ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

DROUGHT RESILIENCE AND SUSTAINABLE LIVELIHOODS PROJECT PHASE V

MINISTRY OF AGRICULTURE

THE GOVERNMENT OF ERITREA

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LIST OF ACRONYMS

AfDB : African Development Bank

ARV : Anti-Retriviral Drugs

CC : Climate Change

CSS : Climate Safeguard System

DRSLP : Drought Resilience and Sustainable Livelihoods Project/Programme

EA : Environmental Assessment

EIA : Environmental Impact Assessment

ESIA : Environmental and Social Impact Assessment

ESMP : Environmental and Social Management Plan

FGD : Focused Group Discussion

GAP : Gender Action Plan

GDP : Gross Domestic Product

GHG : Greenhouse Gas

GoSE : Government of the State of Eritrea

HIV/AIDS : Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome

HIV : Human Immuno-Deficiency Virus

IESIA : Integrated Environmental and Social Impacts Assessment

ILO : International Labour Organization

IPCC : Inter-Governmental Panel for Climate Change

MoA : Ministry of Agriculture

MoLW&E : Ministry of Land, Water and Environment

OS : Operational Safeguards

PIU : Project Implementation Unit

RAP : Resettlement Action Plan

RDGE : Regional Directorate for Eastern Africa

UNCBD : United Nations Convention on Biological Diversity
UNCCD : United Nations Commission to Combat Desertification

UNFCCC : United Nations Framework Convention on Climate Change

UNICEF : United Nations Children and Education Fund

US : United States of America

1. INTRODUCTION AND THE CONTEXT OF THE ESMP

1.1.Background

The proposed Drought Resilience and Sustainable Livelihoods Project Phase V in Eritrea is an integral part of the Regional Drought Resilience and Sustainable Livelihoods Programme for the Horn of Africa, regional and long term endeavor engaged by the Bank in collaboration with the Governments in the Horn of Africa. In this phase v initiative the Bank intends to address the regional and long term challenges caused by drought and climate change through resilience building and enhancement of sustainable livelihoods of the communities. The objective is to enhance drought resilience and improve sustainable livelihoods of the communities in the severely drought prone regions with limited Government or donor interventions.

Eritrea is one of the Greater Horn of Africa countries. It borders the Red Sea (to north-east and east), Sudan (north-west), Ethiopia (south) and Djibouti (south-east). It has a surface area of about 125,000 square km of which 117,600 km^2 constitute land surface area. Of the 117,600 km^2, only 17% is arable land for rain-fed agriculture while the rest are arid and semi-arid lands (ASALs) also known as rangelands or drylands that cover about 83% and receive less than 450 mm of rainfall per year. These rangelands can be converted into agricultural production through alternative means that includes irrigation.

Topographically, Eritrea is divided into 3 major landforms: (1) the eastern escarpment, (2) the central highlands, and (3) the western lowlands. The highlands enjoy a temperate kind of climate with moderately cool temperatures while the lowlands experience hot and dry climate. The rainfall is bi-modal, the short-rains occur in February – April and the long rains come in June to September. Rainfall is highest in the central highlands which receive between 400 mm and 1000mm of rainfall annually. The country is a drought prone one. Rainfall is highly erratic with uneven distribution. Averaged for the nation, the annual precipitation on the average is about 500 mm per annum. As a result agriculture is characterized by very low productivity, producing below subsistence level. In addition to this, lack of improved agricultural inputs and shortage of appropriate modern farming technologies are considered major constraints to food and nutrition security in the country. The above challenges are compounded by high unemployment rates, poverty and environmental challenges are among the main bottlenecks for inclusive growth.

The Agriculture sector plays a key role in the Eritrean economy and has experienced extensive improvement over recent years. It contributes about 17 percent of the country's GDP estimated at $4.037 billion (according to 2017 estimates). The statistics available indicate that about 80% of the Eritrean rural population derive their livelihood from agriculture which is dependent on rainfall and underground water both of which are highly affected by changes in climatic conditions. Consequently, a large proportion of the population is vulnerable and food insecure with an estimated 50% of the children suffering

from under-nourishment. However, the statistics may not very reliable as the country lack current and up-to-date information. The agricultural sector has, however, improved with increasing use of modern farming techniques and equipment, and the construction of dams to increase water availability for irrigation. Nevertheless, it is compromised by a lack of financial services and investment. To minimize the recurrence of and impacts of severe, droughts, water shortages and food crises in Eritrea, there is need to scale up the interventions of the Bank and consolidate the gains of on-going Drought Resilience and Sustainable Livelihoods Project phase II and phase IV (DRSLP II & IV) by introducing new components that will include value addition with objectives of promoting local entrepreneurship and agribusiness to maximize on returns and ensuring improved production and productivity. It will include developing local off-takers to support and provide ready markets for the rural farmers.

Despite uncertainties in climate variability, the Inter-Governmental Panel on Climate Change (IPCC) Fifth Assessment Report identified the "likely range" of increase in global average surface temperature by 2100 of between 0.3° C and 4.8° C (IPCC, 2013). The potential impacts on agriculture include changes in production and quality of crop and forage (especially for livestock feeds), water availability, increased crop failures, impacts on livestock growth and milk production, increased incidences of diseases, impacts on biodiversity, etc. These impacts are primarily due to an increase in temperature as a result of increased atmospheric carbon dioxide (CO_2) concentration which causes insulation, precipitation variation, and a combination of these factors. Temperature affects agriculture through impacts on water availability and plant and livestock health. In terms of economic improvement, the project will improve the food and nutritional security in the country through the Bank's strategies to develop the agricultural sector.

This ESMP has been prepared based on an overall environmental and social assessment, which includes (i) analysis of the general information in the project Zobas and sub-Zobas in Eritrea; (ii) evaluation of potential environmental and social impacts of the project components and sub-components; (iii) assessment of environmental requirements and practices in different ongoing and completed projects; (iv) national requirements by the Government of Eritrea for implementation of similar projects; (v) African Development Bank's Safeguard requirements before implementation of any development project; and, (vi) consideration of several other international and regional regulations for implementation of development projects. The ESMP provides the guidelines for the preparation of all mitigation plans including the Environmental and Social Management requirements, and site specific environmental and social impact assessments that will be prepared to respond to the anticipated project impacts.

1.2. Environmental and Social Management Plan (ESMP) requirements

The ESMP is a required assessment tool that guides the environmental and social implementation of any development project providing procedures for environmental and

social management. This plan will guide the Project Implementation Unit (PIU) in particular and the Ministry of Agriculture at the Headquarters and in the targeted Zobas and sub-Zobas in Eritrea. It will help these entities in determining the appropriate level of environmental and social management required for the project and it also outlines necessary environmental and social mitigation measures for the project and its proposed components during the development and operational phases of the project.

1.3. Purpose of the ESMP and its objectives

This Environmental and Social Management Plan (ESMP) is an implementation guiding tool for the environmental and social impacts management. It will guide the implementation of the proposed Drought Resilience and Sustainable Livelihoods Project phase V in Eritrea to mitigate environmental, social and climate change impacts. The ESMP will support in addressing the environmental, social and climate change challenges of the project whose main objective is to contribute to economic growth as well as food and nutritional security of the country. Specifically, the project aims: (1) to improve crop and livestock production and productivity; (2) to expand opportunities in agriculture and agribusiness to rural Eritrea as a means to advance rural livelihoods and economic development, and (3) to enhance import substitution through improved value additions and processing. The ESMP also fulfils the African Development Bank's environmental and social safeguards policy on borrower requirements to prepare an Environmental and Social Management Plan (ESMP) that establishes the environmental and social impacts of the project's proposed activities. The ESMP sets out, in general, the mitigation and monitoring measures and institutional arrangements to address adverse environmental and social impacts.

The ESMP preparation is a requirement by both the Government of Eritrea and the African Development Bank (AfDB) that environmental and social assessments are carried out at the identification, preparation or appraisal stages of any development project in order to identify the possible impacts of the project and to formulate mitigation measures. The main objective of the ESMP is, therefore, to ensure that the implementation of the DRSL Project is preceded by assessments of its environmental and social impacts and the environmental sustainability of the project are determined early enough. The ESMP provides the project implementers with an environmental and social management plan that enables them to mitigate potential environmental and social impacts, including through the preparation of a site-specific Environmental Impact Assessments (EIA) where applicable. The specific objectives of ESMP are: (i) to establish clear procedures and methodologies for the environmental and social screening, planning, review, approval and implementation of the project's components; (ii) to specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental and social concerns related to the project; (iii) to determine the training, capacity building and technical assistance needed to successfully implement the provisions of the ESMP; (iv) to propose and establish the funding required to implement the ESMP and subsequent environmental and

social assessments, monitoring and management; and, (v) to provide practical information resources for implementing the ESMP.

The Project Implementation Unit at the Ministry of Agriculture in Asmara will work in close collaboration with the technical officers from the Ministry of Land, Water and Environment who are mandated with the management of the environment in Eritrea. From the environmental and social assessments carried out during the preparation mission, the project will have no irreversible negative environmental and social impacts. As such it is a Category 2 Project. However, potential localized adverse environmental and social impacts will require appropriate mitigation and possibly the preparation of comprehensive EIAs that might be at specific sites during implementation. Project will have no Resettlement Action Plan (RAP) since the project will not involve extensive construction works and involuntary relocation of population during the implementation phase.

