



EASTERN NILE SUBSIDIARY ACTION PROGRAM (ENSAP)

EASTERN NILE TECHNICAL REGIONAL OFFICE (ENTRO)

## WATERSHED MANAGEMENT PROJECT

Project Implementation Plan

Volume 3 – Annex F

**Social & Environmental Assessment**



**Eastern Nile Regional Technical Office  
(ENTRO)**

Integrated Watershed Management (Ethiopia)  
Watershed Project, Fast-Track Project  
Detailed Project Preparation

Project Implementation Plan  
Volume 3 – Annex F  
**Social & Environmental Assessment**

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Integrated Watershed Management (Ethiopia)

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Detailed Project Preparation

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**Volume 3 – Annex F**

**Social & Environmental Assessment**

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This report is presented in four volumes as listed below:

## **Volume 1: Project Implementation Plan**

### **Volume 2: Annexes A-E**

- A. *Project area description*
- B. *Unit cost guidelines*
- C. *Project cost estimates*
- D. *Economic and financial analysis tables*
- E. *Guidelines for community action planning and implementation*

### **Volume 3: Annex F**

- F. *Social and environmental assessment*

### **Volume 4: Annexes G-K**

- G. *Training plan*
- H. *Terms of Reference for project staff*
- I. *Monitoring and evaluation indicators*
- J. *Financial management plan*
- K. *Action plan for the first 18 months*

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# Acronyms

ACSI	Amhara Credit and Savings Institute
AfDB	African Development Bank
AIMO	Industrial Association of Mozambique
AMAREW	Amhara Micro Enterprise, Agricultural Research, Extension and Watershed Management Project
ANRS	Amhara National regional state
ARARI	Amhara Regional Agricultural Research Institute
BoARD	Regional State Bureau of Agriculture and Rural Development
BoFED	Bureau of Finance and Economic Development
BoWRD	Bureau of Water Resources Development
BP	Bank Policy (of the World Bank)
CAD	Computer Aided Design
CAP	Community Action Plan
CIT	Catchment Implementation Team
COOPI	Cooperazione Internazionale
CPCO	Catchment Project Coordination Office
CPSC	Catchment Project Steering Committee
DA	Development Agent
DAP	Dia ammonium phosphate (chemical fertilizer)
EA	Environmental assessment
EIA	Environmental impact assessment
EMP	Environmental management plan
ENSAP	Eastern Nile SAP
ENTRO	Eastern Nile Technical Regional Office
EPA	Environmental Protection Authority
EPLAUA	Environmental Protection, Land Administration and Use Authority
ETB	Ethiopian Birr
FAO	Food and Agriculture Organisation
FTC	Farmer training centre
GEF	Global Environment Fund
GIS	Geographic Information System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HH	Household
IDEN	Integrated Development of the Eastern Nile
IFAD	International Fund for Agricultural Development
ILRI	International Livestock Research Institute
IWMP	Integrated watershed management project
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau
KWC	Kebele watershed committee
LFA	Logical Framework Approach
LFM	Logical Framework Matrix
M&E	Monitoring and Evaluation



MCA	Multi-Criteria Assessment
MERET	Managing Environmental Rehabilitation in Transition to Sustainable Livelihoods
MoARD	(Federal) Ministry of Agriculture and Rural Development (in Ethiopia)
MOV	Means of Verification
MoWR	(Federal) Ministry of Water Resources (in Ethiopia)
MSC	Multi-Selection Criteria
MSF	Medecin sans Frontieres
NBI	Nile Basin Initiative
NELSAP	Nile Equatorial Lakes SAP
NGO	Non-Government Organization
NILE-COM	Nile Council of Ministers
NPV	Net present value
NRM	Natural Resources Management
NTFPs	Non-Timber Forest Products
O&M	Operation and maintenance
O&M	Operations and Maintenance
OARD	Offices of Agriculture and Rural Development
OP	Operational Policy (of the World Bank)
ORDA	Organisation for Rehabilitation and Development in Amhara
OVI	Objectively Verifiable Indicators
P&IWMD	Participatory and Integrated Watershed Management and Development
PC	Project Coordinator
PCU	Project Coordination Unit
PDO	Project Development Objective
PIPs	Project Implementation Plans
PLUP	Participatory Land Use Plan
PRA	Participatory Rural Appraisal or Participant Response Analysis
PSC	Project Steering Committee
PWS	Public water supply
SAP	Subsidiary Action Plan
SIDA	Swedish International Development Agency
SMS	Subject matter specialist
SWC	Soil and water conservation
SWHISA	Sustainable Water Harvesting and Institutional Strengthening in Amhara
TBIWRDP	Tana Beles Integrated Water Resources Development Project
TOR	Terms of Reference
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WB	World Bank
WBISPP	Woody Biomass Inventory and Strategic Planning Project
WFO	World Football Organisation
WFP	World Food Programme
WSS	Water supply and sanitation

# Summary, conclusions, recommendations and future Environmental Management Programme

## Summary

This environmental assessment report for the proposed Integrated Watershed Management Project is a self standing Annex to the Project Implementation Plan. This environmental assessment covers both the natural and social/economic aspects of the proposed project. The primary objective of the proposed project is to address the serious problems of erosion and land degradation in the river catchments flowing into Lake Tana by instigating a livelihood improvement program. The initial area for implementation of the project covers 80,602ha and split into five clustered areas located in three sub-catchments, the Ribb, Gumera and the Jema. The locations of these sub-catchments and their relationship to Lake Tana are shown in Figure 1. It is hoped that if successfully implemented then the levels of household livelihood in the area will improve, with the result that in the medium term (five years and onwards) there will be reductions in sediment run-off into the lake. The sedimentation is currently so severe that deltas are rapidly building up in the lake from the bed load sediment and the fine suspended sediment is remaining in suspension and flowing out of the lake into the Blue Nile river system.

