ENVIRONMENTAL PROTECTION AUTHORITY

ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE IDENTIFIED SECTORAL DEVELOPMENTS IN THE ETHIOPIAN SUSTAINABLE DEVELOPMENT AND POVERITY REDUCTION PROGRAMME (ESDPRP)

NOT FOR CITATION

This guidelines is still under development and shall be binding after consensus is reached between the Environmental Protection Authority and the Environmental Units of Competent Sectoral Agencies

May

2004

AD

DIS ABABA

Ethiopia

TABLE OF CONTENTS

PAGE

List of Acronyms

BF	Beneficiaries
BoA	Bureau of Agriculture
BOH	Bureau of Health
BOWR	Bureau of Water Resources
DAs	Development Agencies
EARO	Ethiopian Agricultural Research Organization
EEPCO	Ethiopian Electric and Power Corporation
EIA	Environmental Impact Assessment
EIS	Environmental Impact Study
EPA/B	Environmental Protection Bureau
ERA	Ethiopian Road Authority
ESTC	Ethiopian Science and Technology Commission
FAs	Financing Agencies
M/BOH	Ministry/Bureau of Health
MoA	Ministry of Agriculture
NGOs	Non-Governmental Organizations
PS	Private Sector
R/WAO	Regional or Woreda Agricultural Office
R/WHO	Regional/Woreda Health Office
RARO	Regional Agricultural Research Organization
RC	Regional Council

ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE IDENTIFIED SECTORAL DEVELOPMENTS IN THE ETHIOPIAN SUSTAINABLE DEVELOPMENT AND POVERITY REDUCTION PROGRAMME (ESDPRP)

1. INTRODUCTION

Ethiopia has been hard hit by recurrent events of drought and concomitant famines since the early 70s. These droughts are a series of occurrences of rainfall shortages with negative effects on agriculture and rural life. These droughts have produced serious and variant effects on social and economic life of the people.

The sweeping drought not only devastated the agricultural base of the country but also gripped the environmental complex of the country.

The repeated and persistent droughts have caused the disruption of the hydrological cycle and the loss of both biomass and biodiversity. It is also noted that biological productivity has been reduced inducing acceleration of desertification, especially when being combined with increasing human pressure on the land. This situation has enforced and compelled Ethiopians to live in abject poverty.

In order to combat land degradation and reverse the prevailing level of poverty the government has taken a major step and prepared Sustainable Development and Poverty Reduction Programme. As noted in the programme realization of this can only be achieved by implementing a number of prioritized programmers and developments in different sectors.

In order to meet the sustainability of the programme, however, integration of environmental considerations for key sectors development programmes and projects is essential. This can only be achieved by developing and implementing an umbrella EMP framework for effective environmental management and rehabilitation of these key sectors development activities of the programme.

2. OVERVIEW OF SUSTAINABLE DEVELOPMENT AND POVERTY REDUCTION PROGRAMME (SPDRP)

2.1 Poverty Situation in Ethiopia

From the review of the document it is noted that the proportion of people in absolute poverty declined only marginally from 45.5% in 1995/1996 to 44.2% in 1999/2000. Woreda level consultations undertaken during the development of programme demonstrated that poverty might have worsened since 1999/2000 survey as a result of the declining international coffee prices and the depressed cereal prices in 2000/2001, both of which impacted negatively on rural households income. The percentage of people reported ill without treatment in 1999/2000 was high especially among women, both in the rural and urban areas (rural female 74% versus rural men

68%) and urban female 45% versus urban male 34%). This shows that the incidence of poverty in Ethiopia is considered to be one of the highest in the world.

Over the last decade the country's GNP per capita has remained at around US $110, the lowest in the world. It is estimated that 55 percent of the population is below the absolute poverty level. In some regions the population below the poverty line is as high as 85%. This group consists of small farmers in rural areas, the landless and retrenched workers. Food insecurity and health problems are the main features of poverty.

In disaster years like 2001/2002 as many us 15 million of the population were in need of relief. Even in a normal year the people in need of food is estimated to exceed 7 million

2.2) Measures taken to alleviate Poverty Condition

Inorder to overcome this constraint the government has prepared this programme with the objective of building a free market economic system which will enable the economy to develop rapidly, the country to extricate itself from its dependence on food aid and make poor people to be the main beneficiaries of growth.

Inorder to achieve this strategy four building blocks or pillars are identified. One of the identified pillars is Agricultural Development led Industrialization (ADLI).

Ethiopia though basically a rural country, is launching a major programme for the intensification of agriculture, including the large and small scale development irrigation schemes, as well as industries through this ADLI Policy.

This policy would have importance in reducing poverty by enhancing rapid economic growth while at the same time maintaining macroeconomic stability. Among other things the broad thrust of the strategy during the SDPRP period are the following:

- Overriding and intentational focus on agriculture;
- Strengthening private sector growth and development especially in industry;
- Increased water resource utilization (water harvesting and small scale irrigation) to ensure food security.

3. THE NEED FOR THE PREPARATION OF EMP

Among other things the programme involves the intensification of development projects in water, agriculture, hydropower and road sectors. The effort made by the government in alleviating the poverty condition of the country especially by minimizing dependence on rainfed systems and to gradually attain self-sufficiency in food production in the country through water and other sectors development projects (e.g. by construction of microdams, irrigation systems, reservoirs) is appropriate.

Past experience has shown that small scale development scheme (e.g. small scale irrigation development project) combined with other similar or related interventions under any programme

has resulted massive environmental problems such as deforestation, soil erosion etc. This is because that the concern that is embedded in the notion of cumulative impact was not taken into account in the EIA System prepared by the EPA which is mostly limited to considering the impact of individual major development projects.

Inorder to overcome this constraint and ensure the sustainability of the programme this EMP has been prepared specifically aimed at environmental management of the programmes and projects. This management plan is especially rational at a time when recognition of the necessity to preserve the quality of the environment, and the consumption of the country's natural resources continues to grow rapidly for the purpose of achieving the objectives of the programme. Besides this it would also have importance for the proper use, conservation, and development of the natural resources of the country.

4. REVIEW OF RELEVANT DOCUMENTS IN RELATION TO EMP

The major documents which are envisaged to address environmental management issues in relation to sectoral development efforts are briefly described in a summary form as follows.

4.1 Agenda 21

Agenda 21 provides options for combating degradation of the land, air and water, conserving forests and the diversity of species of life. It deals with poverty and excessive consumption, health and education, cities and farmers. It recognizes that sustainable development is the way to reverse both poverty and environmental destruction.

The following three guiding principles derived from the Rio Declaration on Environment and Development have been used as basis for the preparation of EMP (integrated environmentally sound management of sectors development efforts).

- Inorder to achieve sustainable development environmental protection shall constitute an integral part of the development process and can not be considered in isolation from it;

- To achieve sustainability development and higher quality of life for all people, unsustainable patterns of production and consumption shall be reduced and eliminated;

- Indigenous people and their communities, and the local communities, have a vital role in environmental management and development because of their knowledge and traditional practices. Their identity, culture and interests should be recognized and duly supported, and their effective participation in the achievement of sustainable development should be facilitated.

4.2 Ethiopia's Environmental policy and Legal Frameworks with regard to EMP

Ethiopia has adopted the Constitution in 1995. This Constitution provides the basic and comprehensive principles and guidelines for environmental protection and management. Among

other things the Constitution states that everyone has the right to live in a clean and healthy environment and the government will make every effort to provide such an environment.

The Environmental Policy of Ethiopia (EPE) was approved by the Council of Ministers in April 1997. It has 11 sectoral and 11 cross-sectoral components. It's preparation was based on the policy and strategy findings and recommendations of the Conservation Strategy of Ethiopia. The policy document contains elements that state the importance of mainstreaming socio-ecological dimensions in development programmes and projects.

The National Conservation Strategy (NCS) which was developed through the consultative process over the period 1989-1995 takes a holistic view of natural, human made and cultural resources, and their use and abuse and seeks to integrate into coherent framework plans, policies and investment related to environmental sustainability. The document consists of five volumes i.e., the Natural Resource Base, policy and Strategy, Institutional framework, the Action Plan and Compilation of Investment Programme.

A number of proclamations and supporting regulations were made that contain provisions for the protection and management of the environment that reflect the principles of the Constitution and Environmental Policy of Ethiopia (EPE). Among other proclamations Environmental Impact Assessment (no.299/2000) is the one that provides proactive and reactive provisions designed to ensure sustainable development. According to this proclamation EIA is mandatory not only for development projects but aso for policies, plans and programmes. This adopted proclamation is an invaluable legal tool for environmental planning, management and monitoring of these endeavors.

Moreover several detailed sectoral policies are also prepared by various sectoral agencies. One of them is the Federal Water Resource Policy formulated by the Ministry of Water Resources. This policy advocates a comprehensive and integrated water resource management. The overall goal of this mentioned policy is to enhance and promote all national efforts towards the efficient and optimum utilization of the available water resources for socio-economic development on a sustainable basis.