The ESMP provides a guide to be used within existing Government Policy regulations for environment and social processes and other international legislations by donor organizations. This ESMP will be a living document that will be subject to periodic reviews to address specific concerns raised by stakeholders, and emerging policy requirements.

2. ADMINISTRATION, POLICIES, LEGAL AND REGULATORY FRAMEWORKS

2.1.Introduction

Land use policies in Eritrea have been influenced by Eritrean long history, ranging from pre-colonial, colonial, annexation and eventually independence in 1993. Serious agricultural production seems to have been introduced by the Italian colonial masters between 1891 and 1941. They introduced a lot of changes in land use. Between 1903 and 1926, the Italians introduced a lot land use measures and controlled big chunks of agricultural land. Over the years, livestock was recognised as Eritrea's principal source of natural wealth and as such to control livestock diseases, veterinary institutions were established. A research institute and Africa's first serum laboratory at Villagio were established.

Between 1941 and 1952 Eritrea was under the British rule as a protectorate under which efforts were made to increase the productivity of agriculture through the establishment of demonstration plots and in some areas there was provision of tractors and motor ploughs. Agricultural produce prices were high and many soldiers returning from the 2nd World War settled down to farm. During the federation or annexation period (1952 – 1974), commercial farming flourished and agriculture was supported through research and green-housing which were established in many parts of the country. Between 1974 and 1991, the Derg Period, Eritrea was engaged in the liberation struggle. Armed conflicts affected agriculture. The federal government nationalised some of the big farms and processing plants such as milk production. In 1986, the government reorganised agriculture by establishing the Agricultural Commission which coordinated planning, research, livestock production, reorganisation of land resources and crop production through extension. The Community Integrated Agricultural Development Project was initiated.

During the post liberation period from 1991 the Government of Eritrea has put in efforts to revamp agriculture. Efforts have been geared towards rehabilitation of agricultural lands, provision of farm inputs (including ploughing oxen, farm implements, seeds and other essentials) and enhanced dam construction to alleviate the problem of water shortages. Other efforts include soil and water conservation programmes, sustainable livestock and wildlife management, increased supply of sea foods, and expansion of cash crops for foreign exchange.

However, Eritrea remains a food insecure country and significantly relies on food imports to meet its food needs. This is because of poor farming techniques, limited inputs and limited capacity to support irrigated agriculture. The country also experiences low institutional capacities as well as poor policies, regulations and legal instruments.

In Eritrea, the management and regulation of the environment in the responsibility of the Ministry of Land, Water and Environment. The Directorate of the Environment under the Director General coordinates and supervises environmental issues. The Director of Environmental Management and Regulator oversees day to day management of environmental affairs. The Directorate is responsible for enforcement and compliance with Environmental Assessments. As per the National Environmental Guidelines and Procedures of 1999 and the Environmental Proclamation of 2017, all projects must be implemented after undergoing environmental and social assessments as per the National Environmental Implementation Framework. According to the Eritrean laws, projects are categorised into 3 categories. Category A – those that require full environmental and social impact assessment. The evaluation of such projects can only be done at the ministry headquarters. Category B are those projects whose impacts do not warrant full environmental and social impact assessment. Such projects are evaluated at the regional level (the Zobas). Category C projects are those that have no environmental and social impacts and as such do not require evaluations at all.

This Environmental and Social Management Plan (ESMP) reviewed various legal, policies, and regulations that guide the management of the environment in Eritrea. The key issues in the plan include environmental concerns as raised by various legal instruments. The ESMP has also been prepared in due consideration of the African Development Bank environmental assessment requirements as well as the Eritrean environmental management requirements as outlined in various legal instruments and including considerations for the various international environmental regulations and requirements as well.

2.2. Environmental Governance Structures

The National Environmental Proclamation of 2017 is currently the overall law for the management of the environment in Eritrea. The Act provides for the environmental management structure in the country. It is implemented with reference to the National Environmental Guidelines and Procedures of 1999 and the National Environmental Implementation Framework. The overall mandate to manage environmental activities lies with the Directorate of Environment at the Ministry of Land, Water and Environment. The Act establishes the National Impact Review Committee which reports to the Director General of the Directorate of Environment. The Committee comprises 11 members out of which 9 are Permanent Members and two are appointed from the region (Zoba) where the project is to be implemented. The Directorate of Environment has technical offices at the Zoba and sub-Zoba levels to oversee environmental matters.

The Project Implementing Unit (PIU) at the Ministry of Agriculture will work with the Directorate of Environment to ensure proper environmental management and to address environmental challenges that may arise.

Environmental issues are cross-cutting and as such environmental governance may also be determined by several other sectoral policies and legal requirements of other ministries and institutions which will have direct or indirect links with the proposed development such as those responsible with land, natural resources management, water use, regional/state administration and local government authorities.

2.3. Legal, Policies and Regulatory Frameworks

The key legal frameworks that will govern the environmental and social aspects of the Drought Resilience and Sustainable Livelihoods Project will include: (i) The Constitution of Eritrea, 1997 in which Article 8 spells out the need for all citizens to safeguard sustainable use of the environment and natural resources; (ii) The National Environmental Guidelines and Procedures of 1999; (iii) The Environmental Proclamation of 2017; and, (iv) The National Environmental Implementation Framework. Other legal instruments will be those governing agricultural production, livestock production, local administration, water resources, forestry, land protection and related legal frameworks.

2.4.The African Development Bank (AfDB) Environmental and Social Safeguards

2.4.1. AfDB Operational Safeguards

The 5th phase of the Drought Resilience and Sustainable Livelihoods Project (DRSLP V) will is being developed and intended to be implemented according to the requirements of the African Development Bank Operational Environmental and Social Safeguards. This ESMP has been prepared to forestall environmental and social impacts that will arise during the development and operational implementation of the DRSLP based on Operational Safeguard Policies of the AfDB and all the applicable environmental policies, laws and regulations of the states and national laws of the Government of Eritrea and with due consideration of other international environmental requirements. The AfDB's 5 Operational Safeguard Policies as outlined and summarized in the table below have guided the development of this ESMP and thereafter a determination has been made on the safeguards that will be triggered as a result of: (1) Environmental Assessment (OS1); (2) Involuntary Resettlement including Land Acquisition, Population Displacement and Compensation (OS2)**;** (3) Biodiversity and Ecosystem Services (OS3); (4) Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource efficiency (OS4); and, (5) Labour Conditions, Health and Safety (OS5).

The Drought Resilient and Sustainable Livelihood Project V (DRSLP V) will be implemented in all the six Zobas but targeting 15 sites comprising of Zoba Maekel (4 sites), Zoba Gash Barka (3 sites), Zoba Anseba (2 sites), Zoba Northern Red Sea (2 sites), Zoba Southern Red Sea (1 site) and Zoba Debub (3 sites).

Table 1: Operational Safeguards triggered by the project

OPERATIONAL SAFEGUARDS TRIGGERED BY THE PROJECT(FOR THE MOMENT)	YES	NO
OS1 -Environmental Assessment	x	
OS2 Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation		x
OS3 Biodiversity and Ecosystem Services	x	
OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials	x	
OS 5 Labour Conditions, Health and Safety	x	

The OS1, Environmental Assessment (EA) is triggered because it is a requirement that all projects proposed for Bank financing must undergo environmental and social impacts assessment and must be environmentally sound and sustainable or its adverse impacts are mitigated against. Environmental and social assessments improve decision making. The EA process takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and cultural property) and transboundary and global environmental aspects.

OS2, Involuntary Resettlement will not be triggered because the project will not have any involuntary resettlement programme. OS3, Preservation of Biological Diversity and Conservation of Ecosystems will be triggered hence there will be need to avoid or if not possible, reduce and minimize impacts on the identified biodiversity. The triggering will be caused by excavation during the construction works of the micro-dams and some level of clearing of access roads to the construction sites. OS4, Pollution Prevention and Control, Greenhouse Gases, and Hazardous Materials will be triggered as direct negative impact of the project through increased use agricultural chemicals caused by increased use of farming chemicals including fertilizers, herbicides and pesticides. OS5, Labour Conditions, Health and Safety will be triggered because during both development and implementation phases will involve working environments.

2.5. International Regulations and Conventions

Eritrea has signed and ratified some of the international conventions and Multilateral Environmental Agreements pertinent to environmental and social protection. Some of these conventions that are relevant to the implementation of the proposed project may include: (i) Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention) of 2001; (ii) The International Convention on Biological Diversity (UNCBD) of 1994; (iii) The United Nations Framework Convention on Climate Change (UNFCCC), 1992; (iv) The Montreal Protocol on Substances that Deplete the Ozone Layer; (v) The Vienna Convention for Protection of the Ozone Layer; (vi) The United Nations Convention to Combat Desertification (UNCCD); (vii) Convention Concerning the Protection of the World Cultural and National Heritage (World Heritage Convention), Paris, 1975; (viii) African Convention on Conservation of Nature and Natural Resources, 1968; and, (ix) most recently, the Paris Agreement to reduce GHG emissions.

