Proper maintenance of diesel equipment and curtailment of unnecessary idling should be practiced to control emission;

- Construction machinery should be well maintained to minimize excessive gaseous emissions;
- Appropriate avoidance and reduce dust emissions and nuisance noise must be followed by the Contractor;
- All machinery and plants should conform to the applicable noise standards;
- Well designed traffic management plan to avoid transport disturbance of resident.

5.2.6. Water Resource Pollution and Contamination

The risk of surface water pollution is likely to be high in areas where the water table is shallow and the spring water is recharged locally with a residence time of shorter period. Regarding surface water, the water quality of the rivers Kolu passed at right side of command area could be affected by residual chemicals carried by surface runoff or drain water from the agricultural fields.

Water pollution by residuals of persistent chemicals may pose debilitating effect on human health and aquatic ecology. Contaminated water sources may be consumed by downstream users for drinking and other domestic purposes. In addition, aquatic organisms like fish could be affected by residual chemicals. In areas where the groundwater table is deep enough, the risk of contamination may be less probable as most of the contaminants could be filtered out by soil colloids. The problem might be significant in drainage ditches and in Kolu river and other smaller spring streams, which have low flows during most time of the year.

The potential adverse impacts on water quality can be minimized by adopting efficient water application and nutrient and pesticide management techniques as recommended below:

Mitigation Measure

- Application of irrigation water at field capacity by setting the target soil conditions and amounts to be applied at irrigation. This can be achieved by uniform application of water based upon an accurate measurement of crop water needs and the volume of irrigation water applied;
- Application of proper nutrient management or nutrient budget for the plant. This can be achieved by identification of the types and amounts of nutrients necessary to produce a plant (crop) based on realistic yield expectations ;

- Integrating pest managing, necessary applications to minimize pesticide movement from the field. If pesticide applications are necessary, environmentally friendly pesticides should be selected based on consideration of their environmental impacts such as persistence, toxicity, and leaching potential;
- Avoiding water use for human and animal supply from affected sources following spraying of biocides;
- Improving sanitation in the project area by providing adequate sanitary facilities and avoiding using of open fields for defecation; and
- Using organic manure in preference to inorganic fertilizers as much as possible.

5.2.7. Proliferation of Agricultural and Aquatic Weeds

Canals and drains, which are enriched by nutrients from irrigation fields and catchments intercepted by the structures, are usually invaded by dense growths of weedy plants. It is advantageous that the proposed irrigation project will involve major canals and drains. However, it is unavoidable that operation of the project will increase the availability of water and nutrients that may provide ideal conditions for growth of weeds. In particular, nutrients from irrigation fields can enrich drainage ditches, stream courses, and other drainage channels, which may become favorable environment for proliferation of agricultural weeds as well as aquatic weeds.

Of particular concern is that aquatic plants such as water hyacinth may introduce to the area and colonize drainage ditches and courses of smaller streams or natural drainage channels. Such aquatic weeds are notorious and may cause major nuisance by impeding water flows and drainage. The presence of aquatic plants may have some public health impacts. Aquatic weeds may contribute for the establishment of snails, which are intermediate hosts for bilharziasis or schistosomiasis. *Biomphalaria pfeiferi*, which is the snail host for the intestinal bilharziasis, *Schistosoma mansoni*, can easily flourish well under the protection and support of such aquatic weeds.

Control Measures will include:

- Proper design and maintenance of drainage canal so as to allow proper flow of water or avoid stagnant water in such structures; and

- Monitoring and removing weeds before they spread and clog drainage canals and stream courses.

5.2.8. Drainage Issues and River Flooding

Most part of the proposed irrigable area is characterized by rolling topography and red brown soil colors. Presently the area has significant drainage problem due to lack internal drainage condition of the soils. However, with repeated irrigation, the water available in the soil or over the land surface may exceed the infiltration rate resulting in some drainage problem. Significant part of the project area has limited natural drainage outlets.