5 IDENTIFIED SECTORAL PROGRAMMES/PROJECTS AND THEIR BENFITS

Those identified sectoral developments and activities are the following

5.1 Programmes/Projects

- **Hydropower Development Programme**

  Activities in this programme/ project are the following

  - Construction of access roads
  - Excavation works for dams as well as dump sites
  - Civil works such as tunnel, quarry, borrow pits
  - Induced developments
  - Impoduments of water to form reservoir
  - Regulation of water from the river and /or lake sources
  - Operation of dams and reservoirs

- **Water and Agricultural sector Development programmes and projects**

  Development programmes, projects and activities in the water and agricultural sectors are:

  - Water supply and sanitation
  - Water harvesting techniques such as ponds, dams, cisterns etc.
  - Crop Husbandry
  - Animal Husbandry
  - All earth moving excavation activities and land fill construction
  - Excavation works for construction of different water harvesting techniques.
  - Waste disposal

- Water Extraction for crop production
- Agricultural inputs
- Introduction of new plant species
- Farming technology
- Construction of reservoirs, dams and lands
- Operation of dams and reservoirs
- Inappropriate livestock production management
- Industrialized livestock production system
- Introduction of new livestock species

- **Road Programmes and Projects**

Activities in this development programmes and projects are the following.

- Construction of access roads and excavation works for bricks, quarries, borrow sites
- Road cuts and fills
- Use of chemical and other related toxic materials for dust control, vegetation clearance etc.
- Immigration of people to the project area
- Vehicular traffic and transport
- Construction machineries

5.2 **Benefits of the Programmes and Projects**

The overarching goal of the programmes and projects is to allivate poverty situation and attain food security at house hold level in the country. The major benefits which are expected to be achieved by implementing them are to:

- improve investments in different sectors;
- recyle the benefits gained from hydropower in the country so as to accelerate rural development particularly protection and maintenance of basic infrastructures;
- directly improve the welfare of society, while also meeting other national objectives such as reducing food imports and mitigating migration to the major population centers;
- provide farmers with extension services and give them vocational training;
- encourage diversity of livelihoods and promote income generating schemes;
- increase agricultural output by introducing higher yielding and possibly drought resistant crop varieties ;
- collect and store rainfall by different water harvesting techniques such as cisterns for areas in dry seasons;
- make ponds & small dams so as to stop rain water from flowing away and use them in the dry season for humans & livestock;
- Maintain & extend the country road infrastructure so as to enable the people to get easy access to social & development services.

6. MATRIX OF EMP FOR THE IDENTIFIED PROGRAMMES AND PROJECTS

As can be seen from the following matrix tables the EMP has been prepared for those identified key sectors development programmes and projects in the ESDPRP. The objective of this EMP is to integrate environmental and social considerations into account so as to ensure successful economic and social development of the programme.

The EMP will have importance to briefly illustrate that all activities included in all programme/project components have no significant harm to the environment and is intended to give a brief account on impacts of programmes/projects activities on environment, mitigating/enhancing measures, monitoring indicators, indicative time schedule and budget as well as institutional arrangements for executing mitigating measures.

In line with the principles of the Federal Democratic Republic Constitution in this proposed EMP the Federal EPA and Regional Environmental Agencies will take an overall coordination role of implementing of those suggested mitigation and monitoring measures as per their given mandates. In this regard therefore, their active participations in this proposed EMP are worthwhile.

6.1: Matrix of EMP For Hydropower Programmes and Projects

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
PRE-CONSTRUCTION/CONSTRUCTION PHASE						
Physico-Chemical Environment						
Construction of access roads and excavation works for dams as well as dump sites.	Siltation of local creeks as well as increased soil erosion from borrow areas	Proper material handling by using appropriate measures such as silting basins etc.	Use and effectiveness of material handling machine	Part of EMP costs	Proponent, contractor, ERA, BOH, BoA, EEPCO	As scheduled
		silt traps to be constructed immediately down slope of new access roads and drill sites	Effectiveness of silt traps	Part of construction costs		Regularly
		Newly exposed areas will be re-vegetated	Areas covered by vegetation	Part of construction costs		Regularly
	Generation of dust and increase in levels of air and water pollution emission due to use of construction machineries	conduct of routine occupational (personal) monitoring along construction sites	Levels of dust and other pollutants	Part of management costs		At all times
		Regular maintenance of equipment	Whether maintenance is in place	Part of management costs		At all times
		Use appropriate blasting techniques that will minimize dust	Efficiency and proper function of equipment			
		Sprinkling of roads with water	Visual inspection	Contractors account		During constru.Perio.
		To prevent spill of oils, grease and other pollutants arresters in association with oil separators around workshops and process plants should be installed	Efficiency and performance of pollutants arrestors reduction of pollutants	Contractors account		At all times

(CONT'D)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Introduction of induced Developments	Risk of pollution problems resulting from tunneling ,digging etc	Controlling pollution problem by using the national pollution standards	Reduction of pollution	Part of the construction costs	Proponent, EPB	Through out the construction, or where necessary
		Handling and treating the wastes as per the waste management guideline	Whether wastes are treated as per the requirement of the national guideline			
Regulation of water from the river and/ or lake sources resulting from operation and associated activities	Occurrence of slope failure and land slides	For areas identified as having signs of future landslides, appropriate methods for measuring the development of cracks, subsidence and uplift need to be made	Effectiveness of the methodologies	Part of the EMP costs	Proponent , BOA, BOWR, EPB as of necessary, ERA, EEPCOP	As scheduled throughout the construction and operation phases
		conventional surveying and installation of various instruments to measure movements directly	The result of regular conventional surveying			
	Erosion of fertile riverbanks and pollution of water resources	Regular checking and maintenance of operation equipments to detect any seepages	Whether regular maintenance has been taking place	Part of operating costs.		Regularly
		Establish and implement watershed management programme to reduce erosion and sedimentation	Whether maintenance of equipment is in place	Part of maintenance costs		

EMP for Hydropower….(cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Monitoring of soil and water resources to detect erosion and any changes in quality	Sediment and silt loads in water resources water quality	Part of construction and operation costs		As scheduled
	Increase or decrease the risk of flood damage as the result of change in the flow of water	Appropriate water management measures will be taken to minimize the impact Design appropriate flood diversion woks such as levees	Percent increase and/or decrease in flood	Part of the construction and operation costs		At all times
		Properly designed access roads and bridges will be constructed and implemented	Access roads	Part of environmental management costs		During the construction period
Biological Environment						
Impodument of water flooding of land to form dams and reservoirs	Loss of important vegetation, habitat and promotion of erosion	Construction works will be designed away from areas with heavy vegetation	Whether design of construction works are far away from densely populated vegetation	Part of EMP costs	Proponent, contractor, BoA, EEPCO	Regularly during construction and operation periods
		Strip top soil and rehabilitate site	Rehabilitated sites			
		Restoration of sites to original condition to the extent possible through reclamation measures	Restored places	Part of operating costs		

EMP for Hydropower….(cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Construction of access roads and excavation works for construction of pond, spring and hand dug wells)	Damage of rare and endangered vegetation types as well as ecologically sensitive areas	Construction works will be designed away from those ecologically sensitive and vulnerable areas	Effectiveness of the designed construction works	Part of the preconstruction costs		Throughout the construction period
Water impoundment	Potential impact on biological production of reservoir due to water quality deterioration	Proper water management should be carried out through release program	Water quality parameters which have importance in maintaining the reservoir ecosystem	Part of the environment costs		
		operating schedule to take quality of released water into account	whether the quality of water maintained or not	Part of the environment costs		
		Enforcing the national quality standards for protecting the aquatic ecosystem.	Preserved aquatic ecosystem as per the requirement	Part of the environment costs		

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Socio-economic Environment						
Construction of access roads and excavation works for dams as well as dump sites	Generation of significant noise levels and potential injury to workers and surrounding people	Use of mufflers on construction equipments	Appropriate use of mufflers	Contractors account	Proponent, contractor, BoH, NGOs, DAs	At all times
		Supply of personnel protection equipment such as ear masks	Regular use of personnel equipment by the workers	Contractors account		At all times
	Potential effect of pollution on ground water during foundation work, tunneling, or construction of underground utilities	Protective measures such as liners and other facilities will be implemented	The efficiency and function of the liners and other facilities	Contractors account		Throughout the construction and operation periods
	Loss or damage of cultural and archeological resources	Proper identification of cultural and archeological resources and safeguard them from unnecessary destruction	Maintenance and enhancement of cultural and archaeological importance places	Part of construction costs		As scheduled
	Loss of aesthetic beauty and quality of the river sources as well as the surrounding environment which could fill tourism potential	Proper sitting of hydropower generating infrastructure	Site and distance of hydropower infrastructure from those mentioned places			During the planning stage
		Consideration of view points in relation to maintaining the quality of visual resources.	Whether the quality of visual resources is maintained			" "