3. THE DROUGHT RESILIENCE AND SUSTAINABLE LIVELIHOODS PROJECT PHASE V

3.1.Introduction

Drought Resilience and Sustainable Livelihoods Project Phase V is proposed as part of the Drought Resilience and Sustainable Livelihoods Programme for the Greater Horn of Africa. The programme was earmarked to be implemented in the pastoral and agro-pastoral drought-prone and chronically food insecure parts of the western lowlands and eastern escarpment of Eritrea. The expected impacts and out-puts of the programme were: (1) improved availability and access to water for human, crop production and livestock and improved forage for livestock production; (2) developed and improved infrastructure for agriculture and livestock management and market access; (3) a sustained and well-developed livelihoods systems; and, (4) human and institutional capacity development for pastoral and agro-pastoral production systems in Eritrea.

3.2. Background

Eritrea is a drought prone country. Rainfall in Eritrea is erratic and poorly distributed, both temporally and spatially. The annual precipitation on the average is 500 mm. As a result agriculture is characterized by very low productivity, producing below subsistence level. In addition, the agricultural sector is affected by lack of improved agricultural inputs and shortage of appropriate modern farming techniques and technology hence food and nutrition insecurity. High unemployment, poverty and environmental challenges are among the main bottlenecks for inclusive growth in Eritrea. Despite the numerous challenges, about 80% of the Eritreans derive their livelihoods from agriculture which is dependent on rain-fed and underground water. Consequently, a large proportion of the population is vulnerable and food insecure with an estimated 50% of the children suffering from under-nourishment. To address the challenges of the recurrent severe water shortages, frequent droughts and food crises in Eritrea, there is an urgent need to scale up the interventions so far initiated such as the African Development Bank's Drought Resilience and Sustainable Livelihoods Programme and consolidate the gains of DRSLP II & IV. The currently proposed intervention will support agro-processing and value addition with objectives of promoting the local entrepreneurship in agribusiness to ensure higher productivity and returns for local farmers through development of local off-takers who will be able to support and provide readymade markets for the rural farmers.

Despite uncertainties in climate variability, the IPCC Fifth Assessment Report identified the "likely range" of increase in global average surface temperature by 2100, which is between 0.3° C and 4.8° C (IPCC, 2013). The potential impacts on livestock include changes in production and quality of feed crop and forage, water availability, animal growth and milk production, diseases, reproduction and biodiversity. These impacts are primarily due to an increase in temperature and atmospheric carbon dioxide (CO_2)

concentration, precipitation variation, and a combination of these factors. Temperature affects most of the critical factors for livestock production, such as water availability, animal production, reproduction and health. Forage quantity and quality are affected by a combination of increases in temperature, CO_2 and precipitation variation. Livestock diseases are mainly affected by an increase in temperature and precipitation variation. In terms of economic improvement, the project will reinforce the food security in the country through the Bank's strategies to develop the agricultural sector. Thus, the project will contribute to the achievement of certain activities retained by the United Nation's system. As far as environmental aspect, the project objectives will be in line with the government adaptation strategy to the climate change (CC). For better adaptation, the project proposed activities have to be integrated into livestock management system applied in Eritrea.

However, reliable statistics are lacking on current livestock populations as demonstrated by cattle vaccination figures, which are often more than double registered population. No livestock census has been carried out since 1978, and the current livestock figures are based on estimates. At present there are 1.9 million cattle, 2.1 million sheep, 4.7 million goats, 318,914 camels, 518,459 equine and 1.1 million poultry. The majority of the smallholder farmers keep livestock in the backyard as a source of food (eggs, meat, milk and honey), as draught animals (ploughing), and as a form of savings and cash to buy food and basic consumables in times of need. Agriculture employed nearly 80 percent of the population but accounted for only 12.4 percent of gross domestic product (GDP) in Eritrea. The agricultural sector has improved with the use of modern farming equipment and techniques, and construction of dams to supply water for irrigation. Nevertheless, it is compromised by a lack of financial services and investment. Major agricultural products are barley, beans, dairy products, lentils, meat, millet, leather, sorghum, teff, and wheat.

3.3. Project location

The Drought Resilient and Sustainable Livelihood Project V (DRSLP V) will be implemented in all the six Zobas but targeting 15 sites comprising of Zoba Maekel (4 sites), Zoba Gash Barka (3 sites), Zoba Anseba (2 sites), Zoba Northern Red Sea (2 sites), Zoba Southern Red Sea (1 site) and Zoba Debub (3 sites). The selection of sites was made in consideration of the priorities set by the Government based on equitable distribution of development efforts and scaling of activities in the DRSLP II & IV. The villages surrounding the project sites will be the direct beneficiaries of all the activities which include household and livestock water supply, irrigation, catchment management of affected sites and provision of facilities such as slaughter houses, milk collection and processing facilities, marketing and agricultural inputs targeting a total of 2000 household farmers. The project comprises of the following components

Figure 1: Map of Eritrea showing different Zobas

3.4. Project objectives

The main objective of the project is to contribute to economic growth and food security. The specific project objectives are; (1) to improve crop and livestock production and productivity for improved net farm incomes of the project beneficiaries, (2) to expand opportunities in agriculture and agribusiness to rural Eritrea to advance rural livelihoods and economic development, and (3) to enhance import substitution through improved value additions and processing.

3.5. Project components and their anticipated activities

Component 1: Infrastructure Development & Natural Resources Management

Subcomponent 1: Infrastructure Development: The project will develop and enhance water-harvesting capacity through construction of micro-dams to increase agricultural lands through supplementary irrigation in the dry seasons in six Zobas of the country. It is

envisaged to improve the irrigation for approximately 10 hectares of lands for each dam. The project will open up directly 150 hectares from supplementary irrigation and 350 hectares will indirectly be developed. Thus the proposed project impact will contribute to improving the national goal of food and nutrition security, increment of employment rate and poverty eradication. This subcomponent will cover, (1) Rehabilitation and management of catchment areas, (2) Conduct surveys, studies & designs, (3) Construction of 15 masonry dams, and (4) Construction of irrigation systems to cover a minimum of 150 hectares. With the development of the proposed schemes smallholder farmers in the affected sites will transform from climate dependent rain-fed farming to a more sustainable commercial oriented agriculture.

Subcomponent 2: Watershed management, agroforestry, soil and water conservation: In order for the watersheds not to degrade further and for the project to result into improved environmental conditions, the project will complement the ongoing government/development partners supported conservation programmes in the project area implemented by Zobas.

Subcomponent 3: On-farm management & Irrigation Improvement: This subcomponent will focus on land reclamation and design of appropriate modern irrigation systems and formation of Water Users Association

Component 2: Livelihood Diversification, Market Linkages, Agro Processing and Value Addition

Subcomponent 1: Minimum Integrated Agriculture Household Package: This subcomponent comprises of provision of dairy cows, poultry and beehives with accessories as well as seedlings for fruit, browse, fuel wood trees, cereals and horticultural and forage crops to the beneficiaries in the project areas.

Subcomponent 2: Establishment of pilot date palm production models through provision of varieties of seedlings to small holder and semi commercial farmers.

Subcomponent 3: Agro Processing and Value Additions: The component will provide infrastructure for value addition to enhance product competitiveness and would consist of;(1) Establishment of three complete sets of mini milk processing units (comprising of main processing center, collecting centers, and storage facilities), (2) Establishment honeybee products and by-products processing units (comprising of main processing center, collecting centers, and storage facilities), (3) Establishment of slaughterhouses for local consumption (basic facilities).

Subcomponent 4: Support to Market Linkages: Different approaches will be used to link farmers and agri-business to markets which will include linkages with the following; (1) leading farmers or entrepreneurs, (2) commodity association, (3) marketing cooperatives,

(4) contract farming and outsourcing production and service provision, (5) institutional buying and business to business buying, (6) domestic traders and exporters, (7) retailers, (8) agro-processors, (9) input suppliers and raw material suppliers, and (10) Developing a robust market information systems to inform vendors and farmers on commodity prices.

Component 3: Livestock, Plant Production & Health

Subcomponent 1: Improvement of Livestock and plant production: This subcomponent will support genetic improvement in dairy cows using Artificial Insemination including scientific recording of production aiming at selection of best performing breeds of animals through scientific isolation of generation of animals.

Subcomponent 2: Livestock and Plant Health: The activities of this subcomponent will cover, (1) Implement a surveillance and sanitary program to prevent eventual animal and plant diseases, (2) Provision of veterinary inputs including various items of drugs & vaccines (antihelmintics in tablet and solution forms, reagents for investigation of Tuberculosis) and (3) Provision of pesticides and sprayers.

Subcomponent 3: Institutional Capacity Building (MoA, Zobas, Sub-zobas): This subcomponent will be dedicated to the following activities aimed at strengthening the capacity of various experts of the staff of Ministry of Agriculture.

Subcomponent 4: Farmers Training: This subcomponent will focus on farmers training for higher productivity and prevention of the rapid siltation of the proposed dam.

Component 4: Project Management:

The project will also provide resources to support the Project Implementation Unit to provide the day to day management services to the project and counterpart government staff will be identified to work with the project team. Support will also be provided to the departments of land resources and environmental office to monitor the social and environmental impacts of the project. Project effect and impacts on the target groups will be monitored by constituting cross-section samples of beneficiaries.

3.6. Implementation Arrangement: The project implementation will be executed by the Project Management Unit currently in the Ministry of Agriculture. The established PIU is currently implementing the Drought Resilience and Sustainable Livelihood Program II and IV. In this context, the current PIU will continue to coordinate the DRSLP V and this will provide the Government the opportunities to continuously building the capacities in the sector. However, it may be necessary to increase the number of staff of the PIU to cope with the envisaged additional workload of DRSLP V, which will be determined during the Project Appraisal. The team will ensure that project resources are properly accounted for and that all project targets are timely delivered.