Kolu River flooding can be divided into primary hazards that occur due to contact with water, secondary effects that occur because of the speed flooding river, such as destruction of weir, disruption of services, health impacts such as famine and erosion, and tertiary effects such as changes in the position of river channels. Throughout the last century river flooding has been one of the most costly disasters in terms of both property damage and human casualties.

A rapid rise at summer season in water levels in the Kolu river due to heavy rains at the upstream has resulted in localised flooding (river outflow) in the project area. While project area are the brunt of the initial flooding, by the early part of July further runoff from the north-western escarpment was contributing to rising water levels.

Measures that would minimize drainage problems include the following:

- Application of efficient irrigation system for the areas having potential drainage problems;
- Providing drainage facilities where necessary to remove excess rainwater or irrigation water from the irrigation command area;
- Training the irrigation users in effective water application;
- Provision of interceptor drain(s) that would intercept excess runoff water draining to the command area and discharging it to natural waterways or streams and etc.
- Design and implement water shed based physical , mechanical and biological soil conservation measures;
- Develop in natural depressions where run-off accumulates from the adjacent uplands; and

- Develop blocking dam for the river flooding and concentration of the run-off in natural drainage lines from the surrounding uplands.

5.3. Negative Impacts on Socio-economic Environment

5.3.1. Impacts on Public Health

The main potential public health concern is pneumonia, which is prevalent in the project area. The supply of adequate and reliable water may create suitable breeding sites in irrigation fields, irrigation canal, and stream courses for malaria transmitting mosquitoes and snail intermediate hosts. This situation may result in increased malaria transmission and introduction of bilharziasis, which is not prevalent at present. Also increased human-water contacts and increased population may contribute for increase of the prevalence of the diseases. Presently, schistosomiasis is not prevalent in the area but it may introduce after implementation of the irrigation development.

Proposed mitigation measures include vector control and provision of adequate health services, safe water supply, and sanitation facilities (proper excreta and refuse disposal). The health service component may include improving/upgrading the existing health facilities and establishing new health units together with necessary health personnel, equipment, and supplies. A proper referral system should also be established. This could be Health Posts - Health Centre - Hospital; the Gololcha Hospital could be the appropriate hospital for the referral system. Particular attention should also be given for vector control and sanitation and the proposed measures include the following.

For environmental reasons, it is recommended that environmental control of vector is practiced first. Chemical control can supplement environmental management whenever it is necessary.

Following activities are recommended:

- Applying efficient irrigation water application to minimize creation of suitable vector breeding places and prevent vector production;
- Designing and constructing effective drainage system to collect and remove excess water (overflow, runoff, and seepage) from the irrigation fields to avoid stagnant pools of water;

- Regular removal of weeds from drainage ditches, stream courses, and other areas of water so that vector production is prevented;
- Regular monitoring of drains and other areas of water that are possible vector breeding sites and taking necessary actions depending on the monitoring results;
- Early detection and treatment of infected cases before the disease is spread to healthy people;
- The capacity of health in kebele of proposed project area, especially in malaria control should be strengthened and be supported with good incentives and conducive working environments;
- Provision of adequate impregnated bed nets for the population in the project area;
- Spraying the houses in the project area with appropriate insecticide as required;
- The health education activities must be integrated into the public and environmental health services in the project area; and
- Sanitarians and public health officers must make the individual family and community aware of the cause of communicable diseases and the importance of safe water supply and sanitation in the control of the diseases

5.3.2. Exposure of Sexually Transmitted Diseases

During the construction period, communicable diseases primarily associated with the influx of people to the project area would be the major health problem. Health risks like sexually transmitted diseases including HIV/AIDS are expected to be increased. Other health problems which are directly related to construction activities such as traffic accidents, injuries at the working places, etc would occur.