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
	Loss of aesthetic beauty of the area resulting from road and quarry scars after construction completion	Sides of disused quarries should be graded, where feasible, and vegetated	Whether the quality of visual resources maintained			Regularly at all times
		Regenerate abandoned access roads	Effectiveness of the rehabilitation measures	Part of the rehabilitation costs		During construction period
		Dismantle, breakup and rehabilitate sites	Rehabilitated sites as per the recommendation			During construction period
	Water fall below dam may be eliminated or reduced due to low water releases	Appropriate measures need to be carried out to compensate releases of water	Compensated water releases	Part of the EMP costs		As scheduled
Impodument of water flooding of land to form the reservoir	loss of lands and land belong to the rural development	compensating the displaced people by substitute resources or money	Implementation of compensation as per the recommendation		Proponent, BOA, BOWR, EEPCO	At the end of planning stage
	Impact of scarcity of water for the people living down stream	Decrease thesize of dam	sufficiency of water for down stream users			Through out the construction
		Protect equal areas in regions to onset losses	protected areas			
	Permanent flooding of some inhabitants	Identify those people who live in the risk flooded area and relocate them in some other places	Relocated people	" "		At all times

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Construction of access roads and earth dams	Potential occupational hazards from dam collapse and heavy equipment failure	Ensuring that all underground services are identified and marked before excavation begins	Proper identification and marking of underground services	No cost	Proponent, BOH, EEPCO	At late stage of the planning period
		Site layouts shall be planned with adequate turning room for vehicles /equipment and good visibility for operators /drivers	Adequacy of site layouts planning with appropriate facilities to achieve good visibility for workers	Part of the planning costs		As scheduled
		Safety operational procedures will be enforced	performance of the procedures	part of the OHS costs		At all times during construction and operation periods
	Sizable increases in the population and the resulting impacts on the social and development services in the project area	Developing resettlement plan and implementing it consequentively	Effectiveness of the implementation of the resettlement plan	Part of the environmental management costs	Proponent, BOH ,EEPCO	Throughout the preconstruction and construction
		Integration of social and development services during design work	Availability of social and development services in a sufficient manner	Part of construction and operation costs		At all times

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/E NHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANI ZATION	SHEDU LE
	Conflicts which may arise between residents of the area and temporary workers	Solving conflicts through facilitating of consultative processes between new comers and residents	change in attitude of people so as to come to consensus in reducing the issue of conflicts	No cost		
Introduction of induced Developments	Introduction and/ or aggravation of environmental problems such as fire accidents, in evasive parasitic organism	Measures should be made in avoiding problems of fire and erosion accidents as well as invasive and parasitic organisms (i.e. both animal and plant species)	Effectiveness of the proposed mitigating measures	" "	Proponent, EEPCO, MOWR, EPA	At tall times
		Designing the site of project in consultation with the communities	Effectiveness of public consultation	Part of the planning costs		During the planning and constructi on periods
		Minimize impacts of construction activities from such valuable areas through an appropriate layout and design	proper function and efficiency layout and design			

EMP for Hydropower….(cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
OPERETION PHASE						
Physico-Chemical Environment						
Waste disposal	Potential spillage of hazardous substance may arise from construction materials and causes deleterious effect on human health	spill control/response plan is made and implemented	Efficiency of spill control plan	Part of maintenance costs	Proponent, EEPCO, EPA, EPB, BOWR, BOA, PS	regularly
		Maintenance of construction materials will be done in regular manner	Whether maintenance is In place and carried out properly	Part of maintenance costs		regularly during construction and operation periods
		Procedure with regard to cleaning hazardous substances will be prepared and implemented	Verifying whether the procedures and standards are fulfilled	No cost		regularly during construction and operation periods
Operation of dams and reservoirs for hydropower generation	Loss of storage capacity of dam and reservoir due to sedimentation problem	Regular maintenance of dam by hydraulic removal of sedimentation	Reduction in sedimentation load and lifetime of the reservoir	Part of operating costs		As scheduled
		Undertaking appropriate conservation measures in and the surrounding areas of watershed ,management	The use of soil and water conservation measures	Part of the rehabilitation costs		
		consideration of good catchments areas above the reservoir	Stability of soil	Part of the planning costs		

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Biological Environment						
Impodument of water flooding of land to form dams and reservoirs	Pressure on more marginal and ecologically vulnerable areas	Vegetation will be remediated through replanting	Total area planted by appropriate vegetation	Part of rehabilitation costs	Proponent, EEPCO, BOA	As scheduled
	Affect areas with valuable or conservation worthy animal or plant life and creating barriers for wildlife	Appropriate resettlement plan shall be made and implemented in order to avoid surpassing carrying capacity of the land	Resettlement of people to suitable areas	Part of resettlement plan costs		As scheduled
Operation of dams and reservoirs for hydropower generation	Disruption of ecosystem functioning as well as alteration of a free flowing riverine habitat into a lacus trine habitat	Creating and protecting the buffer zone to compensate for the loss of riparian vegetation	Establishment and proper function of buffer zone	Part of the rehabilitation costs		During the construction periods
	Eutrophication and unwanted aqua-vegetation resulting from an increased concentration of nutrients in the water course	Removal of large vegetation before reservoir filling	Part of the planning costs	Part of the operation costs		At the end of planning period
		Appropriate use of fertilizers so as to reduce nutrient overloading	Amount of nutrients in the water course	Part of the operation costs		At all times

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Use of water for operation and domestic activities	Depletion of water resources and its effect on scarcity of water supply for different purposes (e.g. drinking, irrigation, animal husbandry etc)	Ensuring the use of water in an effective way and monitor its implementation	Efficiency and performance of watershed management practices	No cost	Proponent, BoWR, EEPCO	At all times
	Permanent or periodical reduction of the water quality due to reduced water flow	Periodical monitoring of the status of the water quality	Water quality	Part of construction and operation costs		At all times
		Regular checking and maintenance of dam and reservoir so as to remove sediments and nutrients	Whether dams and reservoir are regularly maintained	Part of normal maintenance costs		Regularly
		Water quality tests using appropriate methods will be undertaken	Water quality	Part of construction and operational costs		" "

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Input of operating machines	Risk of contamination of land or water from discharge of sewerage such as spills of hazardous pollutants from operating materials to water or land	Treating municipal wastes prior to releasing to the recipient should be made	Treated wastes as per the requirment	Part of the environmental management costs	Proponent, EEPCO, Regional Environmental Agency	Regularly
		Developing and implementing spill control response plan	Reduced contamination of land or water			" "
Socioeconomic Environment						
Operation of dams and reservoirs for Hydropower supply	Introduction and/or aggravation of water and/or vector borne diseases (e.g. malaria, bilharzia) as the result of the establishment of stagnant water	Intensifying education campaign on preventive health care of workers and the surrounding people	Reduction in prevalence and incidence of communicable diseases	Part of the EMP costs	BOH, proponent, BF, Relevant Agencies, EEPCO	" "
		proper identification of stagnant water sources and safeguard from unnecessary contamination	performance of pre cautionary measures in safeguarding water resources from contamination	Part of the operating expenses		" "

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Arrangement of health service facilities for primary health care	Availability of health service facilities	Part of the environmental management costs		As scheduled
	Loss of land /agricultural, forest, wetlands etc.	Compensation arrangement for the lost lands will be made	Implimentation of compensation measures	Part of the environmental management costs		" "
Operation of dams and reservoirs for Hydropower supply	Difficulties of transportation due to low flow and river morphology changes	Maintaining flow of water so as to reduce the difficulties of transportation	No cost	Contractor's account		Regularly during construction and operation periods.
	Potential occupational hazards to workers from noise, accidental death through dam collapse, stress, man-machine interaction, wielding times, gasses	Use of enclosures, silencers, screens	The function and performance of the facilities	" "		
		Reducing occupational hazards based on as occupational and health safety guidelines/standards	Effectiveness of environmental requirements in controlling occupational hazards	No cost		At all times As scheduled
		The workers will be provided training course on health and safety	part of the environmental management costs	The workers skills rise on OHS		As scheduled

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		All electrical system connectors will be grounded	Contractor's account	Whether the facilities are in place and working		During the late stages of the construction period
		safety measures such as protective clothing and protective equipment will be provided	part of the environmental management costs	Effectiveness of safety measures in reducing occupational hazards		At all times
Waste disposal	Rise in incidence of communicable diseases resulting from waste production of temporary settlement areas	Proper identification of domestic water sources and safeguarding from unnecessary contamination	Performance of safeguard measures Reduced water contamination.	No cost	Proponent , EEPCO, MOWR, EPB, BOWR	regularly during construction and operation periods
		Adequate and proper waste collection	Waste collection facility	Part of operation costs		Regularly
		Building appropriate pit latrines for local population	Establishment and functions of pit latrines	Part of Environmental Management Plan costs		

6.2) Matrix of Environmental Management Plan (EMP) for Water and Agricultural Programmes and Projects