4. PROJECT ALTERNATIVES

This ESMP study sought to consider possible alternatives to the proposed project. These alternatives included among other considerations the "No Project Alternative", the Alternative Locations and the Alternative Designs. This study has therefore sought to identify and assess alternatives to the proposed developments so as to have the best working models that may have none or those that have the least minimal effects.

4.1.The "No Project" Alternative

This "No Project" alternative implies the project does not proceed thereby maintaining the status quo. The status of the environmental resources neither improves nor worsens since the state of the resources is not interfered with. However, the "No Project Alternative" means foregoing all the environmental, social and economic benefits that are anticipated from the implementation of the project. The DRSLP 5 being developed has been identified to have great social and economic benefits in the identified project Zobas and Sub-Zobas as well as the so called Administrative areas. The targeted beneficiaries do acknowledge that the project will help improve water supply for domestic, agricultural production through irrigation and for their livestock. The provision of water will address many challenges in the areas identified. Currently water sources are far, some as far as 6 – 10 km distance which affects water supply for domestic use including bathing and household hygiene. By increasing water availability, the hygiene conditions in the households will improve hence improving the health conditions within the households. Improved hygiene will have many benefits such as reduced health budgets besides socially improving the beneficiaries' self-esteem and self-image. Improved water supplies will also improve agricultural production for both main crops and small scale domestic kitchen gardening. Improved agricultural production has several benefits among them food and nutritional security, improved incomes from the sale of excess produce beyond what is required at the household level. To quote the women at Dersene Village in in Sub-Zoba Logo Anseba in Zoba Gash Barka: ***"We have suffered so much due to lack of water, if the water is provided, we will use it to do a lot of agricultural activities which will improve our household incomes and will enable us to have enough food for our families and additional resources to send our children to school"***. Statements like these help show the importance of this project to the local communities.

By improving agricultural production, the project is seen as a precursor to poverty reduction and several accompanying social and economic benefits among them alternative livelihood activities and alternative income generating activities. Besides the local communities benefiting from this project through the provision of water and more land being opened up for agricultural production, the locals in the Dersene village believe that the provision of water in the area will also benefit wildlife especially wild animals found in the area such as the wild dogs, monkeys, baboons, hyenas and rabbits.

4.2. Alternative Locations

The selected sites are suitable for the project because they are principal production locations identified during the feasibility studies carried in 2010. The targeted sites in the Zobas and Sub-Zobas experience many environmental and non-environmental challenges such as limited rainfall that affects agricultural production, poor infrastructure, lack of markets and market infrastructure to support agricultural production, poor communication, and climate change. As such they will benefit greatly from this project hence changing the project locations was not considered a better option either.

4.3.Alternative Design of the project

This was not seen as feasible in the current project

5. POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECT

5.1. Environmental, social and climate change challenges:

Eritrea faces several challenges as regards the management and economic production in agriculture and livestock. Some of the challenges include low rainfall amounts while the rainfall is erratic and poorly distributed both temporally and spatially. More than 60% of the country can be classified as semi-arid and arid with low biological production potential. Water for domestic use and livestock is highly limited. Land degradation is a major challenge with extensive vegetation degradation through tree cutting and poor land use and land management systems. Due to the topography and terrain of the country, many parts of Eritrea experience massive erosion problems further degrading the production potential of land in Eritrea. The country also suffers from frequent episodes of drought which, like in most countries of the Horn of Africa, have increased in frequency and intensity. These droughts are often followed by intermittent floods that further compound agricultural production challenges

5.2. Positive environmental, social and economic impacts

The proposed project, which is a subsequent phase of the Drought Resilience and Sustainable Livelihoods Programme Phase 2 and Phase 4 that started their operations in the country in 2014 and 2016, respectively, is focused on addressing the challenges enumerated above to build the resilience of the people of Eritrea and help improve their livelihoods. This project will, overall, result in accrued environmental benefits among them improved land and water management which will increase water availability, control run-off and erosion, improve land management and agricultural production systems, and consequently, improve agricultural production, enhance incomes at household levels, and significantly reduce poverty, particularly in different Zobas and Sub-Zobas in the country. Among the detailed benefits are: (i) improved water supply for domestic, agricultural production through irrigation and for their livestock use; (ii) reduced distance the sources of water from the currently water sources located some 6 – 10 km distance which affects water supply for domestic use including bathing and household hygiene; (iii) improved hygiene and health conditions (iv) reduced health bills and budgets besides socially improving the beneficiaries' self-esteem and self-image; (v) improved agricultural production for both main crops and small scale domestic kitchen gardening hence improved food and nutritional security; (vi) besides food and nutritional security, increased agricultural production will result in improved incomes; the project will be a precursor to poverty reduction; (vii) employment opportunities; (viii) general improvement in social and economic well-being; (ix) improved water supply will also benefit wildlife especially wild dogs and birds; (x) improved environmental conditions through improved catchment management; (xi) improved infrastructure for communication and trade.

Instead, the project is expected to have positive impact through water harvesting and storage through construction of micro-dams and check dams that will reduce run-offs, enhance ground water recharge hence improving water availability in the country. More land will be brought into production under irrigated agriculture resulting in improved agricultural production. The project will also support other land and water conservation activities such as terracing, agro-forestry programmes, livestock production programmes, tree planting, especially fruit trees which will have positive impacts include diversification of livelihoods, improved soil fertility and increased water availability through enhanced percolation and improved water quality hence improving land potential for agricultural production, including rain-fed agriculture.

5.3. Project beneficiaries

The selection of sites was made in consideration of the priorities up set by the Government based on equitable distribution of development efforts and scaling up of activities in the DRSLP II & IV. The villages surrounding the project sites will be the direct beneficiaries of all the activities which include household and livestock water supply, irrigation, catchment management of affected sites and provision of facilities such as slaughter houses, milk collection and processing facilities, marketing and agricultural inputs targeting a total of 2000 household farmers. The project comprises of the following components.

5.4.Socio-Economic Aspects of the project

The DRSLP 5 being developed has been identified to have great social and economic benefits in the identified project Zobas and Sub-Zobas as well as the so called Administrative areas. The targeted beneficiaries do acknowledge that the project will help improve water supply for domestic, agricultural production through irrigation and for their livestock. The provision of water will address many challenges in the areas identified. Currently water sources are far, some as far as 6 – 10 km distance which affects water supply for domestic use including bathing and household hygiene. By increasing water availability, the hygiene conditions in the households will improve hence improving the health conditions within the households. Improved hygiene will have many benefits such as reduced health budgets besides socially improving the beneficiaries' self-esteem and self-image. Improved water supplies will also improve agricultural production for both main crops and small scale domestic kitchen gardening. Improved agricultural production has several benefits among them food and nutritional security, improved incomes from the sale of excess produce beyond what is required at the household level. To quote the women at Dersene Village in in Sub-Zoba Logo Anseba in Zoba Gash Barka: **"***We have suffered so much due to lack of water, if the water is provided, we will use it to do a lot of agricultural activities which will improve our household incomes and will enable us to have enough food for our families and additional resources to send our children to school"*. Statements like these help show the importance of this project to the local communities.

By improving agricultural production, the project is seen as a precursor to poverty reduction and several accompanying social and economic benefits among them alternative livelihood activities and alternative income generating activities. Besides the local communities benefiting from this project through the provision of water and more land being opened up for agricultural production, the locals in the Dersene village believe that the provision of water in the area will also benefit wildlife especially wild animals found in the area such as the wild dogs, monkeys, baboons, hyenas and rabbits.

5.5. Gender and youth Aspects

The Design of the Project will systematically ensure that the project contributes to active gender equality and will not lead to unintended negative gender impacts, such as exclusion. Gender perspectives have been integrated into project formulation in line with the National Gender Strategy and policies while taking due cognizance of the Bank's Gender Policy. The PIU will also ensure development of a Gender Action Plan (GAP) that will drive the real engagement of either of the gender and also the youth to fully engage during the implementation of the project. In terms of project implementation, Component 1, 2 and 3 will aim to ensure that at least 35% of all beneficiaries are female, and/or female headed households to ensure the project addresses the challenges of the most vulnerable households. In terms of Component 4, which focuses on training, a target of 50% has been set to ensure balance in the institutional capacity building efforts. The Ministry of Agriculture has one of the highest number of female staff within government, and these gains should be consolidated. The GAP will outline how to ensure the project reaches these targets in a relevant and contextual approach.

5.6. Involuntary resettlement

The Project does not anticipate any involuntary resettlement. All the dam sites are some kilometres from the settlements while farm-lands are out of the settlement areas. The project will not affect any areas protected by the laws of Eritrea nor will it affect areas of cultural significance and is not anticipated to create any major changes in land use because the project sites are established agricultural areas and are not settled. No major deforestation or extensive construction works are anticipated other than the development of the micro-dams.

5.7. Land Tenure and Access to Land

It was noted that Eritrea has a rotational land ownership system. In this case all the land is owned by the GoSE and is given out to farmers on a rotational basis where land is allocated to individuals for a period of 7 years when re-allocation is done again. This system of land ownership limits individuals to implement permanent development on the land there are allocated.