Mitigation measures

- Provide health education to the work force and community mainly focusing on the HIV transmission and prevention;
- Provide free counseling and distribute condoms & leaflets to workforce and vulnerable group of nearby communities;
- Do not induce malaria out break by creating temporary & permanent water holding areas which favor mosquito breeding;

- Use mosquito nets and insect repellents in times of malaria out break and provide a clinic or medical facilities at the construction camp;
- Strengthening the capacity of health institutes & provide clinics in major construction camps;
- Take care when selecting campsites in such a way that it should not invite close interaction with local community; and
- Provide sustainable irrigation & appropriate waste disposal facilities including the provision of sanitary latrines in the construction camp.

5.3.3. Pollution of Agrochemicals

Agrochemicals are inputs used to increase the productivity of cropland. The use of agrochemicals should be handled in proper care not to damage the surrounding environment. Some the chemicals used in the agricultural sector are highly persistence or they can stay active for a long period of time and result in soil and water pollution due to its residual effect.

In a proposed irrigation project there are different land use area significant segment of the land is allocated for rain fed agriculture and irrigation. In the case of such land use type, the use of agrochemicals such as inorganic fertilizer, herbicides, and insecticides is expected to increase productivity and safeguard the crop from crop pests. In this course of action, some chemicals which are very toxic to the biophysical environment may come with undesirable effects unless proper care is taken in handling and utilization.

Crop protection chemicals are hazardous, either to people, or to the environment, or both. The dangers are intense for the much smaller numbers of people who actually work with these chemicals. As to environmental hazards the best known dangers are the killing of non-target animals, such as birds and pollinating insects. Occasionally, there is a risk of irreversible damage, when a rare species is threatened with extinction. From the other angle, the hazards are not due to the pesticide itself, so much as to its misuse.

Therefore the use of agrochemicals in the proposed land use should incorporate human and environmental safety to control long lasting direct and indirect residual effects that give rise to soil and water pollution.

Mitigation Measure

- Introducing and implementing manual and biological methods
- Implementing Integrated pest control
- Implementing safety precautions
- Best management practices, legislation, monitoring and compliance
- Better education and extension programmes; and
- Use of chemicals (insecticides and fungicides) as the last option.

5.3.4. Insect Pests and Crop Diseases

Insect pests and diseases can significantly affect crop production unless necessary control measures are implemented. The elimination of dry season die-back and the creation of a more humid microclimate with irrigation may be favorable situations for insect pests and diseases.

Possible control measures include:

- Keeping dry fields and drainage ditches when irrigation/watering is not required;
- Use of proper cultural practice, e.g. implementing improved drainage and efficient water application;
- Use of chemicals (insecticides and fungicides) as the last option.

6. Environmental Management and Monitoring Plan

6.1. Environmental Management Plan

In the context of a project, environmental management is concerned with implementation of the measures necessary to minimize or offset adverse impacts and to enhance beneficial impacts. Unless the mitigation and benefit enhancement measures identified in the EIA are fully implemented, the prime function of EIA, which is to provide a basis for shaping the project so that overall environmental performance is enhanced, cannot be achieved.

In order to be effective, environmental management must be fully integrated with the overall project management effort at all levels, which itself should be aimed at providing a high level of quality control, leading to a project which has been properly designed and constructed and functions efficiently throughout its life.

Both project management and environmental management responsibilities are normally shared between several government and non-government organizations, each with specific executive responsibilities for particular aspects, which are exercised during the various stages of project preparation, implementation and subsequent operation and maintenance. In the following section major socio-environmental management activities and responsible bodies for the execution of these activities are described.

6.1.1. Pre -Construction Phase

Prior to contractor mobilization and the commencement of intake construction and reservoir site preparation, environmental management will be concerned with four principal groups of activities:

- Ensuring that all government and funding agency requirements and procedures relating to EIA are complied with;
- Preparation of detailed designs which incorporate specific features aimed at minimizing adverse impacts and enhancing beneficial impacts;
- preparation of tender and construction contract documents which contain appropriate clauses to allow control of impacts arising from construction activities

- Implementation of land and property acquisition procedures including the payment of compensation if necessary; and
- Review and evaluation of the EIA is expected to be the responsibility of the OIDA and REPA/ EPA

6.1.2. Construction Phase

Most of the project environmental management activities will be carried out during the construction phase, since it is at this time that most impacts can be expected to arise. Management will very largely be concerned with controlling impacts which may result from the actions of the Contractor, through enforcement of the construction contract clauses related to protection of the environment as a whole and of the components within it. In this respect, it is important to recognize that successful mitigation of construction impacts can only be achieved if the environmental protection measures, as set out in this EIA report are properly enforced.