6.2.1) Water supply and Sanitation programmes and projects

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
PRE-CONSTRUCTION/CONSTRUCTION /OPERATION PHASE						
Physico-Chemical Environment						
Construction of access, roads and excavation works for construction of pond, spring and hand dug wells	Siltation of local water bodies	Proper material handling based on appropriate soil conservation activities, etc.	Effectiveness and performance of material handling	Part of operating costs	Proponent, MOWR, BOWR, BOA, NGOs	At all times
		Silt traps to be constructed immediately down slope of new access roads	Reduction of siltaion of downstream	Contractor's account		At all times
	Erosion around the water points resulting from the strain on the vegetation cover due to grazing and trampling effects of animals and humans	Newly exposed areas will be revegetated	Total areas planted Reduction of soil erosion around the excavation sites	Part of construction costs		As scheduled
	Generation of dust and increase in emission levels of pollutants due to use of construction equipment	Use of mufflers on construction equipments	Effectiveness in using mufflers	Contractor's account		At all times
	Depletetion of ground water resources reduction of recharging of ground water resources	Adequacy of the plan of the project in maintaining the qualities and volumes of the ground water resources	Quality and quantity of the ground water table	Part of the EMP costs		At all times

EMP for water supply…(cont'd)

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Investigating recirculation of water so as to determine the safe and sustainable yield capacities of the ground water potential in the areas	Whether safe and sustainable yield capacities of ground water is maintained	Part of the operating costs		At all times
Waste disposal	Water pollution resulting from bacteriological or chemical contaminations	Undertaking appropriate water treatment	Reduction of water pollution	Part or EMP costs		Through out the operating period
		Training the communities in the use of hygienic practices and maintenance of latrines	Number of trainees	No cost		At all times
		wastewater management will be carried out according to the national regulation and guidelines	Effectiveness of waste water management	" "		" "
Civil works (e.g. tunnel, quarry, borrow pits.)	Deterioration of water quality from construction runoff of pollutant	Precautionary measures will be taken in to account and furtherly treat the pollutants.	Improvement of water quality	contractors account		Throughout the construction or where necessary
		Disposal of excavated materials at the designated areas	whether the stockpiles and spoils placed at the designated areas	" "		

EMP for water supply…(cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
	Decline in water quality and increased sedimentation downstream	Vegetation will be planted on erodable surfaces as soon as possible.	Total area planted	Part of operating expenses		Regulatory during operation period
		Reduction of sediment load should be made by constructing retention ponds.	Decrease in sediment load Performance of retention ponds			
Socio-economic Environment						
Construction of access roads and excavation works for construction of water supply and hand dug wells)	Generation of significant noise levels	supply of personnel protection equipment	Visual inspection	part of the environmental management costs		At all times
All earth moving excavation activities and land fill construction	Potential occupational hazards to workers resulting from noise, dust, pollution	Supply of personal protection equipments and protective cloths	Supply and proper use of personal protection equipment	Part of the operating costs		At all times
		Use of pollution standards and accompanied guidelines	Workers health conditions in relation to the national standards			At all times

EMP for Water Supply…(cont.d)

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Hand dug wells	In-migration of people and livestock to the wells and the resulting sanitation problems down streams	Proper drainage facilities need to be established	Existence and performance of drainage facilities	Part of construction costs		Regularly during construction and operating periods
	Induced development in village and causing pressure on ground water resources and health problems may occur due to improper drainage	Appropriate use and management of water from wells	Management of water practices	No cost		As scheduled
		Site selection needs to be made so as to prevent the problem of ground water lowering	Inventories which have been taken for selection of sites	Part of planning costs		During the planning period

EMP for Water Supply…(cont.d)

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/E NHANCEMENT	RESPONSIBLE AGENCY/ORGANIZ ATION	SHEDULE
Hand dug well	Human health hazard due to contaminated water by some pollutants (e.g. nitrates)	design and implement water resources projects so as to avoid the concentration of induced developments only at one site	Careful measures taken for avoiding concentration of induced development	No cost		During the planning perio
		Controlling of water quality on a regular basis and if there is any water quality deterioration treat it with appropriate treatment techniques	Water quality	Part of operating costs		
		Give due consideration of hygien and health aspects in the planning and implementation of the projects.	Prevalence and incidence of diseases	Part of operating costs		
		Implementation maintenance of facilities on a regular basis	Whether maintenance is in place	Part of the operating expenses		Regularly through out the entire operating period

EMP for Water Supply…(cont.d)

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
	Work related accidents	Incorporating and implementing safety measures	Whether the proposed safety measures are implemented	Part of environmental management costs	Proponent in collaboration with relevant stakeholders	During the occurrence of accidents.
Spring development	Damage to productive farm lands from gully erosion caused by trials/footpaths around the spring site.	Rehabilitation of disturbed areas with soil conservation measures.	Coverage of rehabilitated areas			
	Problem of sanitation at downstream from excess water	Establishment of proper drainage	Placement of drainage facilities			

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Public Health						
Operation of pond, spring and hand dung wells	Introduction and/or aggravation of major water and/or vector borne diseases from stagnant water sources	Taking preventive and/or curative measures for controlling disease vectors which arise as the result of the creation of favorable habitat sites	Incidence and prevalence of water related diseases	Part of environmental management costs		As scheduled
		Provide health education for the communities on the prevention of water and vector borne diseases (e.g. malaria, bilharzia etc.)	Number of trained people	Part of environmental management costs		As scheduled
		Control of water borne disease vectors through proper sanitation, draining ponded water downstream and at water distribution points	Avoidance and/or reduction of disease vectors	Part of environmental management costs		At all times
		Ensuring comprehensive pre employment medical examination	Whether the workers have been medically examined before employed	Part of planning costs		During preconstruction period

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Regular clearing of vegetation	Visual inspection	Part of environmental management costs		At all times
		Fencing of the constructed water bodies inorder to avoid human water contact	Percent decrease human water contact			
		Proper use and management of water systems as well as maintenance of water supply and sanation facilities	Part of environmental management costs	Performance of water resource management		As scheduled
				Effectiveness the water supply and sanitation facilities		
		Adequate maintenance of canals, ponds, etc. inorder to ensure the prevention of favorable habitat sites	Effectiveness of the maintenance facilities	Part of operating costs		Regularly

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Socio-economic Environment						
Waste disposal	Potential spillage may arise from collection and transport of scale debris as well as absence of sanitation facilities such as pit latrines	Adequate and proper functioning of waste collection	Effectiveness of waste collection approaches	Part of regular operating costs		During collection and temporary storage operation
		Portable debris catcher will be laid within the surrounding work areas	Visual inspection	No cost		Regularly
		Appropriate pit latrines which are sustainable to the local specific situation will be constructed	Increase in number of sustainable pitlatrines	Part of construction costs		During the pre construction period
		Training the communities on hygiene and equipment maintainance	Number of trained and skilled community members in maintaining the sanitation system	Part of normal maintenance costs		At all times
		Accessing safe water to beneficiaries by appropriate drainage facilities such as pipelines, channels, etc.	Performance of constructed drainage facilities	Part of normal pre construction costs		Regularly starting from pre construction period
		Provide training to communities on health and hygiene measures,	Number of trainees	Part of the environmental management costs		At all times
		Selection and sitting facilities, operation and maintenance of water supply and sanitation facilities	Number of trainees Change in attitude of the communities to be involved in such major tasks			

6.2.2. Matrix of EMP for Rainwater Harvesting

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	**COST OF MITIGATION/ ENHANCEMENT MEASURES**	RESPONOSIBLE AGENCY ORGANIZATION	**SCHEDULE**
Physico- chemical Environment						
Rain water harvesting and utilization techniques for different water activities: a) Roof and paved ground catchments b) Storage Tanks (Dams, ponds citterns)	Seepage resulting from expansion and contraction of clay soils as well as unawareness of the communities on how to build tanks and managing them	Provision of quality materials for constructing tanks	The quality of materials used	Part of subsidy and EMP costs	R/WAO, BF, NGOs	
			Soil stability			
		Proper site selection based on stability of soils	Number of Skilled farmers			
		Training farmers on how to build rain water harvesting tanks and managing them properly	Visual inspection			
	Decline in crop production due to the minimization of water supply resulted from siltation of tanks	Monitoring of the constructed water harvesting tanks during operation phases	Presence of check dams and silt traps			
		Protect water ways from erosion by constructing check dams and silt traps	Presence of sieve and fence.			
	Damage of check dams, water ways, silt traps, etc. during operation activities	Lining channels using vegetation/ fence as well as placing a sieve at the opening of the inlet pipes	Time record of inspection		DAs, BF	