5.8. Climate Change and Green Growth

This project was screened using the Climate Safeguards System (CSS) of the African Development Bank and found to be a **Category 2 Project**. In terms of climate change and green growth, the project will contribute to climate change resilience through improved agricultural production, better land use programme and good water and land management practices through catchment management. The project will also enhance climate change resilience through improved storage and warehousing facilities and improved marketing systems. However, efforts should and will be made to seek additional resources that may be used to enhance the effectiveness of this project by implementing climate change adaptation measures such as catchment management programmes and rainwater harvesting initiatives. Such activities will include: (i) sustainable land use practices; (ii) terracing to minimise topsoil losses through erosion; (iii) agroforestry initiatives that will improve soil fertility while providing animal feeds; (iv) development of water harvesting micro-dams; (v) provision of drought tolerant crop seeds; and, (vi) capacity building.

5.8.1.Climate mitigation and adaptation

The project is unlikely to directly cause material greenhouse gas (GHG) emissions. Emissions will arise from transport and construction of infrastructure and facilities such as micro-dams, irrigation systems, agro-processing facilities, dam access roads, agricultural produce storage facilities, or similar activities. In such regard, there will be limited scope for project-based mitigation. However, by improving land, water management and agricultural production systems, the project will directly increase the overall GHG emission efficiency of the agricultural sector in the target Zobas and hence reduce the net GHG emission intensity of food production in the country. The project will, therefore, directly assist Eritrea to adapt to changing climates by improving the efficiency agricultural production while minimizing wastages through improved storage and marketing systems and market facilitation.

5.8.2. Climate Finance

This project is analysed and considered to be contributing significantly to climate change adaptation and will contribute to the Bank's climate adaptation finance target. The project will contribute as much as 100% climate financing from its financing or more. It was noted, however, that the project, as currently proposed, does not have adequate resources to address environmental and climate change challenges such as through soil and water conservation measures (including terracing, agro-forestry activities, water harvesting and storage). As such it is important that more efforts be put in to get additional resources either as co-financing to the project or just as independent project activities within the target states to address the challenges.

5.9. Negative impacts

From the expert assessment, the project classified as Category B meaning that the negative impacts are localized and reversible. This is the equivalent of Category 2 in the Bank's Integrated Safeguard System (ISS).

i. **Loss of biodiversity/vegetation removal**: There is anticipated increase in clearing of vegetation when constructing the water dams, dam access roads and establishment of irrigation systems, construction of market infrastructure, livestock infrastructure, etc. The project areas are mostly characterized by natural wooded grassland vegetation and the canals are to be established in areas where there is prevalent vegetation. These infrastructural developments may thereby lead to de-vegetation. The cutting of indigenous trees may interfere with some cultural values of the local communities as some trees have medicinal value and have been used for treatment purposes. The clearing of vegetation and the subsequent changes may result loss of biodiversity and habitats especially of organisms. Besides loss of vegetation, the project also plans to introduce new crops such as dates

ii. **Soil Compaction and destabilisation of the geological balance:** The use of heavy machineries and increased traffic during the construction work within the project area is likely to lead to compaction of the soil structure which may leading to reduced soil infiltration capacities and subsequently resulting in increased run-off. The increased run-off may lead to soil erosion. It may also affect soil-water balance and the general hydrological cycle.

iii. Pollution due to increased use of chemicals (agro-chemicals): The construction of the intake canals and water conveyance systems as well as infrastructure development, if not well controlled and managed could deposit resultant construction wastes such as sediments from the earthworks and oils and fuels from machinery into the rivers and also through surface run offs. This may ultimately lead to potential degradation of the water quality especially for downstream users and adversely affect the aquatic life. Pollution could also come from heavy use of agricultural chemicals during the implementation of the project. There will be need to have these well addressed during the project implementation.

iv. **Increased incidences of water-borne diseases:** Such structures are likely to result in increased accumulation of water which may have several negative impacts such as water-borne diseases (malaria, bilhazia, typhoid, etc.) and also result in accidental deaths through drowning of people and livestock.

v. **Accidental deaths from the construction of water harvesting structures**, **micro-dams:** The dams if not protected could be death traps for humans, livestock and other wildlife.

vi. **Water and Air Quality Concerns due to dust pollution:** The construction activities mostly the excavation of the construction materials are likely to generate a significant amount of dust which may be blown by the wind and construction vehicles. Construction vehicles and other machinery could emit smoke and fumes engines leading to air pollution. The dust and the fumes when inhaled could lead to adverse effects to residents, especially to young children. Oils spills and grease from the construction vehicles and machinery have the potential to pollute soil and other water sources and the vegetation. Noise pollution emanating from construction vehicles, other machinery and workers will have a great significant negative impact to livestock, and wild animals.

vii. **Transmission of HIV/AIDs and other diseases:** The prevalence of HIV/AIDS in the area could increase due to free-flow and high influx of people particularly during the construction phase of the project. The influx of people into the project areas may result in increased infections of diseases, particularly HIV/AIDS. During project implementation activities such trade and employment are also likely to increase hence increased interactions consequently leading to increased infections.

viii. **Increased generation of wastes**: Resulting from construction works will be increased generation of solid waste materials. Other wastes will be generated from agro-processing works.

ix. **Occupational Health Hazards**: Project will involve long term working environments. As occupational health hazards must be put under consideration and check.

6. MITIGATION/ENHANCEMENT MEASURES

The negative impacts of the project as outlined in chapter 5 above will have to be addressed. Mitigation measures and enhancement mechanisms are presented in this Environmental and Social Management Plan (ESMP) while further details of the impacts will be contained in the site specific environmental impact assessment reports. The overall goal is to ensure adherence to laws and regulations governing environmental management in Eritrea to ensure sustainability. Public education and awareness as well as sensitization to enhance long term sustainability of environmental conditions as well as environmental goods and services will be important aspects of the mitigation plans. The overall objective of environmental and social monitoring will be to ensure that mitigation measures are implemented and are effective. Environmental and social monitoring will also enable response to new and developing issues of concern during the project implementation to ensure that project activities comply with and adhere to environmental provisions and standard specifications of the Bank and those of the Government of State of Eritrea. The overall responsibility of the environmental and social monitoring will lie with the Project Implementation Unit that will be based at the Ministry of Agriculture in Asmara.

Listed here below are some of the possible negative impacts as a result of the development and implementation the proposed project.

(i) Loss of vegetation and destruction of habitats and biodiversity: There is anticipated increase in clearing of vegetation, destruction of natural habitats and loss of biodiversity during the development phase of the project for construction works

Mitigation: To mitigate against these: (i) where possible, the clearing of vegetation, particularly of indigenous trees needs to be avoided as much as possible during construction, and the clearing needs to be carried out only where necessary; (ii) where clearing is done, land should be landscaped and reclaimed by planting more trees and other forms of vegetation; (iii) avoid clearing and construction within key sensitive habitats such as wetlands, culturally protected areas, unique and special habitats; and (iv) where possible, buffer the special, sensitive and ecologically important habitats, particularly during the infrastructure designing.

(ii) Soil Compaction and destabilisation of the geological balance: The use of heavy machineries and increased traffic during the construction work within the project area is likely to lead to compaction of the soil structure which may leading to reduced soil infiltration capacities and subsequently resulting in increased run-off. The increased run-off may lead to soil erosion. It may also affect soil-water balance and the general hydrological cycle.

Mitigation Measures: To mitigate against the compaction: (i) avoid moving machineries and other equipment anyhow and away from from designated transport routes; (ii)

unnecessary vehicular and machinery movements should be avoided as much as possible; (iii) reclaim and re-vegetate once work is completed to reduce run off.

(iii) Pollution due to increased use of chemicals (agro-chemicals): The construction of the intake canals and water conveyance systems as well as infrastructure development, if not well controlled and managed could deposit resultant construction wastes such as sediments from the earthworks and oils and fuels from machinery into the rivers and also through surface run offs. This may ultimately lead to potential degradation of the water quality especially for downstream users and adversely affect the aquatic life. Pollution could also come from heavy use of agricultural chemicals during the implementation of the project. There will be need to have these well addressed during the project implementation.

Mitigation Measures: Minimize excessive use of agro-chemicals

(iv) Increased incidences of water-borne diseases: Such structures are likely to result in increased accumulation of water which may have several negative impacts such as water-borne diseases (malaria, bilhazia, typhoid, etc.) and also result in accidental deaths through drowning of people and livestock.

Mitigation: To mitigate against these impacts: (i) ensure that such structures are not constructed near homesteads; (ii) the communities should be educated and made aware of such dangers, particularly of water-borne diseases to ensure they take preventive measures such as boiling drinking water or chemically treating the water; (iii) community members should also be encouraged to use preventive measures such as sleeping under mosquito nets; (iv) such waterbodies should be protected against direct access by fensing or planting trees around them which will help in avoiding contamination while at the same time minimise likely accidents; (v) construction could be done in such a way that water can be allowed to flow by gravity to minimise pumping which helps in avoiding the use of petroleum products.

(v) Generation of wastes due to processing: Value addition and sorting of agricultural produce will result in generation of solid wastes which may have negative impacts unless properly managed.

Mitigation: (i) put in place appropriate waste management mechanisms to manage the wastes generated; (ii) educate and sensitize the workers and the general population to be mindful of and responsible for their own environments.

(vi) Noise, Dust and Air Quality Pollution Concerns: The construction activities mostly the excavation and transportation of construction materials are likely to generate a significant amount of dust as well as emitting smoke and fumes from engines and oil spills that will lead to pollution of air, water and other environmental resources. Other pollution agents are likely to be chemicals and chemical fumes.