During the actual construction period, an environmentalist should provide advice and assistance to the Engineer and the RE, as and when required, on all aspects of environmental management. He/she should also be responsible for time to time environmental monitoring during the construction period. For the effective implementation of environmental management and monitoring plan, He/she is recommended to work in close cooperation with both district land administration and Environmental protection, and with NGOs and local communities.

Similarly, the land administration and Environmental protection, of both district should be involved in environmental management and monitoring activities of the project. The unit may assign an environmental/social expert in order to monitor and follow up over all project impact and he/she should report for district administration and zone EPA.

The environmental supervisor of the construction supervision consultant team should submit environmental performance progress reports for the OIDA, for the construction supervision team leader and for other relevant organizations. On the other hand HIV/AIDS prevention, awareness creation, counseling, monitoring and evaluation activities should be subcontracted for NGOs, which are involved and experienced in such activities.

6.1.3. Operation Phase of the Construction Work

During the commissioning phase, the construction contractor should clean up the project environment. All the salvages and waste materials from the construction process should be cleaned, demolished or dumped in appropriate and authorized places. Quarry and borrow areas should be rehabilitated and drained. Temporary camp sites should be removed and the compacted materials should be removed and reinstated, so that the land continues giving services which were discontinued due to the project. The environmental supervisor should follow up the proper implementation of these activities and check that the work as built meets all the environmental requirements.

6.1.4. Project Operation Phase

Continued enjoyment of the benefits arising from implementation of the main canal alignment and distribution canals irrigation project will only be achieved if effective routine and periodic environmental management activities are in place. Environmental management and monitoring in this respect will be the responsibility of the project proponent. The project proponent is expected to establish environmental unit at project level to carryout routine environmental management activities.

Major environmental management activities to be undertaken at different phases of the project and responsible body or organizations to implement these activities are presented in the following table:

Table 13: Summary of Environmental and Social Impact Management Plan (ESMP)

Environmental, ecological or social component	Potential Adverse Impacts	Mitigation measures
Construction phase of the project		
Noise	Disturbance due to noise generated from construction works and intensive traffic as well as associated vibration effects	<p>Use of adequate construction materials and equipment;</p> <p>Adherence to predetermined work schedule to minimize disturbance and implementation of noise generating works during normal work hours;</p> <p>Minimum use of noise generating equipment (example, stone cutters, compressors);</p> <p>Minimize traffic during dark hours, and use of silencers;</p> <p>All machinery and plants should conform to the applicable noise standards, and plants should be provided with effective noise mufflers;</p> <p>Construction workers should adhere to health and safety standards pertaining to noise, such as wearing ear protection when operating plant or heavy machinery.</p>
Air quality	Dust, gases/aerosol associated with construction (toxic gasses discharged by construction machineries, windblown construction materials etc.)	<p>Dust prevention by watering and other means;</p> <p>Transportation of grainy or dusty materials in the top-coated trucks;</p> <p>Watering of dust sources;</p> <p>Transportation of dust producing materials during calm days (not in the windy days);</p> <p>Avoid making open fires;</p> <p>Avoid setting fire on residue grease, isolation materials, and other substances;</p> <p>Efficient use of machinery and other technologies;</p> <p>Application of adequate construction methodologies and facilities;</p> <p>Careful implementation of works in vulnerable areas.</p> <p>Diesel engines of construction equipment should be subjected to regular checking and cleaning of the injectors to minimize emissions.</p>