EMP for Rain Water… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION /ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
Soico-economic Environment						
	Potential impact on demand of labour, capital cost and aggravation of water related diseases resulting from implementation of large reservoirs in limited areas	Cleaning the silt traps and sieve in a regular manner Check the tanks regularly so as to take prompt action of repairing them from damage such as cracks			BOH, NGOs, BF	
		Construct large number of smaller tanks close to each household Training of people on how to minimize/prevent water related diseases				
Public Health						
Operation of pond, spring and hand dung wells	Introduction and/or aggravation of major water and/or vector borne diseases from stagnant water sources	Taking preventive and/or curative measures for controlling disease vectors which arise as the result of the creation of favorable habitat sites	Incidence and prevalence of water related diseases	Part of environmental management costs		As scheduled

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION /ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
		Provide health education for the communities on the prevention of water and vector borne diseases (e.g. malaria, bilharzia etc.)	Number of trained people	Part of environmental management costs		As scheduled
		Control of water borne disease vectors through proper sanitation, draining ponded water downstream and at water distribution points	Avoidance and/or reduction of disease vectors	Part of environmental management costs		At all times
		Ensuring comprehensive pre employment medical examination	Whether the workers have been medically examined before employed	Part of planning costs		During preconstruction period
		Regular clearing of vegetation	Visual inspection	Part of environmental management costs		At all times
		Fencing of the constructed water bodies inorder to avoid human water contact	Percent decrease human water contact			
		Proper use and management of water systems as well as maintenance of water supply and sanation facilities	Part of environmental management costs	Performance of water resource management		As scheduled
				Effectiveness the water supply and sanitation facilities		

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION /ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
		Adequate maintenance of canals, ponds, etc. inorder to ensure the prevention of favorable habitat sites	Effectiveness of the maintenance facilities	Part of operating costs		Regularly

6.2.3 Matrix of EMP for Rainfed Crop Husbandry

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION /ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
CONSTRUCTION/OPERATION PHASE						
Physico-Chemical Environment						
Poor farming/ production techniques	Decline in agricultural productivity resulting from loss of loss of soil and biodiversity	Training farmers on the importance of preserving ecosystem and biodiversity	Number of trainees Percent increase in agricultural productivity	Cost obtained from cost recovery mechanism	PS, BOA, EPA ,ESTC	Regularly
		Ensuring on farm soil fertility improvement and off farm activities based on integrated agricultural extension system	Effectiveness of on farm soil fertility improvement practices	Part of EMP costs		As scheduled
		Supporting the farmers to ensure new technologies for production of crops	Efficiency and performance of new technologies in improving crop yield and soil production			
Removal of vegetation for crop cultivation as well as encroachment into pristine and marginal areas	Deforestation soil erosion and soil fertility reduction	Develop and encourage sustainable use of efficient alternative energy sources (e.g., solar, wind)	Alternative energy options and their implementation Enhancing protection of forest resources (e.g. developing tree nurseries)			Regularly
		Use improved stoves	use of improved stoves			

EMP for Rainfed Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
Agricultural inputs such as use of agro chemicals	Soil and water pollution through inappropriate use of pesticides and fertilizers	Undertaking adaptation and validation research on IPM in selected sampled areas	Presence of buffer zones along water bodies	Part of operating costs	MOA, BOA, Proponent, ESTC, EPA NGOs, EPB, PS	Regularly throughout the operating period
			Proportions of farmers adopting combinations of IPM techniques			
		Ensure appropriate use of IPM/ pesticides	Changes in patterns of pesticide use			
		Consider the use of both organic and inorganic fertilizers, as well as intercropping nitrogen-fixing plants	Increases in crop yields			
		Use buffer zone and/or re-afforest degraded areas along streams and river banks.	Presence of buffer zones			
			Soil conservation activities such as re-afforestation programme along river sides etc.			

EMP for Rainfed Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
Biological Environment						
Removal of vegetation for crop cultivation as well as encroachment into pristine and marginal areas	Potential effect on pristine and marginal lands	Avoid pristine and marginal areas	Reducing consumption of woods by improving cooking stoves	Part of operating costs	MOA, BOA proponent, ESTC, EPB,	Regularly throughout the operating period
Agricultural inputs	Damage to aquatic ecosystems and biodiversity	Judicious use of fertilizers and pesticides	Reduction of pollutants from aquatic system			
		Integrated pest management and use of agrochemicals	The use of IPM			
Mismanagement of water resources and scarcity of rain water	Drought caused by insufficient rain and potential conflict with other users	Consideration of drought resistant crop varieties.	Drought resistant and early maturing crop varieties	Costs obtained from cost recovery mechanism		
		Using rainwater harvesting mechanisms including small-scale irrigations	Improved water harvesting system and increased shelf life of crops.			
		Use of indigenous knowledge for identification of some cop up mechanisms	Strengthened of indigenous knowledge			
		Taking appropriate water management strategy	Efficiency of utilization of water			

EMP for Rainfed Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
Introduction of new plant species including genetically modified ones	Introduction of pant diseases pests	Importation of new seeds should be in accordance with national laws/regulations	Importance of new seeds in comparison with the local ones	No cost	Proponent in collaboration with relevant sectoral Agencies	Regularly
		Getting specific permit for introduction of new plant species from the concerned agency is required	Fullifilment of permitting requirements			
	Displacement of native species (traditional varieties) as the result of introduction of exotic species	Thorough research should be undertaken before using new species at a large scale.	Out put of the research	Part of operating costs		
	Population pressure on biological diversity and specific ecosystem	Relocation of people from environmental sensitive areas based on existing legislation requirement	Effectiveness of the intended reclocation mechanism	No cost		As scheduled
		Creating mechanism for controlling the influx of people into the threatened areas as well as other areas of special value	Implementation of the established mechanism for controlling in flux of people	No cost		Regularly throughout the operation period

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY ORGANIZATION	SCHEDULE
Encroachment of people to the project area	Decrease in productivity of marginal lands and fragile areas	Relocation of people from environmentally sensitive areas to other places	Increased productivity of marginal lands and other fragile areas	Part of resettlement plan costs		As scheduled
Socio economic Environment						
Agricultural inputs such as the use of agro chemicals	Potential human and animal health hazards resulting from inputs of pollutants	Preventing and/or controlling health problems by treating water resources by appropriate treatment techniques	Change in prevalence and incidence of health indicators	Part of operating costs	Proponent in collaboration with relevant stakehodrs	Regularly throughout operation period
Introduction of new seeds including genetically modified ones	Rise in incidence of communicable diseases due to introduction of new diseases non endemic in host communities	Proper identification of domestic water sources and safeguarding from unnecessary contamination	Water quality	Part of EMP costs		
		Appropriate warning signs	Installation of warning signs	Part of operating costs		
		Ensuring comprehensive pre-employment examinations	Whether the workers are examined before employed	No cost		
		Intensifying education campaign on preventive health care of workers	Reduction of communicable diseases	Part of operating costs		
		Establishing local health institutions for undertaking preventive and/or controlling communicable diseases such as malaria, HIV,etc.	Sufficiency of local health facilities	Part of operating costs		
			changes in baseline health indicators			

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COSTOF MITIGATION/ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
			Effectiveness of HIV/ AIDS and other communicable diseases health programs			

6.2.4. Matrix of EMP for Irrigation Crop Husbandry

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY/ ORGANIZATION	SCHEDULE
PRECONSTRUCTION/ CONSTRUCTION PHASE						
Physico-chemical Environment						
Poor design and construction of reservoir and canals	Seepage below the reservoir and along the primary canals	Use of proper designed constructed reservoir and canals	Check-up of the design of the reservoir and primary canals	No cost	BOWR; PS	At the end of the planning period As scheduled
		Use of appropriate construction materials that minimize/eliminate seepage	Reduction of seepage	Part of construction costs		
			The quality of constriction materials			
Site clearing; excavation; leveling construction of access roads;	Deforestation and soil erosion problems from canals ditches; etc.	Re-vegetation of newly exposed areas and surroundings of the reservoir	Areas covered by vegetation	Part of the operating cost	BF; NGOs; WAO	As scheduled
		Appropriate use of soil conservation measures such as earth stone bunds; terraces; etc.	Establishment of soil conservation measures			

EMP for Irrigation Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY ORGANIZATION	SCHEDULE
		Proper handling/management of construction materials and the area	Handling of construction materials			
	Soil and Water salinity problem	Training of farmers	Number of skilled farmers		Proponent in collaboration with relevant stakeholders	Regularly of where necessary
		Provision of adequate drainage facilities and maintaining them	Establishment and proper function of drainage facilities			
		Soil salinization due to water logging and absence of drainage in the project areas	Grow less-water demanding and salt-tolerant crops water quality			
			Provision of adequate drainage facilities such as drainage canals for removing salinity Crop-water requirements and soil features			
			Avoid irrigating saline-prone and poorly draining soil types (e.g. vertisoles) Level of ground water			