The report reviews the existing regulatory framework for environmental assessment in both Ethiopia and also that of the World Bank, through whom the study and implementation of the proposed project would be managed. The main conclusions of the review of the regulatory requirements for environmental assessment for the proposed project are that, under the current Ethiopian system, the responsibility for following the procedures lies with the project proponent. At present the recommended proponent is the Bureau of Agriculture and Rural Development (BoARD) at the regional level. The wider project area all falls entirely within the boundaries of Amhara National Regional State and thus lies within its remit and not that of Federal Government. The regulatory function for reviewing and approving the environmental assessment work that is to be carried out by the project proponent lies with the Amhara Regional Environmental Protection, Land Administration and Use Agency. The framework for environmental assessment procedures in Ethiopia broadly conforms to international best practice and the Safeguard Operational Policies and Bank Procedures of the World Bank.

A baseline environmental profile of the proposed project area has been drawn up, covering both the natural and human/social and economic aspects of the area. The baseline profile has allowed identification of the existing environmental risks and constraints to rural development in the area.

The main natural and social risks and hazards have been identified and include:

- Erosion and Land Degradation (compounded by high human population densities)
- Unpredictable rainfall

- Food security
- Human disease
- Floods
- Storms (in the highlands)

The key existing environmental issues that act as constraints to rural development in the area have been identified and these have been taken into consideration when formulating the proposed interventions. They include:

- Human population pressure
- Land degradation
- Climate and weather patterns
- Rural energy balance
- Livestock numbers and management
- Human health conditions
- Education levels

Physical access (especially in the Jema sub-catchment including the Engule detailed study micro-watershed)

An initial needs assessment in the five detailed study micro-watersheds was carried out in the early part of the studies and the results were given in the Interim Report. This initial process allowed identification of the key groups of issues and could be related to development sectors. In late September and early October 2007 detailed group discussions were carried out in the communities at each of the five detailed study micro-watersheds and eight major development sectors were prioritised for each area. The results are shown in Table 1 of the report, with the eight sectors being prioritized overall and also for each detailed study micro-watershed. The key issues within each sector were identified and prioritised for each of the detailed study sub-watersheds. This information has provided a key input into the identification of the proposed interventions for the project.

A listing of the proposed interventions is given in Table 2 of the report. These interventions have been rearranged by discrete intervention type and are given in Table 3 to allow environmental screening to take place.

The proposed interventions have been screened for potential impacts (both positive and adverse) against a listing of key environmental issues found in the area. The results are shown in a matrix given as Appendix F.

## Conclusions

The main conclusion from the initial environmental screening of the twelve types of proposed intervention is that the only major potential adverse impacts could come from the irrigation component. These two impacts are the risk of increasing water related disease, particularly malaria, and the risk of groundwater abstraction for irrigation resulting in reducing the amount of water available for domestic supply. The latter impact can be minimized by appropriate design. To mitigate

the risk of increased malaria a targeted program for provision of treated nets may need to be considered. In order to remain a fast track project, the pre-condition that none of the interventions shall require any land acquisition can not be over-emphasized. A key environmental management requirement is to maximize the positive environmental impacts of the proposed interventions by careful detailed formulation during the initial phase of the project implementation program. There are no major issues of upstream and downstream induced impacts and constraints. The nature and degree of potential cumulative adverse impacts would need to be considered. However the main cumulative impacts are likely to be positive and the design of the interventions should be carried out to maximize these.

It is already possible to conclude that there will be no interventions that would be classified under the World Bank Category A and that it is not necessary to carry out a full World Bank detailed Environmental Impact Assessment. The following World Bank safeguard policies and procedures can be satisfied and there is no need to invoke the special measures needed if these could not be met:

- 4.04 Natural Habitats
- 4.09 Pest Management
- 4.10 Indigenous People
- 4.11 Physical Cultural Resources
- 4.12 Involuntary Resettlement
- 4.36 Forests

Under the Ethiopian regulatory framework for environmental assessment at least seven of the twelve types of intervention considered will require an EIA to be carried out according to the procedures managed by the Amhara National State EPA. The proposed implementing agency is the Amhara National State Bureau of Agriculture and Rural Development. Once their role is confirmed then they will be responsible, as the project proponent, to ensure that an EIA is carried out and submitted to the regulatory authority in a timely manner.

## **Recommendations**

It is recommended that from an environmental management point of view that the proposed project be given the go ahead following the regulatory requirements for environmental assessment in Ethiopia. Once the project proponent is confirmed then they should arrange for the necessary EIA work to be carried out and submitted to the regulatory authority for it to be reviewed in the required manner. It is imperative that these procedures are followed in a timely manner so that there is no delay in the proposed fast track approach that the project has been designed to follow.

## **Future Environmental Management Programme**

The next crucial step in the environmental assessment process can only be taken once it is finally confirmed who will be the project proponent. The recommendation is for this role to be entrusted to the Regional Bureau of Agriculture and Rural Development (BoARD). The proponent will then be responsible for arranging for an environmental assessment to be carried out following the

requirements of the Regional Environmental Protection, Land Administration and Use Agency. The PIP Environmental Assessment (Annex F) is structured in such a way that it can be used as a basis for a report required to be produced by the project proponent.

It must be remembered that the detailed interventions for each micro-watershed will be finally fixed in consultation with local people during the project implementation process.

The detailed environmental assessment work to be carried out by the project proponent should consider type interventions along the lines of the headings indicated in Table 3. Detailed discussions will be needed between the project proponent and the regulatory authority to establish a system for coping with the fact that the detailed nature, location and size of many of the interventions will not be finalized until the initial stage of the project implementation process, carried out in collaboration with local people.

Before, during and after project implementation there will be a need to monitor key environmental parameters to see if the project objectives are being met. These parameters are likely to include:

- Any changes in land degradation
- Sediment levels in the river system
- Household livelihoods, including health conditions and education levels
- Levels of agricultural production, including data on crops, forestry and livestock

A monitoring programme can be drawn up once the detailed nature of the interventions has been finalised.

# 1 Introduction

## 1.1 Background

The basic philosophy underpinning the proposed project is the goal of improving livelihoods for rural communities in the watersheds of the river systems flowing into Lake Tana. The waters of Lake Tana flow into the Blue Nile and then join the White Nile at their confluence in Sudan. The studies for the project formulation are being prepared for the Eastern Nile Regional Technical Office (ENTRO) as part of the wider Nile Basin Initiative.