Mitigation: This could be mitigated against by: (i) ensuring that all vehicles transporting raw materials especially soil should be covered or avoid overloading to reduce dust emissions; (ii) the workers in dusty areas should be provided with requisite protective equipment such as dust masks and dust coats for preventive and protection purposes; (iii) the movement and speed of the construction machineries and vehicles should be controlled and properly managed; (iv) the removal of vegetation should be avoided and denuded surfaces should be adequately re-vegetated; (v) most noisy machinery should be fitted with proper silencers to minimise noise emissions; (vi) where necessary, ensure good and appropriate selection of construction machinery and equipment; (vii) the amount of blasting in the quaries should be controlled where necessary; (viii) sprinkle water in construction yards, on dusty roads and soil heaps to keep down the dust produced; (ix) ensure the construction work takes the shortest time possible, in addition, the activities generating dust should be carried out in calm weather; (x) ensure the noise levels are kept at the minimum acceptable levels and the construction activities are confined to the working time limits; (xi) ensure chemicals are well handled and properly stored while disposals should be in accordance with prescribed procedures.

(vii) Transmission of HIV/AIDs and other communicable diseases: Because of strict controls due Islamic Laws, free interactions between males and females are highly controlled. However, with increased activities and also improved incomes, human interactions may increase. This could lead to infections such as Human Immuno-deficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) and other infections. As such there might be need to put in place control and prevention measures.

Mitigation: Challenges due to infections could be addressed through: (i) enhancing education and sensitization of workers and the local communities on the dangers and prevalence of disease; (ii) regular sensitization campaigns and monitoring of the spread diseases; (iii) development of brochures and other materials that will convey information about diseases and infections; (iv) regular provision of adequate prevention measures such as condoms; (v) provision of drugs such as anti-retriviral drugs (ARVs).

(viii) Occupational Health Hazards: Project will involve long term working environments. As occupational health hazards must be put under consideration and check.

Mitigation: The mitigation measures will include: (i) the use of proper personal protective gears; (ii) public education and sensitization; (iii) well labelled and conspicuously placed warnings; and, (iv) provision of First Aid Kits that will be conspicuously located and well labelled.

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN AND MONITORING

7.1. Environmental and Social Management Plan (ESMP).

Table 3: The table below provides the summary of the project impacts and the intended mitigation measures

Activities forming sources of impacts	Impacts identified	Nature of impact (negative/positive)	Duration of impact	Scope of impact (local, regional or global)	Level of risks associated with the impacts	Proposed mitigation measures	Capacity building required	Reporting frequency	Responsibility
Development of infrastructure phase	Vegetation and Biodiversity losses	-	One-Two years	Local	Moderate	• Minimise vegetation clearing • Landscape and reclaim • Control soil erosion	Sensitisation and Public awareness campaigns	Monthly during construction period	Supervising Engineer/PIU/ MoA
	Destruction of habitats	-	12 – 24 months	Local	Moderate	• Avoid sensitive ecological areas • Buffer areas of special ecological importance	Sensitisation and Public awareness campaigns	Monthly during construction period	Supervising Engineer/PIU/ MoA
	Soil compaction	-	12 – 24 months	Local	Moderate	• Avoid unnecessary movement of vehicles and machinery • Reclaim and re-vegetate	Sensitisation and Public awareness campaigns	Monthly during construction period	Supervising Engineer/PIU/ MoA
	Dust, air quality and noise pollution	-	12 – 24 months	Local	Significant	• Sprinkle water • Use protective gears	Public education and control through enforcement	Bi-weekly or Monthly	PIU, Ministry responsible for Labour and Human Development
	Agro-chemical pollution	-	Prolonged time	Both local and regional	Could be significant	Control and minimize chemical use	Public education	Quarterly	PIU/MoA

Activities forming sources of impacts	Impacts identified	Nature of impact (negative/positive)	Duration of impact	Scope of impact (local, regional or global)	Level of risks associated with the impacts	Proposed mitigation measures	Capacity building required	Reporting frequency	Responsibility
Development of infrastructure	Occupational health and safety risks	-	48 months	Local	Generally moderate	• The use of proper personal protective gears • Public education and sensitization • Well labelled and conspicuously placed warnings • provision of First Aid Kits	• Public awareness and education • First Aid management	Monthly	PIU/MoA Supervising engineers
	HIV/AIDS infections	–	The entire lifespan of the project	Local, regional and national	Moderate	• Enhancing education and sensitization • Regular sensitization campaigns • development of education materials • Provision of condoms • Provision of anti-retrivival drugs (ARVs).	Public education and awareness	Quarterly	MoA/Ministry of Health/ Ministry responsible for public health
	Employment opportunities	+	30 months	Local, regional and national	None	No mitigation measures required	Hire of skilled people	Quarterly reports	PIU, Ministry responsible for Labour and Human Development
	Increased public knowledge and awareness	+	During the project period and long after	Local, regional and national	None	No mitigation measures required		Annual reports	National Bureau of Statistics
	Enhanced environmental management skills	+	During the project period and long after	Local, regional and national	None	No mitigation measures required	Public awareness and education Advances academic training	Quarterly/annual reports	PIU/MoA/MoLW&E

Activities forming sources of impacts	Impacts identified	Nature of impact (negative/positive)	Duration of impact	Scope of impact (local, regional or global)	Level of risks associated with the impacts	Proposed mitigation measures	Capacity building required	Reporting frequency	Responsibility
Operational phase	Occupational health and safety risks	-	During the duration of the project and long after the lifespan of the project	Local	Generally moderate	• The use of proper personal protective gears • Public education and sensitization • Well labelled and conspicuously placed warnings • provision of First Aid Kits	• Public awareness and education • First Aid management	Monthly	PIU/MoA Supervising engineers/ Responsible institutions
	HIV/AIDS infections	–	The entire lifespan of the project and after the project	Local, regional and national	Moderate	• Enhancing education and sensitization • Regular sensitization campaigns • development of education materials • Provision of condoms • Provision of anti-retrivival drugs (ARVs).	Public education and awareness	Quarterly	MoA/Ministry of Health/ Ministry responsible for public health
	Employment opportunities	+	48 months	Local, regional and national	None	No mitigation measures required	Hire of skilled people	Quarterly reports	PIU, Ministry responsible for Labour and Human Development
	Increased public knowledge and awareness	+	During the project period and long after	Local, regional and national	None	No mitigation measures required		Annual reports	National Bureau of Statistics
	Enhanced environmental management skills	+	During the project period and long after	Local, regional and national	None	No mitigation measures required	Public awareness and education Advances academic training	Quarterly/annual reports	PIU/MoA/ MoLW&E

Activities forming sources of impacts	Impacts identified	Nature of impact (negative/positive)	Duration of impact	Scope of impact (local, regional or global)	Level of risks associated with the impacts	Proposed mitigation measures	Capacity building required	Reporting frequency	Responsibility
Operational phase of project	Improved pre- and post-harvest and management practice	+	During the duration of the project and long after the lifespan of the project	Local, regional and national	None	• None	• Public awareness and education	Monthly	PIU/MoA
	HIV/AIDS infections	–	The entire lifespan of the project and after the project	Local, regional and national	Moderate	• Enhancing education and sensitization • Regular sensitization campaigns • development of education materials • Provision of condoms • Provision of anti-retrivival drugs (ARVs).	Public education and awareness	Quarterly	MoA/Ministry of Health/ Ministry responsible for public health
	Employment opportunities	+	Lifespan of the project and thereafter	Local, regional and national	None	No mitigation measures required	Hire of skilled and unskilled labour	Quarterly reports	PIU, Ministry responsible for Labour and Human Development
	Increased public knowledge and awareness	+	During the project period and long after	Local, regional and national	None	No mitigation measures required	Public awareness and education	Annual reports	National Office responsible for Statistics
	Enhanced environmental management skills	+	During the project period and long after	Local, regional and national	None	No mitigation measures required	Public awareness and education Advances academic training	Quarterly/annual reports	PIU/MoA/ Directorate of Environment

Activities forming sources of impacts	Impacts identified	Nature of impact (negative/positive)	Duration of impact	Scope of impact (local, National	Level of risks associated with the impacts	Proposed mitigation measures	Capacity building required	Reporting frequency	Responsibility
Capacity building initiatives	Improved knowledge base of the communities	+	Long term positive impacts	Local/National	None	None	Education and awareness	Training Reports	MoA
	Enhanced agricultural productivity	+	Long term positive impacts	Local/National	None	None	Education and awareness – extension work	Annual Reports	MoA
	Improved value chain addition capacities	+	Depends on management	Local/National	None	None	Education and awareness, technical skills	Annual Reports	MoA/ Ministry of Trade and Industry
	Improved entrepreneurial skills	+	Long term	Local	None	None	Education and technical skills	Training Reports	MoA/ Vocational Training Institutions
Institutional strengthening and capacity building	Enhanced institutional management capacities	+	Long term	Local/National	None	None	Technical skills	Annual	MoA
	Developed entrepreneurial skills	+	Long term	Local	None	None	Education and awareness	As and when needed	MoA/ Vocational Training Institutions
	Promoted nutritional knowledge and capacities	+	Long term	Local/National	None	None	Education and awareness	As and when needed	MoA/ Ministry of Health/ Ministry of Public Health
	Improved environmental conservation and management skills	+	Long term	Local/National	None	None	Technical skills, education and awareness	Annual/As and when needed	PIU/MoA/ Ministry responsible for environmental management

7.2.Environmental and Social Management Plan Monitoring

The overall objective of environmental and social monitoring is to ensure that mitigation measures are implemented and are effective. Environmental and social monitoring will also enable response to new and developing issues of concern during the project implementation hence ensuring that project activities comply with and adhere to environmental provisions and standard specifications of the Bank and those of the Government of Eritrea.