EMP for Irrigation Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY/ / ORGANIZATION	SCHEDULE
			Leaching of salts by flushing			
			soils periodically Sufficient drainage facilities			
Improper use of Agrochemicals	Soil and water pollution and the resulting consequence of decline in crop productivity of the land, poor returns to farmers	Appropriate use of agrochemicals based on the national guidelines	Use of on agrochemicals as per the requirement	Part of operating costs		Regularly
		Application of fertilizer based on soil analysis	Soil tests			
		Apply soil reclamation and fertility enhancement	Soil fertility			
		Application of IPM	IPM in place			
		Implement more efficient irrigation methods (e.g. dip instead of surface irrigation)	Irrigation methods			
		Improve irrigation regime to minimize deep percolation and surface runoff.	Surface and ground water tests			
		Application of fertilizers based on soil analysis	crop production			
	Contamination of ground water caused by higher	Ensuring appropriate water use management	Improved water management			

	salinity; nutrients and agrochemicals	Wise use of agrochemicals and other inputs	Improvement in appropriate use of agricultural inputs			

EMP for Irrigation Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY/ ORGANIZATION	SCHEDULE
		Training of farmers on how to use agrochemicals and management of irrigation waters	Farmers skills change			
	Losses of productivity of the irrigated sloppy land (above 5%) due to soil erosion	Selection and construction of appropriate on-farm watercourse conveyance structures	Effectiveness of the structures in stabilizing soil transport with in the command area	Part of the rehabilitation costs	R/WAO, BF, NGOs	Regularly
		Stabilize run-off conveyance by appropriate soil and water conservation structures	Establishment of the conservation structures			
		Training of farmers on water and soil conservation activities and management	Number of skilled trainees			
	Declining of crop yields of the lands due to over intensive use of them and mono-cropping	Use of appropriate fertilizers which would have importance in producing crops in a sustainable manner Crop rotation, inter-cropping, fallow	Increment of crop yields	Costs to obtained from cost recovery mechanism	Same as above	
			Attitude of farmers in applying crop rotation, etc.			
			Change in farmer's income			

EMP for Irrigation Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY /ORGANIZATION	SCHEDULE
Biological Environment						
Site clearing; excavation; leveling construction of access roads	Loss of biomass and biodiversity as well as damage to the aquatic system	Put the sites of the construction activities far away from those areas which are rich in biodiversity	The sitting of construction activities	Part of the planning costs		Regularly
Use of water for crop production	Reduction/loss in fish species diversity and abundance Damage to downstream ecosystem and wetlands. Saline aquifers/ groundwater pollution	Maintaining fish Species diversity by means of spill ways/fish passes proper modification of outlet/water release etc.	Presence of spill ways; fish species diversity and abundance			Regularly throughout the operating period
		Proper management of reservoir so as to suit downstream requirements	Water disposal site; designated wetlands (if necessary)			
		provision of separate disposal channel for saline/used water disposal	Comparison of extraction rates with recharge rates			
		Designate land for wetlands				

		Ensuring that extract of groundwater is at or below recharge rates				

EMP for Irrigation Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY /ORGANIZATION	SCHEDULE
Socio-Economic Environment						
Site clearing; excavation; leveling construction of access roads	Dislocation of people from the reservoir area and sites to be irrigated	Provision of proper compensation for lost resources	Compensation made for displaced people as per the recommendation and allotted time		Proponent, BOWR, BOH, BOA, BF	As scheduled
	Complain of downstream users and associated social conflicts	Under taking proper management of irrigation water;	Reduced frequency of conflicts /dialogue;			
	food security losses for non-beneficiaries and high management costs	respect ion and strengthening of social norms and user association rules	low management cost; respected norms/rules			
Public Health						
	Introduction and aggravation of water and vector borne diseases (e.g. malaria, schistosomiasis	Training of local people on how to prevent and control water and vector born diseases	Number of trainees	Part of operating costs	Proponent, BOH, BOWR, BOA, NGOs	Regularly

		Removal of vegetation from reservoir & canals as well as maintaining of irrigation infrastructures	Changes in number of vectors			

EMP for Irrigation Crop… (Cont'd)

PROGRAMME / PROJECT ACTIVITIES	IMPACTS DESCRIPTIONS	MITIGATING/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONOSIBLE AGENCY /ORGANIZATION	SCHEDULE
		Avoidance of stagnant water as well as slowly moving water	Visual inspection			
		Filling or draining of borrow pits along canals and roads	Borrow pits to be filled			
	Impacts on human health which may arise from the use of waste water in irrigation	Provision of alternative sources of potable water	Availability of alternative potable water sources			
		Training the communities on how to manage potable water	Number of trained people on how to manage potable water			
		Waste water treatment (e.g. settling ponds) prior to use	Waste water treated			

		Develop and implement standards for wastewater use	Waste water treatment as per the established standards			

6.2.5 Matrix of EMP for Animal Husbandry

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION /ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
CONSTRUCTION/OPETATION PHASE						
Physico-chemical Environment						
Inappropriate livestock management activities (e.g. overgrazing and misbalancing foraging)	Soil erosion and soil compaction caused by overgrazing and imbalanced foraging	Building the capacity of herders on how to reduce the problem of overgrazing and use of rangelands in an efficient manner	Reduction of overgrazed areas	Part of EMP costs	Proponent, MOA, NGOs, R/WAO, community level organizations	Regularly
		Undertaking preliminary assessment inorder to get baseline data for livestock carrying capacity of the area	Whether carrying capacity of the area maintained or not	Part of EMP costs		During preconstruction period
Installation of new/improved water supply	Deterioration of water quality Caused by livestock and human contamination	Ensuring appropriate water management practices so as to reduce water contamination	Effectiveness of water management practices	Part of operating costs	Regional Environmental agencies, BOWR,	Throughout the construction and operation period

		placing appropriate regulatory water use mechanisms inorder to prevent exhaustion of water resource	performance of regulatory water use mechanisms		Proponent, PS	As scheduled
Industrialized livestock production system	Eutrophication of water bodies by surplus nutrients from manure	prevent leaching by storing it in a proper place	Reduction in leaching of nutrients	Part of operating costs	RWAO, EPB, PS, proponent	At the beginning of construction period
		Restrict nutrients inputs in animal feed	Regular checking			

EMP for Animal… (Cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
	odor resulting from volatilization of ammonia and spread of disease and pathogens	Treating manure inorder to prevent leaching of ammonia and spread of diseases and pathogens	Reduction of leaching		BOH, R/WAO	
			change in prevalence and incidence of diseases			As scheduled
Biological Environment						
Inappropriate livestock management activities(e.g. overgrazing and imbalanced foraging)	Loss of biodiversity and impediment of livestock growth and production	Rehabilitate overgrazed areas through reduction of pressures on grazing areas and/or introduction of modern management practices (e.g. forage development and constructed terracing)	The rehabilitated coverage areas	Part of the rehabilitation costs	BOA, DAS, Regional Environmental Protection Agency, proponent	Regularly during Operation period
			Changes in flora indicators			
			Increased forage development,			

			terracing etc. in backyards farms and marginal lands			At all times
	killing of wildlife resulting from competition of livestock with wild life in protected areas for the scarce resources(e.g. water, fodder)	Ensuring sufficient supply of fodder/water for livestock and wildlife	sufficiency of fodder and water points	costs to be obtained from subsidy as well as recovery system	BOA, R/WAO, EPB, EPA, NGOs, DAS, proponent	Regularly throughout the operation period
			Decrease of wildlife death			

EMP for Animal (Cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Integration of community based co-management practice	Functionality of the identified co-management practice			
		Facilitating the condition to share the parks in come with livestock herders	Effectiveness of the created benefit sharing system			
	Reduction of utilizable plants by introduction of less valuable ones	Maintaining biodiversity of the area by raising the skill of the concerned stakeholders	Species diversity			
Industrialized or conventional herders	Reduction of genetic diversity of domestic animals and degradation of habitats	appropriate research will be carried out on those new livestock species so as to reduce their impact on biodiversity	Research output	Part of subsidy and recovery costs	ESTC, DAS, BOA, MOA, proponent	At the beginning of construction stage or where necessary

Introduction of new livestock species		Envisaging pilot test on those new livestock species in terms of their suitability to the local environment (e.g their resistances to diseases, resistance to local environment)	pilot test result			prior to operating phase

EMP for Animal …(Cont'd)

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST MITIGATION/ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Introduction of invasive/alien plan t species	Loss of genetic diversity of plant species cased by alien plant species	Ensure that new forage seeds are in line with pertinent regulations/ law	Suitability of new forage seeds to the local environment	Part of subsidy and recovery costs		At the beginning of operation period
		Envisaging research on those intended new forage seeds before they introduced in the local environment	Outcome of the research			
			Increase in forage supply			
	Loss of biodiversity as well as decrease in productivity of marginal lands duet to population pressure	designing the project in such a manner to maintain human and livestock population with carrying capacity of ecosystem	change in population growth			Throughout the operation period

		Considerations of permitting requirements for limiting of immigration of people at environmentally sensitive areas.	Practicalities of permitting requirements in limiting immigration of people			Regularly throughout the entire operation period

EMP for Animal… (Cont'd)