The current situation with the relatively low levels of household livelihood experienced by people living within the feeder rivers of Lake Tana needs to be appreciated within the wider context of sustainable river basin management. The key to understanding this is the complex relationship between low levels of household livelihood and land degradation, with resulting erosion which is causing high sediment levels in the river system. Bed load sediment in the Ribb, Gumera and Jema rivers (see Figure 1 for their locations and Plate 1 for a satellite image of the area) is resulting in the development of bird's foot deltas in Lake Tana (see the time series of satellite images given as Figure 2). The suspended sediment in these three river systems is very fine and currently (October 2007) a significant amount of it remains in suspension (see Plate 2), resulting in it travelling through the lake and into the out-flowing Blue Nile river (see Plate 3). By successfully addressing the problem of low levels of household livelihood in the feeder rivers of Lake Tana it is hoped that the levels of erosion and sedimentation can be reduced. The key is to draw up and successfully implement a set of targeted interventions to address the livelihood problems identified by people living within the catchment area of Lake Tana. Such a targeted approach needs to be based on the principles of sustainable environmental management.

The formulation work for the proposed project has identified five micro watersheds within the Ribb, Gumera and Jema sub-watersheds that have been studied in detail. The objective is to implement targeted interventions over a five year period in these detailed areas and also adjacent micro-watersheds (see Figure 1) which total an area of just over 81,600ha. The effectiveness of these interventions would be monitored before considering expanding the program over the rest of the three sub-watersheds and also other areas feeding Lake Tana. The locations of these three sub-watersheds (sub-catchments on the map) and the five micro-watersheds (detailed study areas) are shown on the map given as Figure 1. The areas of the sub-watersheds and micro-watersheds are:

Ribb sub-watershed = 184,530ha  
Gumera sub-watershed = 210,332ha  
Jema sub-watershed = 48,797ha  
Total of the three sub-watersheds = 443,659ha

Baskura detailed study area = 137ha  
Kantai detailed study area = 384ha  
Zefie detailed study area = 229ha  
Enkulal detailed study area = 350ha  
Engule detailed study area = 319ha

Baskura and surrounding micro-watersheds = 10,893 ha  
Kantai and surrounding micro-watersheds = 11,668 ha  
Zefie and surrounding micro-watersheds = 12,969 ha  
Enkulal and surrounding micro-watersheds = 19,793 ha  
Engule and surrounding micro-watersheds = 25,279ha

Total micro-catchments in the intervention area = 80,602ha

## **1.2 Aims and Objectives of the Environmental Assessment**

Environmental Assessment (EA) encompasses both the natural environment and also the human and social environment, including the socio-economic. It is an integrated approach which takes into consideration the linkage between natural resources and the human use of these. Of particular concern is to understand how any man-made interventions (including physical, social and institutional) can change the nature of interaction between the natural and human environment. The fundamental aim of an environmental assessment is to ensure that all proposed interventions take existing environmental conditions into account (and ideally the interventions should be designed to be environmentally proactive) and ensure that no person is made worse off as a result of the proposed intervention. Any predicted adverse impacts are to be avoided as far as possible by modifications in project design, and where this is not possible then targeted mitigation measures are to be incorporated into project design to ensure that no body becomes disadvantaged as a result of the intervention.

Environmental Assessment is a continuous process throughout the project formulation, design, implementation and operational stages of the development cycle. The initial task is to identify existing environmental issues and concerns, as well as environmental factors that could act as constraints upon the range of possible interventions being considered and that are likely to influence the effectiveness of these proposed interventions.

There is a requirement that Environmental Assessment is carried out in a participatory manner and this is specifically outlined in World Bank Operational Policy 4.01 on Environmental Assessment. The overall project formulation approach being followed for the proposed project uses participatory methodologies that allow local people to articulate their needs and expectations. As part of this participation process a needs assessment has been carried out in the five detailed study areas. Many of the issues raised directly concern environmental conditions in the wider study area (including soil erosion and low crop yields) but they also include such problems as the lack of adequate access to safe drinking water, education and all weather access. The identification and

prioritization of livelihood issues with their causes and possible solutions has formed the basis for intervention formulation.

The aim of the environmental assessment of the proposed project is to screen the identified interventions, by following World Bank safeguard policies and procedures, to ensure that the proposed project will be environmentally sound and sustainable.

### **1.3 Methodology for Environmental Assessment**

#### **1.3.1 International Best Practice for Environmental Assessment**

There are internationally accepted best practices for environmental assessment and these are articulated in the World Bank safeguard policies and procedures, specifically OP/BP 4.01 on Environmental Assessment. A review of the regulatory framework for environmental management in Ethiopia, and also for World Bank managed projects, was carried out by the international environmental consultant during August 2007 and submitted to ENTRO in September 2007 (See Halcrow et al, August 2007a). The review included consideration of all relevant national policies, legislation, regulations and guidelines. The main items in the regulatory framework are summarized below (along with the institutions involved and their remits and responsibilities), specifically concentrating on items directly related to the environmental assessment process. In addition recently obtained procedures for environmental assessment at the regional level have been added.

#### **1.3.2 Ethiopian Federal Government Regulatory Framework for Environmental Impact Assessment**

The basis for the Federal Government regulatory framework for Environmental Impact Assessment (EIA) is the Federal Environmental Impact Assessment Proclamation 299 of 2002. The proclamation specifies the types of activities and interventions that require EIA and mandates the Federal Environmental Protection Agency (EPA) to draw up procedures, regulations, guidelines and standards for achieving this. These include:

- The Environmental Impact Assessment Guideline Document of May 2000
- The Environmental Impact Assessment Procedural Guidelines Series 1 of November 2003

Chapter 5 of the EIA Guideline of May 2000 contains sections on dealing with EIA for specific sector based or intervention specific development. These comprise:

- Agriculture
- Industry
- Transport
- Mining
- Dams and Reservoirs
- Tannery
- Textiles



- Hydropower Generation
- Irrigation Projects
- Resettlement Projects

The most relevant of these documents for the proposed project is the sector guideline for agriculture which identifies the main environmental issues in the sector and outlines their sources, causes and impacts. Recommendations are also given for the management of these environmental issues and concerns. In addition there are reportedly separate EPA guidelines for the EIA for Soil Conservation on Cultivated Lands, Livestock and Rangeland Management and Water Supply, although some of these may have now been in effect subsumed into the 2000 guideline.