Environmental, ecological or social component	Potential Adverse Impacts	Mitigation measures
		<p>Wearing material for access roads should be selected so that dust levels would be minimized.</p> <p>Diesel powered machinery and vehicles should be well maintained to reduce excessive exhaust emissions.</p> <p>Dust collectors or water spray systems may be required as appropriate to prevent high dust emissions from batching plant operations.</p>
Top soil	<p>Damage to the topsoil resulting from material storage, excavation works, temporary roads etc.</p> <p>Loss of topsoil during excavation; soil erosion due to excavation along the slopes for various project activities.</p>	<p>Adequate design works and selection of proper route to minimize impact on the topsoil;</p> <p>Usage of excavated soil material for the agriculture purposes;</p> <p>Cut, store and restore topsoil where possible after the completion of the construction works;</p> <p>Discharge of materials to the predetermined areas by secondary routs;</p> <p>Measures against land slides</p> <p>Storage of toxic materials and effluents in the safe and predetermined areas, its provision with drainage waters, and processing where necessary;</p> <p>Standards applied, including soil erosion prevention by good soil practice and drainage control. Good soil conservation measures and effective reins to prevent future erosion and soil loss.</p> <p>Refill the canals and trenches properly so as to reduce soil erosion</p>
Flora and fauna	<p>Earthworks, operation of machines, noise and etc.;</p> <p>Losses or degradations during and after construction works, non-seasonal works, disturbance of ecological situation etc.</p>	<p>Adequate storage, processing or liquidation of wastes;</p> <p>Protection of vulnerable areas located close to the construction site;</p> <p>Application of seasonal work methodologies where necessary.</p>
Aesthetics and	Impact of works on landscape and	Careful design and location of works;

Environmental, ecological or social component	Potential Adverse Impacts	Mitigation measures
landscape	disturbance to natural sights, greenness and trees; Noise, dust, residue and etc. during and after construction.	Restoration of damaged trees, protection lines and etc.; Planting of greenery in the construction site, careful implementation of works in the work sites, and management of wastes.
Degradation of water quality	Earthwork activities for construction of the proposed intake plant are likely yield high sediment loads.	Avoid leakages of vehicles and construction plant by regular and effective maintenance, and accidental spills hazardous chemicals (oil, fuels, paint, lubricants, etc.) through good practice. Avoid pollution of river or stream water during concreting work from cement slag and oil and fuel spills by providing suitable diversion and/or other appropriate measures
Risks to human health and environment	Quality of treated water	Operation supervision of treatment facilities in due accordance with the operation guidelines; Quality control of water flows entering the system; Avoid pollution of treated waters with the wastewater flows; Avoid over-chlorination of water flows supplied to the consumers.
	Breakages and emergency situations	There is need to develop scheduled preventative maintenance Training of staff on safety and human security issues; Measures to avoid leakage of chlorine gas.
Safe storage of hazardous and non-hazardous wastes	Risks to human health	Use of authorised sites for non-hazardous waste disposal; support and arrangements for setting facilities for hazardous waste safe storage
Human health	Risks to health of residents and workers and to the environment	Training of staff on safety and human security issues; Training of staff on sanitary and hygiene rules to prevent infections from wastewater discharges and sludge residues; Provide staff with adequate protection uniforms and facilities; Measures to prevent emergency situations such as leakage of chlorine gas.