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST MITIGATION/ENHANCEMENT	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Socio-economic Environment						
Inappropriate livestock management activities(e.g. overgrazing and misbalancing foraging)	Encroachment of rangelands and the possible rise of conflicts between livestock herders and others	Minimize conflicts of stakeholders through discussions to be held with them according to the existing legal rights, laws etc.	Reduction of conflicts between stakeholders	Part of the rehabilitation costs	BF, BOA, RC, FAS, R/WAO, EPB, proponent	Regularly throughout the operation period
		Ensuring diversification of alternative livelihoods and improving credit access to the disadvantaged groups	Minimized pressure on rangelands			
			Extensive package of alternative livelihoods			

			presence of local savings and credit organization			
Industrialized or conventional herders Introduction of new livestock species	Introduction and/or aggravation of new diseases to livestock/wildlife	Precautionary measures such as envisaging appropriate research is required before the introduction of new species	Implementation of precautionary measures as Per the requirement			

EMP for Animal… (Cont'd)

PROJECT ACTIVITIES	IMPACTS DESPRICTION	MITIGATION/ ENHANCEMENT MEASURES	INDICATORS TO BE MONITORED	COST MITIGATION /ENHANCEMENT	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Introduction of invasive/alien plant species	Introduction and/or aggravation of communicate livestock and human diseases	Establishment of local health institution for controlling epidemic diseases	changes in baseline health indicators	Part of the operating costs	MOA, BOA, DAS, EARO, R/WHP, proponent	
		providing preventive health education programme for the local livestock herders	performance of local health education porgramme			
Industrialized livestock	Damage of aquatic and wet land habitats and biodiversity from			" "		Regularly

production system	excess use of manure as well as release of heavy metals from production system	Treating and/or storing manure by using appropriate techniques	placement and performance of treatment facilities			Regularly throughout constriction period
		Use of the national laws/regulations to minimize/control pollution	Effectiveness of controlling pollution as per the national environmental requirements			Regularly

6.3: Matrix of Environmental Management Plan (EMP) for Road Programmes and Projects

PROGRAMME /PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGA NIZATION	SHEDULE
PRE-CONSTRUCTION/CONSTRUCTION PHASE						
Physico- Chemical Environment						
Construction of access roads and excavation works for brick	Siltation and sedimentation of local creeks	Silt traps to be constructed immediately down slopes of new access roads	Presence of silt traps	Part of construction cost	EPA,MoA, MoWR, proponents, ERA	At the end of constructio n period

quarries, borrow sites		Establishment of retentation ponds to reduce sediment load before water enters creeks	Part of construction cost	Effectiveness (performance) of retention ponds		During the entire operation period
	Water and soil pollution resulting from release of pollutants (e.g. oil, greases) of the construction machineries	Construction materials will be maintained regularly so as to avoid accidental spills	Accidental spill reduction	Part of operating costs		Regularly
		Collection and recycling accidental spills	Water and soil quality			
	Soil instability which can lead to land slides	Due consideration of route alignment should be made so as to avoid inherently unstable areas	Options of route alignments	Part of construction costs		As scheduled

EMP for Road… (Cont'd)

PROGRAMME /PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
	Destruction of buildings, vegetation and soil in the right of way, borrow pit	Destruction will be remediated by giving due consideration of alternative alignments	Consideration of alternative alignments	Part of the design cost		During pre construction period

	sites, waste dumps, etc.	Ensuring that all excavated sites should be restored to its original condition through reclamation measures	Whether the excavated sites are restored back to their original conditions or not	Part of normal maintenance cost		As scheduled during operation periods
Road cuts and fills	Erosion of lands below the road bedside due to concentrated outflow from covered or open drains	provision of sufficient drainage outlets will be made so as to reduce the problem	Adequacy of number of drain outlets	Contractor's account	EPA,MoA, MoWR, proponents, ERA	As scheduled
		Inorder to avoid and/or reduce the road bedside erosion, lining of receiving surface with stones and concrete will be done	Percent decrease of soil erosion	Part of monitoring cost		During the entire operation period

EMP for Road… (Cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZ ATION	SHEDULE
	Occurrence of landslides, slumps, slips and other movements in road cuts and steep areas	Limitation of earth moving to dry periods	whether earth moving is done as per the suggested time	Visual inspection	At all times	At the end of construction period

		Route alignment should be made so as to avoid inherently unstable areas	Route alignment as per the result of the study	Part of the planning costs	ERA proponent the concerned	During the entire operation period
		Protection of most susceptible surfaces with appropriate structures such as concrete walls, dry wall masonry, Gabon's, mulch	Stability of the surfaces	part of construction costs	EPA,MoA, WRM proponents contractors	Throughout the construction and operation periods
						During the entire operation period.
		Protection of drainage channels with berns, straw or fabric barriers	Effectiveness of protective structure	" "		
Use of chemicals and other related toxic materials for dust control vegetation clearance, etc.	Contamination of land especially those of environmentally sensitive areas caused by indiscriminate use of those chemicals	Use of non-chemical methods as best alternatives for controlling dust	Application and use of non chemical methods	part of operation expenses	EPA and other regulatory bodies	During the entire operation period

EMP for Road… (Cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE

		Ensuring regulation of transport of toxic materials by using national standards/ guidelines	Effectiveness in controlling transport of toxic materials as per the prepared national environmental requirements	No cost		During construction and operation periods
		Prohibition of toxic wastes transport in ecologically sensitive areas should be strictly made based on the prepared national regulations and/or guidelines	Performance of the national laws and regulation	No cost	The concerned environmental agencies	
Immigration of people in and around the project area	Destruction of buildings, vegetation and soil in the right of way occupied the highway	Destruction will be remediated by giving due consideration of alternative alignments	Whether alternative alignments are in place and working use and per the result output	No cost	ERA the concerned environmental agencies	Through out the construction period, or where necessairy

EMP for Road… (Cont'd)

PROGRAMME/PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENTMEASUREMES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Ensuring that all excavated sties should be restored to its original condition through reclamation measures	Restored sites as per the recommendation	Part of construction costs	ERA, proponent, contractor	At the end of construction period
		Adequate compensations to the dislocated people will be given	Effectiveness of the compensation measures	Part of resettlement plan costs		During the preconstruction period
Biological Environmet						
Construction of access roads and excavation works for brick quarries, borrow sites	Loss of vegetation, territorial wildlife habitats, biological resources, etc resulting from construction equipments (e.g. large graders and bulldozers	Identify best sites for construction activities	Whether the identified sites are placed at the right places	No cost		During the design period
		Use of environmentally sound construction methods	Appropriateness of the construction methods	Part of construction costs		At the beginning of the construction period

PROJPPROGRAMME/PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Give due consideration of route alignment according to location of fragile, unique aspects areas of etc	Operation of route alignments Achievement in maintaining biodiversity	Part of the planning costs		At the beginning of preconstruction period
Construction of Access Roads	Potential effects on hydrological regimes of wetlands.	Appropriate action needs to be taken in realigning of the route so as to void wetlands	Verifying the realignment of the road	part of the planning costs		At the end of the planning stage
		Proper measures will be taken in stalling of road infrastructures (e.g. culverts) as per the criteria from prior hydrological surveys	Installation of infrastructures as per the findings of hydrological surveys	part of the design costs		During the end of the planning stage

PROJPPROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Road Cuts and Fills	Destruction or damage of terrest orial wildlife habitats, biological resources etc.	Alignment should be made with minimal effect on the biodiversity and different ecosystems	Achievement in maintaining biodiversity	part of the planning costs	EPA, MOA, ERA, proponent	At all times
		Appropriate measures will be undertaken in preserving the biodiversity and ecosystems adjacent to the road after completion	Effectiveness of the proposed measures	part of the EMP costs		At all times
Socio-economic Environment						
Construction of access roads and excavation works for brick quarries, borrow sites	Destruction of buildings, vegetation and soil in the right of way, borrow pit sites, waste dumps, etc.	Providing appropriate compensation measures for the displaced people from the sites	People's reaction to the types of compensation which they have been provided	Part of resettlement plan costs		At the end of design period

EMP for Road… (Cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTIO N	MITIGATION/ ENHAN- CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGANI ZATION	SHEDULE
In migration of People in and around the project areas	Serious social and economic disruption of the areas may occur as the result of illegal invasion of indigenous peoples by squatters and poachers	Controlling of poachery in the areas will be made by using an appropriate law and regulation	Percent decrease of poachers into the area	No cost	EPA, MoA, MoH, the concerned regional agencies	Through out the entire construction and operation periods
		If the problem of squatters is unavoidable, some precautionary measures will be sought to minimize conflict of interest	Effectiveness of mechanism in reducing conflict of interest	Part of planning costs.	EPA, MoA, MoH, the concerned regional agencies	
Construction of access roads	Disturbance of settlements and potential effects on employees health caused by high intensity of noise and dust generated from construction machinery, plant process and transport facility	Regularly sprinkling of temporary roads with water	Periodical inspection	No cost		Regularly during the construction period