The EIA Procedural Guideline of November 2003 outlines the framework for EIA in the country following the requirements of Proclamation 299/2002. Importantly it states under which circumstances a full EIA is required and that such an EIA shall be prepared by the proponent of the proposed intervention and following the specified format and procedures. The Federal Environmental Protection Agency is to then review the EIA and approve (with or without conditions) or reject the proposed intervention.

Under the Environmental Impact Assessment Proclamation the proponent of the project, policy or programme regulated under the law is required to:

- Proactively integrate environmental concerns into its social and economic development project, programme, policy, plan or strategic initiative as per the requirements of the relevant environmental laws and directives
- Ensure that positive effects are optimised and strive to promote conservation based development and work with the objective of continuous improvement
- Initiate the EA process and create the necessary ground for undertaking EA
- Appoint an eligible independent consulting firm which shall seek to undertake EA
- Cover all expenses associated with Environmental Impact Assessment, including the costs of:
  - Undertaking EA,
    - Public participation process
    - Reviewing EIA reports as the need arises
    - Preparation and implementation of an Environmental Management Plan
    - Closure plan as the case may be
    - Environmental management system
    - Contingency plan
    - Reporting, environmental education etc
- Submit to the EPA, or the relevant regional environment agency, an EIA report together with the necessary documents requested in both electronic and hard copy format

- Observe the terms and conditions of authorisation and work in partnership and cooperation with all responsible and interested parties
- Provide the necessary reports for stepwise decisions required for approval of the proposal
- Involve all interested and affected parties, and to that effect take all reasonable and practical measures to notify the latter in good time
- Establish environmental units to monitor the environmental performance of the project in a proactive manner to ensure sustainable development
- Consult relevant government institutions as the case may be
- Report on a regular basis about its environmental performance
- Establish databases and network with all concerned parties and local values and interests
- Develop a standardised environmental management system
- Be familiar with the pertinent EA related stipulations

Annex III of the EIA Procedural Guideline of November 2003 states the types of project that require full EIA. In some cases this is dependent upon the size or area of the project. For the proposed project, the crucial part of Annex III is Section 1 which relates to agricultural development. There are 13 types/sizes of agricultural development that require a full EIA but watershed management interventions are not specifically cited. The types of agricultural project requiring full EIA are quoted as follows:

- Water management projects for agriculture (drainage, irrigation)
- Large scale mono-culture (cash and food crops)
- Pest control projects
- Fertilizer and nutrient management
- Land development schemes covering an area of 500ha or more to bring forest land into agricultural production
- Agricultural programmes necessitating the resettlement of 100 families or more
- Development of agricultural estates covering an area of 500ha or more
- Construction of dams, man-made lakes and artificial enlargement of lakes with surface areas of 200ha or more
- Drainage of wetlands wildlife habitat or of virgin forest covering an area of 100 meters or more
- Introduction of new breed, species of crops, seeds or animals
- Surface water fed irrigation projects covering more than 100ha
- Ground water fed irrigation projects more than 100ha
- River diversions and water transfers between catchments

With regard to the proposed project it could be worth bearing in mind the above categories when formulating the final detailed project design during the early phase of the implementation program. It must also be remembered that the range of proposed interventions is very wide and cuts across many sectors, including road improvement, small scale rural water supply provision and improvements in education infrastructure. The project proponent (BoARD, see below) will need to arrange for an appropriate environmental assessment to be carried out on the proposed programme that covers approximately 80,600ha. This issue will be addressed once the institutional arrangements for project implementation have been finally agreed. In discussion with the Federal EPA in Addis Ababa it is apparent that all the EA work for the proposed project will follow the regulatory framework of the Amhara Regional EPA (see below for details of the regional regulatory framework and institutional arrangements for this) as the project lies within one region. The Federal EPA role in the case of the project is primarily restricted to giving support and advice as and when required.

The Ethiopian EIA guidelines are broadly in line with the assessment guidelines of international funding agencies, including the World Bank (see below for more detail) and the African Development Bank. The EPA has not as yet developed guidelines for the preparation of Strategic Environmental and Social Assessment (SEA) of policies, plans and programmes which would give a wider screening framework for assessment of a multi-sector project like the one proposed.

### 1.3.3 **Amhara Regional State Government Environmental Management and Assessment Requirements**

The current administration of Ethiopia is highly decentralised with each of the National Regional States having its own constitution and legislation. All of the project area falls within the Amhara National Regional State (ANRS). The guiding principle is that the Regions use the Federal Government regulatory system as a basic framework but can make the provisions more stringent if they wish (for example environmental quality standards for water, air and soil). In discussion with the Federal EPA it is clearly the case that all of the environmental assessment work for the proposed project will be handled at the Regional level.

The crucial regulatory documents for environmental assessment and management at the regional level include:

- The Regional Conservation Strategy of ANRS July dated 1997
- ANRS Basic Concepts and Procedures of Environmental Impact Assessment

These documents broadly follow the format and procedures of the equivalent Federal regulatory framework.

An initial review of the ANRS Conservation Strategy has indicated that there are specific provisions for issues concerning land degradation and soil erosion. The strategy objectives include:

- To significantly lower the region's soil erosion/degradation hazard by enabling the land user to do effective soil conservation measures/programmes on its own land
- To increase agricultural production through reduced land degradation and increased soil fertility

The document also outlines the following principles of livelihood development:

- Reform to clarify land tenure rights to promote a feeling of secure tenure
- Increasing agricultural production by intensifying existing farming systems
- Appropriate organic matter nutrient management for improving soils
- Safeguarding the integrity of soil and protecting its physical and biological properties
- Maintaining and developing effective ground cover
- Undertaking water conservation measures in drought prone and low rainfall areas
- Improving accessibility to allow improvement in land husbandry
- To place a focus on research for highlands agriculture taking into consideration the heterogeneous nature of farming systems and land use in the area
- To carry out long term agricultural research programmes for the lowland areas
- Incorporation of the potential costs of soil degradation into the planning for any agricultural development
- Diversify the types of agricultural inputs based upon the requirements of the soils.