Environmental, ecological or social component	Potential Adverse Impacts	Mitigation measures
		Monitoring of drinking water and wastewater quality
Land pollution	Pollution of the land due to agrochemicals	<p>Proper design of the treatment plant so as to lessen the amount of wastes into the system;</p> <p>Undertake water shade management around the area so as to reduce addition of wastes from the surrounding area into the treatment plant;</p> <p>Apply effective and efficient treatment chemicals as per the standard not reduce their impacts on human health;</p> <p>Remove residuals from the treatment plant and other systems and dispose them in selected area so as reduce its environmental impacts on the soil and air;</p>

6.2. Environmental Monitoring Plan

Environmental monitoring of the Lega Kolu small scale Irrigation Project is very essential part of the EMP. It helps to follow up the implementation of the proposed mitigation measures and evaluate effectiveness of the proposed mitigation measures. There are two basic forms of environmental monitoring. Compliance monitoring, which checks whether prescribed actions have been carried out, usually by means of inspection or enquiries; and effect monitoring, which records the consequences of activities on one or more environmental components and usually involves physical measurement of selected parameters or the execution of surveys to establish the nature and extent of induced changes.

It is recommended to carry out both compliance and effects monitoring. Such monitoring has to be carried out by environmental inspector who is assigned by the construction supervision consultant on day to day basis and by the Environmental Protection Authority of OIDA, once in every three months. The responsibility of the environmental inspector should be to ensure the implementation of all the proposed mitigation measures, their effectiveness and identifying unforeseen impacts and recommending remedial measures and gaps to be filled or amended. The monthly reports prepared by the environmental inspector should contain a brief section referring to environmental matters, which summarizes the results of site monitoring, remedial actions which have been initiated, and whether or not the resultant action is having the desired result.

Environmental team from Environmental Protection Authority of OIDA should also participate in monitoring activities in an intermittent basis. They should visit the construction site at least once in every three months and monitor overall environmental activities of the project and discuss with the environmental supervisor of the construction supervision consultant. The monitoring team should also submit monitoring report for the Federal and Regional EPAs. Federal and Regional EPAs should be involved in complaint monitoring and auditing.

Whenever complaint on environmental management performance raised by any stakeholder or responsible person, Environmental impact assessment service of WEPA or REPA should undertake complaint monitoring and take remedial action wherever it is appropriate. In order to facilitate effective monitoring, it is essential to identify feasible environmental indicators those

could be measured easily and indicate environmental changes as fast as possible with limited cost and time. To this end indicators for environmental monitoring in each phases of the project are identified and monitoring mechanism are designed. The summary of environmental monitoring plan is given in Table below.

Table 14: Summary of Social Environmental Management Plan (SEMP)

	Components/ Issues	Monitoring Parameters or Activities	Costs	Responsibilities for Monitoring
	Physical Environment			
	Soils	<ul style="list-style-type: none"> • Rate of soil erosion in the main canal and distribution canal area and sedimentation of main canal 		WARDO
	Biological Environment			
	Terrestrial Ecology	<ul style="list-style-type: none"> • Status of habitats conserved/ protected for ecological functions such as conservation of flora and fauna, comparing to the pre-project condition. 		WARDO, OFWLCE & Forestry Research Centre at Finfinne
		<ul style="list-style-type: none"> • Changes in riverine forests downstream of the project area in relation to river regulation & changes in river flows, comparing to the pre-project condition. 		WARDO & Forestry Research Centre at Finfinne.
	Socio-economic Environment			
	Public Health & Social Infrastructure	<ul style="list-style-type: none"> • The availability of sufficient social infrastructure (health, education, water supply) in the project area; • Incidence of water related diseases (malaria & water-borne diseases); • Condition of vector breeding sites & vectors; • Availability of potable water supply. 		WCBO, WHO, and/or Health Centers
	Overall Performance			
	Auditing/ Evaluation	<ul style="list-style-type: none"> • Auditing or evaluation of the environmental performance of the irrigation development. 		Regional Environmental Authority or EPA

7. CONCLUSIONS AND RECOMMENDATIONS

The implementation of the proposed surface water irrigation project will bring a number of economic and social benefits. These include improved economic and nutritional status through increased and varied agricultural production, improved access to health care and food self sufficiency, creation of employment opportunities and more productive labour, and reduction of poverty. Conversely, the construction and operation of the project will result in several adverse environmental and social impacts. However, the negative impacts can be reduced to acceptable levels through integration of environmental mitigation measures in the design or planning and implementation of the project. Therefore, it can be concluded that there will be no severe or immitigable impacts that will prevent the implementation of the irrigation project.