EMP for Road… (Cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGAN IZATION	SHEDULE
		Installing of mufflers on equipments as well as maintaining them on a regular basis should be made	Performance of installed mufflers in controlling the voice	Contractor's account		
		Supplying the required personnel protection equipment	Use of the equipments by the employees	Part of the environmental management costs		
Road cuts and fills	Water supply scarcity due to reduction of surface flows	Undertaking preliminary assessment and design of appropriate drainage works so as to minimize changes in surface flows and make adequate to local conditions	Changes in surface flows	part of construction costs	EPA,MoA, Mow proponents the concerned regional stakeholders	Throughout the construction. or where necessary

EMP for Road… (Cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURES	RESPONSIBLE AGENCY/ORGAN IZATION	SHEDULE
		Grade limitations will be made so as to avoid cutting and filling where scenery would be spoiled	Adequacy of water supply to the local users	part of construction costs	EPA,MoA, Mowh proponents	Throughout the construction. or where necessary
	Loose of visual aesthetics of the areas resulting from marred landscapes (scars from road cuts, slumps, etc.)	Tourist access roads should be planned for accessing visual aesthetics	The restored aesthetic beauty of the area	part of construction costs	EPA,MoA, Mowh proponents	During the feasibility study period
		Maintenance and/or restoration of roadside vegetation will be carried out	Access road facilities Total area planted along the road side	During the design and construction periods.	EPA,MoA, Mowh proponents	
Road operation and maintenance	Environmental and social disruption caused by construction camps	Careful sitting, construction and management of construction camps	sitting of the construction camp Efficiency and performance of the management of construction camps	part of preconstruction and construction costs	The concerned road authority, proponent	Through out the preconstruction and construction

PROJPPROGRAMME/PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENT MEASURE	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
OPERATION PHASE						
Physico- Chemeical Environment						
Establishing drainage facilities and impoundment of water	Potential release of oil, grease and fuel from equipment yards that may cause soil and water contamination	Safety precautionary measures (e.g. treatment of wastes and chemicals) will be incorporated to avoid accidental spills	The efficiency and performance of precautionary measures	Part of regular operating expenses	Proponent, the concerned environmental agencies	As scheduled
	Risk of accidents such as explosions and fires resulting from transporting of environmentally dangerous substances such as gas , oil, etc.	public awareness and safety operational procedures should be enforced	Increase in number of skilled people for effectively implementing operational procedures	Part of operating expenses		As scheduled
			Effectiveness of safety operational procedures			
Biological Environment						
Establishing drainage facilities and impoundment of water	Effect on the aquatic communities due to loss of normal water flows	Undertaking controlled management and distribution of water resources through release programme	performance of watershed management	No cost	The concerned Road Authority and environmental agencies	

MP for Road… (Cont'd)

PROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST OF MITIGATION/ ENHANCEMENTMEASURE	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Operating schedule to take quality of released water	Maintenance of quality of water as per scheduled operation	No cost	Proponent	As scheduled
		Adequate and proper collection and recycling of lubricants	Improved water quality	Part of operating costs	Proponent and the concerned environmental agencies	As scheduled
Opening main and access roads for transport	Creation of favourable situation such as new pathways for alien invasive species as well as for propagation of disease vectors and pests	Plant and animal sanitation service and related check points will be established so as to avoid the said problem	Proper functioning of plant and animal sanitation services	No cost	EPA, MoA, MoH, the concerned regional agencies	Through out the entire construction and operation periods

PROJPPROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST MITIGATION/ ENHANCEMENTMEASURE	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
Socio-economic Environment						
Road operation and maintainance	Creation of favourable habitats (stagnant water bodies) in borrow pits, quarries, etc for disease vectors	Appropriate precautionary measures such as improving landscaping, filling of drainage will be made so as to avoid creating favorable habitats for diseases vector	percent decrease of favorable habitats for disease vectors	Part of operating costs	The concerned road authority, proponent	As scheduled
		Use properly designed culverts, bridges and ditches	Efficiency and performance of the designed infrastructures		Proponent the concerned regional authorities	At all times
		Preserving natural habitats along streams, steep slopes, and ecologically sensitive areas	Visual inspection to verify the preserved natural habitats		Proponent in collaboration with the concerned stakeholders.	At all times
		Construct and use of well designed culverts and bridges to channel water resources	Establishment and performance of culverts and bridges		proponent in collaboration with the concerned stakeholders	At all times

PROJPPROGRAMME/ PROJECT ACTIVITIES	IMPACTS DESCRIPTION	MITIGATION/ ENHAN-CEMENT MEASURES	INDICATORS TO BE MONITORED	COST MITIGATION/ ENHANCEMENTMEASURE	RESPONSIBLE AGENCY/ORGANIZATION	SHEDULE
		Use environmentally sound road engineering practices so as to ensure protection against soil erosion from steep slopes and water run off	The performance and function of engineering practice		Proponent, contractor	As scheduled
Vehicular traffic and transport	Potential risk to human health and environment that may result in spills of toxic materials	Incorporation of safety measures and emergency plan during the design stage	establishment and implementation of OHS and emergency measures	part of the operation costs		Throughout the construction and operation period
		Transporting of hazardous materials will be made on some other designated special routes	Effective implementation of the procedure	No cost		At all times
	Potential effect on individual properties and other land uses (e.g. agriculture, forestry)	Appropriate compensation arrangement should be carried out.	Effective implementation of compensation	No cost	Proponent	As scheduled

REFERENCES

Birley (1991), Guidelines for Forecasting the Vector-borne disease implications of Water Resources Development. PEEM Guidelines Series 2. Second edition PEEM Secretariat, WHO, Generva. WHO/CWS/91.3

Bova Nova and Goldemberg, (1999), People and Large Dams, Social Performance of large Dams

Brandt and Hassan (200), Working paper on Cultural Heritage Management around Large Dams

Bureau of AFrica; Office of Sustainable Development (June 1996); Environmental Guidelines for Small-scale Activities in Africa

Catterson et al (1999), Programmatic Enviromental Assessment of Small-scale Irrigation in Ethiopia. Catholic Relief Services, U.S. Catholic Conference, Baltimore, Maryland.

Environmental Guidelines for Small Scale Activities, Chapter 13 Livestock Production **http:// www.encapafricea.org/EGSSAAsectionsMarch2003/Env%** Guidelines %2013Livestock%Graphics%20%201.pdf

EPA (July 2002), Environmental Impact Assessment Guideline Document , Addis Ababa

Federal Republic of Nigeria (2002), National Action Programme to Combat Desertification and Mitigate the Effects of Drought- Towards the implementation of UNCCD and mitigate the effects of drought in the country

Hune Nega (September 2000), Sustainable agriculture : Concepts Principles and Practices Rain water Harvesting and Utilization Techniques-NOVIB Partners Forum on sustainable Land use Lecture notes on Stainable Land Use

IIRR (2002), Managing Dryland Resources-An Extension manual for Eastern and Southern Africa. International Institute of Rural RE-construction, Nairobi, Kenya.

Impact Assessment Service of EPA (June 2003), Environmental and Social Management Plan (ESMP) for Agricultural Support Project

Jobbin, (1999), Case Study of Tucurui Dam, India World Commission for Large Dams

Keating, M. (1993), The Earth Summit's Agenda for Change. A Plain language version of Agenda 21 and the other Rio Assessments centre for our common Future, Geneva, Switzerland

Menzi, H., Minimizing Environmental Impacts of Livestock Production through Good Manure and Nutrient Management. Swiss College of Agriculture (SCA), Ch-3052, Zollikofen, Switzerland.

Ministry of Finance and Economic Development (May 26, 2003), Ethiopia: Poverty Reduction Support Policy Matrix of SDPRP

MOFFD (2002), Ethiopia: Sustainable Development and Poverty Reduction Programme. Federal Democratic Republic of Ethiopia. Addis Ababa, Ethiopia

Morse and Berger, (1999), Social Impact of Sardar Sarovar Dam, India; contributing paper for World Commission on Dams

Rana et al (1999), Livestock In Mixed Farming System of the Hindu Kush-Himalayas: Trends and sustainability. FAO, ICIMOD.

Stockle, C.O. Environmental Impact of Irrigation: A Review. State of Washington Water Research Center. Washington State University

The World Bank (2002), The Environment and the Millennium Development Goals

The world Bank (May/1995) Environmental Assessment Sound Book; Volume II Sectoral Guidelines Washington D.C, Fourth Printing

United Nation Conference on Environment and Development (1992), Agenda 2

WCD (2001), Report of World Commission for Dams. Dams and Development a new framework for decision- making, Brazil

Yonas Tekelemichael (December 2002), The Role, Status and Effectiveness of Environmental Impact Assessment in Ethiopia: a paper presented on the First Meeting of East African Directors Responsible for Environment and Economic Planning, held in Nairobi Kenya from 9th to 11th December, 2002

Yonas Tekelemichael (January 2003), Vision for Impact Assessment Published in the Bilingual Magazine of the Environmental Protection Authority