Following the above guiding principles the strategy document specifies actions that should be implemented to improve the natural resource management of the region whilst increasing productivity that would enhance livelihoods in the region:

- Secure land tenure in order to motivate land owners to carry out appropriate erosion control measures on their own land in their own time and with their own labour
- Implement the rural land use policy, including the formulation of local level participatory land use plans
- Apply population control through effective family planning schemes
- Ensure provision of government supporting services, including rural infrastructure and agricultural credit, along with appropriate technologies to promote food self sufficiency and improved livelihoods.

In addition there are other regional level documents that have implications for the proposed project. These include:

- Rural Land Administration and Use Proclamation 46/2000 of ANRS
- The Revised Amhara National Regional State Rural Land Administration and Use Proclamation 33/2006

- The Land Administration and Use Regulation of ANRS (these are presumably the regulations drawn up under the powers of Proclamation 46/2000 and perhaps 33/2006)
- Forestry Conservation, Development and Utilization Proclamation of ANRS 1999
- Forest Resources Conservation Inspection and Movement Guideline ANRS 1998. This document gives the designation of forestry protected areas by type and status for the region with an inventory.

For environmental assessment work at the regional level the crucial document is the Basic Concepts and Procedures note for EIA. The note follows the national procedures but has a section on natural resource degradation as applied to conditions in the region. Specific issues identified include deforestation, soil erosion and the use of animal dung for domestic fuel rather than it being returned to the land as organic fertilizer.

#### 1.3.4 **Local Level Regulatory Framework for Environmental Management**

In discussion with project national staff it would appear that there are as yet no local level implementation guidelines for environmental assessment and management. There is talk of some documents being drafted but as yet there is nothing formally in existence. There is however a Community Based Participatory Watershed Development Guideline of January 2005 at the national level which is highly relevant for such work at the local level and provides a framework for the proposed project.

#### 1.3.5 **World Bank Environmental Assessment Procedures**

The institution managing the financing of the proposed project is the World Bank. The environmental assessment requirements of the World Bank are clearly laid out in its safeguard policies and procedures. The crucial documents are the Bank's Operational Policies (OP) and Bank Procedures (BP). Operational Policy 4.01 and Bank Procedure 4.01 clearly outline the requirements for Environmental Assessment for World Bank managed development projects and programmes. These two documents are supported by a Guidance Note on Environmental Assessment. All three of these documents are publicly available on the website of the World Bank, along with the Environmental Assessment Sourcebook and toolkits. The way that the World Bank makes sure that these environmental safeguards are incorporated into the Bank's lending policy is clearly set out in OP/BP 4:00 on the use of borrower systems to address environmental and social safeguards.

The basic philosophy that underpins the World Bank approach to environmental assessment is that all development should be environmentally sound and sustainable in the broadest sense, covering both the natural and human/social aspects of development. No person is to be made worse off as a result of any intervention. Any potential adverse impacts are to be avoided by appropriate changes in intervention design. Where this is not possible then potential adverse impacts are to be fully mitigated for by appropriate interventions and the costs of these are to be included in the economic appraisal of the proposed intervention. In addition the aim of the World Bank's environmental

assessment process is to ensure proposed interventions maximise their environmental benefits, often adapting design elements to enhance positive impacts.

The World Bank Guidance Note on Environmental Assessment has a categorisation of projects according to their type, size and likely degree of impact and outlines the differing procedures needed for each category. Some components of the proposed project would appear to fall into Category B (Section h) covering the management or rehabilitation of watershed projects. As the scope of the proposed project is much wider than just watershed management, including components covering road rehabilitation, water supply, sanitation, health, education and telecommunications, the categorisation of the project on environmental grounds is not straight forward. The screening process in Section 6 and the matrix in Appendix F address this issue in more detail. It must also be remembered that the total area to be covered by the proposed project is around 80,600ha, which is large in comparison to the small scale nature of most watershed management projects. A crucial proviso is that there must be no involuntary resettlement caused by the project as defined by the Bank's OP and BP 4.12. Put simply this means that no homestead can be removed nor there be significant land acquisition that adversely affects any household that they would be forced to relocate. If this condition can not be met then the project is elevated to a Category A, which requires far a more stringent level of assessment and complex procedures. It is thus crucial to ensure that the proposed project will not require acquisition of land on which there are residential or commercial buildings that would necessitate resettlement. Even temporary acquisition of such land can be problematic and the World Bank policy even applies to occupants who have no statutory rights to the land. It is thus a pre-requisite for a Category B project that there is no permanent or temporary land acquisition that would cause people to relocate. In order to be a fast track project it is imperative that there be no land acquisition.

The occurrence of Indigenous People, as defined in World Bank OP and BP 4.10, is also critical to the environmental classification of the project. However all of the people in the proposed project area are of the single large Amhara ethnic group and there are no ethnic minority indigenous people in the area as defined by the World Bank OP and BP 4.10.

Other relevant World Bank policies and guidelines include 4.02 on Environmental Actions Plans (EMPs), which outline the need for and nature of an EMP. An EMP is only normally required if there are significant adverse impacts that can not be avoided by changes in the design of the proposed intervention. The EMP is to include targeted mitigation programmes, with cost estimates and an implementation programme. An EMP also includes an environmental management and monitoring framework with recommendations for appropriate institutional arrangements for its implementation.

The need for an EMP is determined during the initial environmental assessment process, once the project implementation components are known and an environmental scoping and screening has been carried out.

Bank policies and guidelines also apply to the following issues:

- 4.04 Natural Habitats
- 4.07 Water Resources Management (includes watershed management) but this document appears to have now been withdrawn from the Bank's public web site and the last published version seen is from February 2000
- 4.09 Pest Management (of relevance to the project in the use of pest control chemicals)
- 4.11 Physical Cultural Resources
- 4.36 Forests

Bio-diversity considerations form an intrinsic part of the environmental assessment process. The World Bank has a guideline for showing how bio-diversity issues are to be mainstreamed into the development process. This is available on the Bank's website. Similarly public consultation is to be an intrinsic part of the environmental assessment process. The requirements for public consultation are clearly stated in Update No 26 of the Environmental Sourcebook, dated May 1999. The participatory planning approach that has been followed by the project, including a needs assessment to provide the basis for intervention formulation, normally satisfies the consultation requirements of the Bank. However it does need to be reported in the environmental assessment documentation in the required manner.

The Bank have been involved in drawing up guidelines for watershed management projects. However these do not currently appear to be available on the Bank's public website. There is also a Bank toolkit for the development of small scale activities, but downloading of this has proved to be problematic.