The overall responsibility of the environmental and social monitoring will lie with the Project Implementation Unit at the Ministry of Agricultures (PIU/MoA) in conjunction with the Zoba and Sub-Zoba environmental management units and working in close collaboration with the Directorate of Environment at the Ministry of Water, Land and Environment. Many senior staff at the Directorate of Environment are highly trained in environmental issues and natural resources management. However, the ministry will require senior staff in social and gender issues. The AfDB using their environmental experts will also follow up to ensure adherence to environmental and social safeguards, especially during the supervision missions.

The whole exercise of ESMP monitoring will involve monitoring compliance with regulations, managing worksites, executing specific environmental and social works and seeking solutions to emerging environmental problems. The ESMP monitoring team will ensure regular reporting, which will be on a monthly, quarterly biennially or annually basis depending on the aspects being monitored to avoid any serious environmental consequences. Among the key issues to be monitored will be: (i) the status of the biological conditions; (ii) status of the physical works; (iii) the technical and environmental problems encountered; (iii) proposed solutions to the problems encountered; and, (v) the effectiveness of environmental and social measures adopted.

The ESMP monitoring programme is proposed compliance with agreed upon local environmental standards under the laws of Eritrea. The monitoring will involve: (i) reviewing the contractor's detailed worksite ESMP or ESIA and its specific procedures; (ii) ascertaining mitigation of the negative impacts identified; (iii) ascertaining the effectiveness of proposed measures; (iv) studying specific applicability conditions for the proposed measures; (v) monitoring the implementation of measures during the works; (vi) monitoring the recommended measures; (vii) proposing remedies in the event of occurrence of major impacts; and (viii) conducting environmental compliance and assessment at the end of the project.

7.3. Monitoring schedules

Table 5: The ESMP monitoring schedule

No.	Aspects to be Monitored	Project Phase (construction, operational & maintenance	Location	Monitoring Indicators	Frequency of Monitoring	Institution/Agency to Monitor
01	Development of the ESMP	Project Appraisal phase	National Exercise	ESMP prepared	Once	PIU/MoA/Directorate of Environment
02	Development of site-specific ESIAs	Development	Project sites	❖ ESIA reports ❖ Adherence to laid down legal and policy requirements	Once	PIU/MoA/Directorate of Environment
03	Environmental conditions during the infrastructure development ▪ Status of the biological conditions ▪ Assessing the status of the physical works ▪ Follow up on mitigation measures ▪ Assess effectiveness of environmental and social mitigation measures adopted	Construction and operational phases	Project sites	❖ Number of meetings planned and held; ❖ Record of meetings that took place ❖ Mission reports	Monthly/bi-annually/annually	Control missions/PIU/ MoA/ Directorate of Environment
04	Environmental conditions during the operational phase of the project. Types of chemicals used during production, etc.	Operational phases	Project localities	❖ Number of meetings planned and held; ❖ Record of meetings that took place ❖ Mission reports	Monthly/six monthly/annually	Control missions/PIU/ MoA/ Directorate of Environment
05	Environmental conditions during the operational phase of the project – post-harvest operations including sorting, storage, transportation and marketing	Operational phase	Grain storage and transportation	❖ Number of meetings planned and held; ❖ Record of meetings that took place ❖ Mission reports	Monthly/six monthly/annually	Control missions/PIU/ MoA/ Directorate of Environment

8. CONSULTATIONS AND PUBLIC PARTICIPATION

8.1.Rationale for consultation and disclosure

Consultations and public participation is a requirement by law to generate concerns about environmental impacts of any development project or programme. During the preparation of this ESMP, significant consultations and public participation was carried out. Further consultations are anticipated during the subsequent parts of the project development process especially during the preparation of site-specific environmental and social impact assessments. The public consultation and public participation process is a crucial mechanism that informs the public, key stakeholders, interested parties and those to be affected by the project about the purpose and aims of the project and the key activities that will be carried out during the development and implementation phases of the project.

The objectives of the stakeholders and public participation include among others: (i) to provide an opportunity for people to be affected to get clear, accurate and comprehensive information about the proposed project and its anticipated environmental impacts; (ii) to provide an opportunity for people that will be affected by the project to give their views, raise their concerns regarding the project and also give possible alternative arrangements that may assist in the development of the project in order to avert some of the environmental and social impacts; (iii) to provide people to be affected with the opportunity of suggesting ways of avoiding, reducing, or mitigating negative impacts or enhancing positive impacts of the proposed project activities; (iv) to enable the project proponents to incorporate the needs, preferences and values of the project as seen by the stakeholders into the proposed project/programme; (v) to provide opportunities to avoid and resolve disputes and reconcile conflicting interests by the stakeholders of the project; and, (vi) to enhance transparency and accountability in decision making.

Stakeholder consultations and public participation was carried out during the project preparation process and will continue even during the implementation phase to ensure regular communication between the project proponents/implementers and the various stakeholders including project's direct beneficiaries. It will facilitate regular communication and updates that will enable modifications and alterations as well as implementation of proposed mitigation measures. Stakeholder consultations and participation will also be carried out during the preparation of site-specific environmental and social impact assessments. Further consultations will be carried out during the ESMP implementation phase that will include ESMP monitoring based on the concerns that will be raised by the affected communities.

8.2.Methodology of engaging stakeholders

The stakeholders were engaged through: (i) public consultative meetings, particularly with communities and technical officials from the government of Eritrea; (ii) interviews with different key informants in relation to the proposed project/programme; (iii) physical site visits and inspections that also included discussions with community leaders and community members; (iv) due consideration of gender and various age groups during consultative processes was observed.

8.3.Possible key issues that were considered during stakeholder engagements

A number of issues were identified that were useful during stakeholder engagements. Some of these were:

8.3.1.Identification of ecologically sensitive sites

This was with regard to finding out and identifying areas that are protected by national laws and international conventions such as forest reserves, Ramsar sites, important migration routes, world heritage sites, etc. Again, an initial environmental and social assessments have revealed that the programme will not affect any such sites in the identified districts.

8.3.2.Identification of important cultural sites

These usually include lands set aside for cultural ritual sites, cemeteries and special burial sites. Again, the assessment reveals that the programme is not likely to affect any such areas in the identified districts.

8.3.3.Identification of Environmental impacts:

These include both negative and positive environmental impacts of the programme. These covered issues such as levels of pollution – water pollution, air pollution, issues such as oil spills, generation of wastes, destruction of biodiversity and ecological habitats, etc. These have been identified and remedial measures proposed to address them.

8.3.4.Environmental/biodiversity issues

These may include issues of destruction of natural environment including damage to vegetation, views from conservationists, damage to biodiversity of biological and economic importance, biodiversity loss in general, intensity of construction and excavation

works, etc. These were identified and mitigation measures have been proposed in this ESMP.

8.3.5.Socio-economic considerations for the project

During stakeholder engagements and public consultations, the programme was analysed from its socio-economic impacts. What positive impacts is the project going to have? How is the project going to influence social well-being as well as economic well-being? The project's agribusiness value addition potential? What are the potential complementary initiatives? Employment opportunities that will be created by the project. Etc. etc. These were analysed and adequately identified in this ESMP.

8.3.6.Socio-cultural issues regarding the project

Consideration of gender mainstreaming, women and youth empowerments, identification of vulnerable groups such as poor women, the elderly, the people with disabilities, spreading of diseases (especially HIV/AIDS and other communicable diseases as well as uncommunicable disease were of utmost consideration), improvement of life in terms of life quality and the standards of living, etc. Again, the socio-cultural impacts of the programme have been identified and discussed in this ESMP.

8.3.7.Disruption of normal life

Of importance was the analysis of the project's/programme's interference with daily economic activities such as closure of specific roads, change in normal daily activities, etc.

8.3.8.Trans-boundary issues and cumulative impacts

During stakeholder engagements and public consultations, issues such as possible trans-boundary impacts of the project were reviewed. Cumulative impacts such contribution to changes in climatic conditions were evaluated.

8.3.9.Occupational health and safety

Possible occupational health challenges and safety of workers during the project development phase as well as operational phase were given great consideration and their importance analysed.

8.4.Consultative meetings held during the preparation of this ESMP

During the project preparation mission, several consultative meetings were held. The consultations were undertaken with reference to the updated AfDB's Integrated Environmental and Social Impact Assessment (IESIA) Guidance Notes on consultation, participation and broad community support, which also provides guidance on affected communities' involvement in the process of project planning, implementation and monitoring. Consultations were carried out with the technical officers from different ministries, civil society institutions (such as the Union of Youth and Student Association and the Federation of Eritrean Workers) and community members in Sub-Zoba Logo Ansba (in Dersene Village) and Sub-Zoba Adi Telezan (in Dekizeru Village), Sub-Zoba Gheleb (in Aibaba Village), Zoba Maekel, Zoba Asmara (in Durfo Village). The consultations were preceded by disclosure of adequate project information and environmental and social information to ensure that participants are fully informed. The consultation and public participation is a continuous process during project circle and begins at an early stage during project preparation and will continues as needed. The consultations have been conducted in a timely manner in the context of key project preparation steps, in an appropriate language, and in accessible places.