The proposed project is highly accepted by the beneficiary community and stakeholders responsible for planning, implementation and/or facilitation of economic and social development programs in the project area. The acceptance by the local community is based on the assumption that they will have the opportunity to develop their land plots using irrigation without transfer of their landholdings to other parties. It is believed that implementation of the proposed irrigation project will bring substantial improvement in the socio-economic status of the beneficiary community.

In order to have minimal and acceptable residual environmental and social impacts, and enhance the potential benefits, it is recommended that the proposed mitigation measures are properly implemented at the right time, and necessary follow up of their effectiveness is made through well planned monitoring plan. In particular, the following recommendation or actions shall be given due attention and properly implemented by the concerned parties:

- Establishment of an efficient water application/management system that delivers only necessary quantities of water to minimize salt accumulation in the soil profile, water-logging and creation of mosquito breeding sites.
- Proper nutrient management or nutrient budget for the plant to avoid excess nutrients that may infiltrate and pollute the groundwater.
- Limiting pesticide use and managing necessary applications to minimize pesticide movement from the field.
- Application of proper handling and use of agro-chemicals according to accepted

guidelines.

- Use of environmentally friendly chemicals and biological control measures against pests and diseases.
- Establishment of a strong environmental management and vector control programme to control the transmission of water related vector-borne diseases especially malaria.
- Provision of sustainable irrigation development for the Bayima kebele population in and around the project area.

In addition, the commitments of the key stakeholders including the Oromia irrigation development authority, district and kebele administrations, pastoralist development offices, and health offices to implement the mitigation measures specified in the empower and other necessary actions will be vital.

8. References

- Acres International Limited (1995). TGE MONREP Water Resources Development Authority. Feasibility Study of the Birr and Koga Irrigation Project. Koga Irrigation Project Vol. II. Annex R: Environmental Impact Assessment.
- Booker Tate (2005). Metahara Sugar Factory. Feasibility Study of Land Development for Cane Plantation at Metahara Sugar Factory. Annex 8 Safety and Environmental Impact.
- EPA (1997). Environmental Policy. Ethiopian Environmental Protection Authority.
- EPA (2000). Environmental Impact Assessment Guideline Document. Ethiopian Environmental Protection Authority.
- EPA (2003). Environmental Impact Assessment. Procedural Guideline. Ethiopian Environmental Protection Authority.
- FAO (1989). Water Quality for Agriculture. FAO Irrigation and Drainage Paper 29 Rev.
- Proclamation No. 295/2002. Proclamation for Establishment of Environmental Protection Organs. Ethiopian Environmental Protection Authority.
- Proclamation No. 299/2002. Environmental Impact Assessment Proclamation. Ethiopian Environmental Protection Authority.
- Morrison-Saunders, A., J. Arts, J. Baker and P. Caldwell (2001) "Roles and Stakes in Environmental Impact Assessment Follow-up, & Good Practice and Future Directions " Impact Assessment and Project Appraisal".
- Proclamation No. 300/2002. Environmental Pollution Control Proclamation. Ethiopian Environmental Protection Authority.
- WAPCOS (1996). Environmental Impact Assessment Report. Amibara Drainage Project Phase II. Preparation of Detailed Designs, Tender documents, Project Preparation Report and Environmental Impact Assessment Report.
- Worthington, E. B. (ed) (1976). Arid Land Irrigation in Developing Countries, Environmental Problems and Effects. International Symposium 16-21 February 1976, Alexandria, Egypt.
- WWDSE and WAPCOS (2005). Kesem Weir and Irrigation Project. Environmental Impact Assessment Report.

- WWDSE (2006). Wonji/Shoa Sugar Factory Cane Plantation Expansion, Welenchiti Bofa Irrigation Project. Feasibility Study, Design Works and Tender Documents Preparation. Environmental Impact Assessment Report (Final).