The required output of the environmental assessment process for the project is an environmental assessment report following the World Bank procedures and format as given in their Guideline. The report contents and order is specified and is to be one self contained volume of no more than 150 pages.

## **1.4 The Institutional Framework for Environmental Management in Ethiopia**

### **1.4.1 The Federal Government Environmental Protection Authority (EPA)**

The Environmental Protection Agency (EPA) is an autonomous Federal Government organisation reporting directly to the Prime Minister's Office. The EPA was established in 2002 under proclamation 295/2002, the Establishment of Environmental Protection Organs. The remit of the Federal EPA is to formulate policies, strategies, laws and standards with the objective of fostering environmentally sound and sustainable development in the widest possible sense. The responsibilities of the EPA include establishing and implementing the procedures for the environmental impact assessment of public and private developments and also the strategic environmental and social assessments of policies, plans and programmes. The Federal EPA also has the remit to ensure compliance and enforcement to environmental regulations and standards.

The Federal EPA has a national office in Addis Ababa with the remit of providing advice and technical assistance, particularly to the regions. The Federal EPA only carries out EA work if a proposed intervention should cover more than one region. The regional level institution for environmental management in the project area is the Amhara Region Environmental Protection, Land Administration and Use Authority (EPLAUA). This regional office reports directly to the Regional Government rather than to the Federal EPA. The regional office, unlike the Federal EPA office, also has the responsibility for land administration and land use. Land administration at the national level lies within the remit of the Ministry of Agriculture and Rural Development in Addis Ababa.

The Environmental Protection Council was established under Proclamation 9/1995. The role of the Council is to oversee the EPA and to deliberate on policy and legal issues, including the setting of environmental standards. There is also a similar Council at the regional level which should include the Chief Executive of the Regional Administration and the heads of all Bureaux, NGOs public representatives and religious leaders.

The other key Federal institutions with vested interest in the proposed project include the Federal Ministry of Water Resources and the Federal Ministry of Agriculture and Rural Development. The current study falls under the remit of the Federal Ministry of Water Resources.

#### 1.4.2 **Regional Level Environmental Management Institutions**

The whole of the project area falls within Amhara National Regional State. Ethiopia has a decentralised Federal Government system with the regional institutions reporting to the Regional Government and with relatively weak links to the Federal offices in Addis Ababa. Federal Government functions are replicated at Regional level but with some changes based on the differing regional resource conditions. A highly significant difference in Amhara National Regional State is that the land administration and use function is subsumed into the Regional EPA to form the Amhara National Regional State Environmental Protection, Land Administration and Use Authority. The hierarchy of government layers below the Region is the Zone followed by the Wereda and then the Kebele (essentially a village administration area).

A through review of the structure and remits of the regional and sub-regional institutions operating in the project area has been undertaken as part of the project work and is clearly summarised in Section 5.3 of the project Final Interim Report dated September 2007. For environmental assessment the key institution is the Amhara National Regional State Environmental Protection, Land Administration and Use Authority. Other institutions include the Regional Environmental Protection Council and the Regional Agricultural and Rural Development Bureau, along with the Regional Bureau of Water Resources Development.

In the context of environmental assessment for the proposed project, the key factor is who will be the project proponent? Under the regulatory framework, the project proponent is responsible for carrying out the EA work according to the requirements of the Federal EIA Proclamation. The institutional capabilities of which everybody is to



implement the project will be critical in ensuring that the required environmental assessment procedures are followed in a timely manner so that there is no delay in the implementation of the project.

#### **1.4.3 Amhara National Regional State Environmental Protection, Land Administration and Use Authority**

As stated above, the regional level institution for environmental management in the project area is the Amhara region Environmental Protection, Land Administration and Use Authority (EPLAUA). This regional office reports directly to the Regional Government rather than to the Federal EPA. As explained above, the Amhara regional office, unlike the EPA national office, also has the responsibility for land administration and land use. The EPLAUA is the regulatory authority for managing the EIA system, including the handing of applications and the review of EIA reports. The role of the Environmental Protection Councils has been outlined above and these exist at the regional level. The suggested institutional framework for implementation of the proposed project envisages a multi-institutional approach lead by the Regional Agriculture and Rural Development Bureau (BoARD) with inputs from the other relevant regional institutions, including the Regional EPLAUA and the Regional Water Resources Bureau, plus those responsible for health, education, roads and telecommunications.

#### **1.4.4 Local Level Environmental Management Arrangements**

Below the Region is the Wereda level of government and below this is the Kebeles (essentially a village area which can include more than one settlement). The key government staff at the local level are the Development Agents (DAs), who have been key players in assisting with the participatory planning process for the proposed project. The level of environmental awareness of these staff in the detailed study micro watersheds appears to be high and it is apparent that many local people are also acutely aware of the environmental issues that influence their lives.

### **1.5 Scope, Resources and Limitations of the Environmental Assessment**

The environmental assessment was carried out using six weeks international consultant's time carried out in two inputs between August and October 2007. The timing of the final input allowed the public meetings to be observed which provided the inputs into intervention formulation. However the very serious down side to this timing was that the environmental specialists input finished before that of the international sociologist and also before the proposed project interventions had been finalized. As a result the impact analysis had to be reworked and this report has had to be radically redrafted in just four days in order to make it address the finally agreed proposed interventions.

### **1.6 The Interface with other Study Components**

The project has fostered a highly integrated approach that is inter-disciplinary and not just multi-disciplinary. The areas of expertise within the team cover a wide range of fields, including land resources, agriculture, sociology and socio-economics, forestry,

livestock, rural engineering, finance as well as broad environmental planning. The emphasis during the planning of the project was to view the range of potential interventions in the widest possible light and driven by local people's needs. The whole philosophy of the proposed project is environmentally pro-active.

## **1.7 Layout and Format of the Environmental Assessment Report**

The layout of the report follows the format of that indicated in the World Bank Environmental Assessment Guidelines. There is a logical progression through the planning process demonstrating how the public participation and needs assessment work feeds into the intervention formulation process. The format of the report also allows it to be used by the eventual proponent of the project to form the basis of an environmental assessment report required to satisfy the procedures existing in Ethiopia.