This having been identified as a Category 2 project, the affected communities and stakeholders were mainly consulted about the draft environmental and social assessment report and the draft ESMP as a guide. Consultations were conducted mainly with the objective of ensuring that the project has broad community support, and that affected people endorse the proposed mitigation and management measures.

The list of the people consulted is given as an annex to this report.

9. INSTITUTIONAL ARRANGEMENTS AND CAPACITY BUILDING FOR ENVIRONMENTAL AND SOCIAL MANAGEMENT

9.1. Responsibilities for environmental and social management and monitoring

The overall responsibilities of coordination of the DRSLP lies in Ministry of Agriculture (MoA) as the executing agency. The Project Implementing Unit (PIU) at the Ministry of Agriculture working in close collaboration with staff from the Directorate of Environment at the Ministry of Land, Water and Environment will ensure compliance with environmental laws, policies and regulations. Technical experts who are well-trained and highly qualified with the capacity to implement the Environmental and Social Management Plan (ESMP) will be identified. The project will have a Project Coordinator working together with an Irrigation Expert (with soil and water specialization), a Natural Resources Management Officer, a Gender Officer, an Environmentalist, an Administrative and Finance Officer, a Procurement Officer and an M&E Officer. Qualified PIU staff will be appointed by the Government. Lacking skill or unqualified will be recruited or upgraded by the project. Oversight responsibilities in Eritrea, for example, will be assumed by the Project National Steering Committee chaired by the Minister of Agriculture and including the Minister of National Development, the Minister of Finance, the Minister of Land, Water and Environment (MLWE), President of National Union for Eritrean Women (NUEW), National Union of Eritrean Youth and Students (NUEYS) and the Governors of the participating Zobas.

9.2.Monitoring and Evaluation

Monitoring, evaluation and reporting on environmental issues will be part of project implementation processes and reporting systems. Contractors as well as the implementing agency will be required to keep records of all activities that will be undertaken under each project site, which will be compiled and used in enhancing environmental sustainability of the project sites. The PIU at the State Ministry of Agriculture (MoA) will be responsible for environmental and social monitoring at local levels at each implementation site. Compliance with the environmental and social screening requirements will be generated based on monthly works reports, quarterly reports, annual reports, evaluation reports, feedback meetings and implementation supervision missions. The responsible entities will regularly generate environmental reports to be shared with the national environment authorities and the AfDB's Safeguard systems.

9.3. Capacity building and training needs identified

During discussions with the officials from the Directorate of Environment at the Ministry of Land, Water and Environment and the technical staff from different technical departments it was realized that there will be need to empower the relevant officials with technical skills in environmental assessments and management.

In terms of partnerships and collaborations, the National Agricultural Research Institute will be responsible for crop, forage and pastoral plants germplasm development and evaluation in collaboration with the forest and tree crops nurseries and farm based germplasm development. The Zoba Administration Agricultural Divisions will backstop producers and communities who will carry out crop and livestock production, environmental protection, soil and water conservation and afforestation activities. The MoLWE can assist in meteorological and other environmental management and climate adaptation aspects in collaboration with the Regulatory Services Department on aspects relating to the impact assessment of the project. The Hamamelo Agricultural College will assist in the training of Staff at the Central and Zoba levels. MOA and Zoba Administrations will be responsible for watershed characterization and agricultural infrastructure development. Implementation agreements will have to be signed between these institutions to identify the management and resources.

To put this programme into effect the GoSE through the Ministry of Agriculture (MoA) and the various community based organizations such as the Village Development Committee (VDC), the National Union of Eritrean Women (NUEW), the National Union of Eritrean Youth and Students (NUEYS) sensitize and mobilize the farming communities to construct structures like soil and stone bunds on farm lands, land levelling and construction of river diversion canals for developing spate irrigation. The main idea of such interventions is to keep the rain water and river floods on the farms. Such interventions will result in increasing crop and livestock production and productivity per unit area.

10. COMPLIMENTARY INITIATIVES

The project implementing agency will be responsible for the supervisory role in conducting the environmental and social monitoring of the project's environmental activities. The project is envisaged to complement the working relationships among different entities that will be engaged in the implementation of the project. It is also anticipated that there will be good working relations among the different Zobas in which the project will be implemented including different responsible sector ministries, other key stakeholders in agricultural production and particularly those responsible for land and water management, environment and natural resources management, trade and industry, infrastructural development, etc. One of the most important complementary initiatives will be the enhanced collaboration among these different players. The other complementary initiative of the project will be the capacity building initiatives proposed in the project targeted to train the key officers involved in the project on various aspects of environmental management especially environmental assessment and in understanding the importance of ESIA.

The local communities will be involved in a lot of capacity building focusing on good agricultural production practices, proper land use techniques, and, land and water management programmes. The capacity building will be carried out through extension services by officials from the Ministries of Agriculture aimed at ensuring long term sustainability of their lands and ensuring environmental and natural resources sustainability to improve production and minimising post-harvest losses through good storage systems. Mainstreaming public health and HIV/AIDS in the overall operations of the agricultural sector and other economic activities will help improve social well-being of the project communities.

The project will aim to engage and support some local interventions that will ensure good environmental management in agricultural production as well as increasing the number of players in agricultural produce value chain systems. Other complementary initiatives could include agro-processing and agro-processing by product.

11. ESTIMATED COSTS TO IMPLEMENT THE ESMP

The ESMP implementation budget refers to all costs that will be incurred to implement the requirements or recommendations in this Environmental and Social Management Plan (ESMP). In the ESMP the requirements are to ensure that implementation of the project integrates environmental and social issues for the sustainability of the project as well as its components and sub-components. Among other things the ESMP recommends the following key issues, namely; implementation and management of this ESMPs, preparation of site-specific ESIAs, training and capacity building, environmental screening, reviewing and monitoring mechanisms. These issues have been amplified and are clearly described in this ESMP. The staff who will be involved in the implementation of the project should be trained to enhance their skills on specific environmental and social issues.

Building the capacity of staff from the implementing unit, division/departments/ sections especially those who will directly be involved in implementing the project and its sub-projects, value chain systems as well as Management and Finance will enable them to review and monitor environmental issues in the project as well as sub-projects to ensure compliance with requirements of the national policies, laws and regulations as well as AfDB safeguard policies. Based on experience from other related assignments the estimated cost for implementing the recommendations of this ESMP requires approximately US$0.652 million. Details of these costs are presented in the table below.

The summary of the ESMP costs

Table 6: ESMP implementation costs

No.	Activity	Timeframe	Cost (USD)	Responsibility
01	Preparation of site-specific ESMP/ESIAs	Quarter 1 prior to actual project works	50,000	PIU/MoA/Directorate of Environmental
02	**Complementary initiatives:**			
	• Capacity Building of Technical officers – environmental matters	Quarter 1 & 2 of project implementation	75,000	PIU/MoA/Directorate of Environmental
	• Capacity building of farmers – farming practices and farm inputs	Quarter 2 of project commencement	65,000	MoA
03	**ESMP Monitoring**			MoA/PIU/ Directorate of Environment
	• Regular supervisions – environmental aspects	Entire project period until hand-over	150,000	MoA/PIU/ Directorate of Environment
	• Control missions	Annually during project period	45,000	PIU/MoA/AfDB
04	Institutional Strengthening and Capacity building and general public awareness programmes	As and when needed	150,000	PIU/MoA/MoLW&E
05	HIV/AIDS Mainstreaming	Quarterly campaigns	75,000	MoA/ Public Health
	Total		610,000	
06	5% mark-up		30,500	
07	**Grand Total**		**640,500**	

12. CONCLUSIONS AND RECOMMENDATIONS

12.1. Conclusions

This ESMP has been prepared based on environmental and social assessments conducted to equip the relevant authorities of the Government of the State of Eritrea and especially the Ministry of Agriculture and the Directorate of Environment at the Ministry of Land, Water and Environment as well as several other interested agencies, local administrative agencies plus all stakeholders with relevant and sufficient environmental information about the proposed Drought Resilience and Sustainable Livelihoods Project Phase V. It is hoped that the authorities in Eritrea will use this information to evaluate the environmental viability and sustainability of the proposed project. The project has environmental impacts but which do not have long term and cumulative nor significant impacts. The proposed development project explains the various economic and social benefits not only to the local communities within the project areas, but to the entire nation as a whole, particularly in supporting international trade and foreign exchange as well as national food and nutritional security. The negative environmental impacts that have been identified and are associated with the implementation of this project are minimal and could be addressed by implementing the mitigation measures proposed to ensure that they pose no threat to the environment and to the communities. These measures are part of the projects' component and will bring no added cost in the implementation process.

12.2. Recommendations

Even though the project focuses on agricultural production, it is a multi-sectoral and a multi-disciplinary project. As such, it is important that during the implementation, relevant line ministries and other stakeholders are effectively involved to address some of the cross cutting issues such as environmental management and trade in agricultural produce. The multi-disciplinary approach will ensure that emerging issues and challenges are not only adequately addressed but the addressing is done timely and appropriately. The contractors and the project proponents should take into consideration all the legislative measures put in place so as to ensure the due process is followed. The mitigation measures provided are based on the recommendations of this ESMP and they should be followed so as to address the environmental issues that may arise in the course of the implementation of this project.