## **1.8 Acknowledgements**

During the environmental assessment work a wide range of government officials at federal, regional and local level were met and many were extremely helpful in assisting project staff. In addition the local people in the five detailed study areas gave up a lot of their time and put a lot of effort in the participation process for project formulation. The Development Agents in the five detail study areas went out of their way to greatly assist the project staff. Staff working on other projects in Ethiopia were also consulted.

## 2 The existing environmental situation, constraints and needs

### 2.1 Environmental Profile

The following environmental profile follows international best practice by outlining the key environmental conditions in the three sub-catchments with an emphasis on the five micro-watersheds which have been studied in detail. A large body of information has been collected and published, with data split by geographical area, specifically the three sub-catchments and the five micro-watersheds (see Halcrow et al, August 2007b, 2007c and 2007d). The profile given below summarizes the key points by environmental issue, following a systematic checklist approach (see Appendix E for a copy of the checklist devised for the work based upon international best practice) starting from the natural environment and working progressively through into the human environment.

There is a major difference between the environmental conditions in the hilly upland area of the Gumera and Ribb sub-catchments (which contains four of the detailed study micro watersheds), with that found in the western area (the Jema sub-catchment) containing the Engule detailed study micro watershed, which is in more gently rolling terrain (see Figure 1 for the locations). The most important key environmental issues which act as pre-conditional constraints to development in the area are summarized in Section 2.2.

#### 2.1.1 The Natural Physical Environment

##### ***Atmosphere***

The most noticeable atmospheric condition in the area is the incidence of dust. Even in the immediate post rainy season period there are considerable levels of dust in the air due to the very fine nature of the soils which requires only a little disturbance (wind and often motor vehicles on the un-surfaced roads) to put it into transport.

##### ***Climate***

The rainfall pattern in the area is uni-modal with rainfall occurring between April and October and the maximum over a two or three month period. The heaviest rain usually occurs during July and August. There is however great variation in the timing of rainfall over the rainy season and also a considerable variation in the annual total from year to year which has significant effects on food production. Rainfall is the most significant limiting factor for agricultural production, determining the 150 day minimum growing days experienced in the area during normal conditions. Since the 1970s there have been serious droughts in 1973-1974, 1984, 1987-1988 and 2002. Since 1970 there is evidence that rainfall intensity has been stronger, part of a world wide trend of more extreme climatic conditions.

Within the Jema sub-catchment, the variation in mean annual rainfall from place to place can be between 800mm to 2500mm due to local variations in altitude. In the micro-watersheds the annual rainfall at Enkulal is normally at least 1200mm whilst at Baskura it is 1500mm, Kantai 1800mm and Engule can vary from between 1400mm and 2200mm per year.

There is a wide range of temperatures experienced in the area over the year and with high daily extremes. The range in the Jema sub-catchment is between 33 and 7 Celsius over the year whilst frost is a problem at night for crop production in the highland areas of the other two sub-catchments. The duration and intensity of sunshine is important for plant growth and hence crop production in the area. The intensity of sunlight is increased by the effects of the high altitudes in the area, resulting in a greater rate of plant growth and hence shorter growing periods for some crops.

### ***Water Resources***

The relatively high rainfall levels spread over quite short time periods can result in localized rainfall flooding and also flooding of the main river systems. This is particularly the case in the Engule micro-watershed in the Jema sub-catchment and allows cropping on residual moisture along side the river till January. There can also be seasonal problems with drainage and water-logging at the downstream parts of the three sub-catchments where they meet Lake Tana. The three main rivers have perennial flow but there are great variations due to the extreme fluctuations in rainfall pattern, both within a year and also from year to year, especially since 1970. Of the five detailed study micro-watersheds only Engule on the Jema has all year flow, as it lies in mid catchment on the bank of the main river. At Enkulal the flow normally continues till January but the other three areas lie right in the hilly upstream portions of the sub-catchments and experience rapid runoff. There is currently no major storage for dry season irrigation in the three sub-catchments but rice cultivation (using dry-land varieties) is carried out in the downstream lowland parts near Lake Tana. Some small scale diversion of water is carried out at Engule to extend the cropping season.

The main problem for surface water quality is pollution by organic waste from humans and livestock which renders it unsafe for direct human consumption and in some places in the dry season it is considered by local people to be unsafe for animal watering. There are reportedly no major problems with the chemistry of surface water which constrain its use for domestic and livestock water supply and irrigation.

The high incidence of erosion in the sub-catchments results in very high levels of sediment in the surface water system.

In the upstream ends of the upland catchments erosion has resulted in bare rock being exposed (See Plate 4 for an example from Zefie). Sheet erosion is commonly found throughout the upper and middle parts of the three sub-catchments but in the five micro-watersheds is most extreme downstream of grazing areas, some of which are communal forestry areas where enforcement of grazing regulations is problematic (see Plate 5 for

an example from Engule). There is also significant gully erosion on drainage lines, both in the upland areas (see Plate 6 for an example from Zefie that is exacerbated by poor cross drainage design on roads) and in more rolling country (see Plate 7 for an example from Enkual). There are often very deep gullies that are hidden from normal view by lines of trees that have been planted at field edges (see Plate 8 for an example from Engule) and gully erosion also occurs on relatively flat areas close to the main river, for example at Engule (see Plate 9). There is also main river bank erosion, for example on the Jema (see Plate 10). It could be the case that some of this erosion is natural and would occur irrespective of human activity due to changes in rainfall patterns since 1970. However as the photographs show, human activity has greatly exacerbated the problem. The base load sediments have resulted in the formation of large deltas in Lake Tana (see Plate 1 and Figure 2) and a significant part of the suspended sediment is currently flowing through the lake system into the Blue Nile (see Plate 3). The sediment in the main rivers also results in accretion and occasional land smothering as shown in Plate 11.

Where possible, groundwater is preferred for domestic water supply as it has less risk of contamination from animal and human waste. Sources include hand dug wells and springs (see Plate 12 for a spring source that is on the main Jema river bank). However some of these groundwater sources are starting to fail in some dry seasons, probably due to increased abstraction and changes in rainfall patterns. Groundwater is not currently used for irrigation except for forestry seedling nurseries. There is reportedly no major problem with the chemical content of groundwater for human and livestock use. However local people have commented upon the problem of pollution by livestock at well and spring heads.

### ***Land Resources***

The range of altitude in the three sub-catchments is from 4135masl down to around 1830masl at Lake Tana. The topography of the Engule micro-watershed in the Jema sub-catchment is different from the other four micro-watersheds, being more rolling rather than mountainous. The Engule micro-watershed is also at the downstream part of the sub-catchment whilst the other four lie in the upstream parts of their sub-catchments. Topography is a major constraint to resource use in the upper parts of the sub-catchments but of the four micro-watersheds in the Ribb and Gumera sub-catchments, Kantai has more rolling topography than the other three (Baskura, Zefie and Enkual) which are hilly. The range of altitudes for the five micro-watersheds are:

Enkual 2320m to 2529m  
Zefie 2500m to 2882m  
Baskura 2250m to 2475m  
Kantai 2711m to 2850m  
Engule 1900m to 2000m

There is a national systems of Agro-Climatic Zones and a more detailed delineation of Agro-Ecological Zones (AEZ) which classify land type and allow interpretation for land

capability. Details of the land types are given in Halcrow, August 2007b. Soils in the micro-watersheds are relatively uniform and fertile but soil quality has recently been badly degraded by sheet, gully and river bank erosion as indicated above. Stones and rock are now exposed in the upstream portions of some of the micro-watersheds (see Plate 4) and there are extensive areas of gullies. There are reportedly few problems with soil chemistry and there is no salinity. Water-logging occurs only in very localized depressions (which are often used for grazing) and at the downstream ends of the main river systems. Of the five micro-watersheds Engule has the greatest soil potential as the land is more rolling. Of the four upland micro-watersheds Kantai has more potential than the other three (Baskura, Zefie and Enkulal) as it has more rolling terrain and less steep topography. The localized smothering of some small areas of land next to the main rivers with sediment (for example in Engule) is perceived by farmers to be beneficial as the material is considered to be fertile. Soil capability has not been a major constraint historically and a wide variety of crops can be grown. Rotations with legumes are beneficial for nitrogen fixation.

## 2.1.2 The Natural Biological Environment

### *Terrestrial Habitats*

Terrestrial flora in the area has been under immense pressure due to historically high human population densities. Most of the natural vegetation has been removed for land cultivation and fuel-wood and what remains tends to be on the highest land at watershed divides. There is however a significant area of protected natural woodland just outside and to the west of the Baskura micro-catchment, known as Alesaga Forest, reportedly covering an area of 819ha. This protected area is proactively managed with infill planting and guarded to prevent degradation. There is also a small piece of natural woodland in the upstream end of the Enkulal micro-watershed (see Plate 13). This has survived having once been part of a feudal estate and is also protected, but there is reportedly a lack of funds to adequately guard it. Other areas of degraded remnant natural vegetation have been infill planted and designated as communal forestry land. These are policed by local people who are allowed to take dead material for their own use. However many of these areas are used as grazing areas and are quickly degrading. There are also many churches on hill tops with surrounding protected woodland. Kantai micro-watershed has 2% of its area under woodland, including a 5ha area around a church, and Engule also has a remnant forest area around an old church. There is planted vegetation along gullies, field boundaries and homesteads, often made up of exotic species, particularly eucalyptus which is fast growing and has high value for building materials and fuel-wood. There is also collection of plant species for medicinal use.

The status of terrestrial fauna in the area is very poor as due to the high human population densities most natural habitats have been cleared for cultivation. There are bird habitats in the forest areas and also homestead vegetation.

### ***Freshwater Habitats***

The principle freshwater habitats in the area are Lake Tana (technically outside the study area) and the three main rivers of the Ribb, Gumara and Jema that have perennial water flow. Due to high human population densities there are few significant flora and fauna freshwater natural habitats. There are fish in the main perennial rivers and at Engule on the Jema these are migratory species that move from Lake Tana up and down the river system. Some of the fish species are caught by local people for their own consumption and are an important source of animal protein.

### ***Bio-diversity and Conservation***

The most important areas of biological diversity are the remnant natural forest areas already mentioned. Of these, the most significant is the Alemsaga forest area just west of the Baskura micro-watershed. The Nifara Forest at the upstream end of the Enkulal micro-water shed is an important old forest area but its protection needs strengthening. The hill top churches surrounded by well protected forest areas of around 5ha are important habitats. The planted forests containing eucalyptus support only low levels of bio-diversity whereas areas planted with local species are of much greater value. The promotion of field boundary, river bank and gully side planting with economically useful local species would promote bio-diversity. Better management of communal forest areas, some of which are remnants of natural vegetation, would help bio-diversity, particularly if they were sensitively planted with infill local tree species. There are also some single large trees (notably in Engule, see Plate 14) which are important for bio-diversity and particularly bird habitats, that need to be taken care of.

### ***Sensitive and Protected Areas***

The most important protected area near the five micro-watersheds is the Alemsaga Forest which reportedly covers 819ha and lies just to the west of the Baskura micro-watershed. It is a Priority State Forest and proactively managed with appropriate infill planting and guarded to stop damage and encroachment. The Nifara Forest covering 107ha lies in the upstream end of the Enkulal micro-watershed and is Wereda managed. However local people state that there is insufficient funding to pay for adequate guards for the area and as a result it is under pressure. The large number of hill top churches, surrounded by natural forest and sometimes grassland, appear to be well protected and are important from a conservation point of view. The community forests managed by local people are under pressure and there is a need to strengthen their management. Many communities in the micro-watersheds have emphasized the need to prevent livestock encroachment into communal forest areas.

### ***Endangered Species***

The IUCN Red Book currently lists 25 endangered species in Ethiopia none of which are reportedly present in the project area.

### 2.1.3 **Natural Risks and Hazards**

The following are the main potential natural risks and hazards identified in the three sub-catchments. They have been broadly prioritized using the results of interviews and meetings within the study area and particularly the five detailed study micro-watersheds. The human consequences of these natural risks and hazards are discussed in Section 2.1.6.

#### ***Erosion and Land Degradation***

Erosion and land degradation are natural processes that have been greatly accelerated by human activity. Erosion types include sheet, gully and river bank/gully side erosion and result in increased sediment loads in the river system. There is evidence from field observation that these processes have been increasing since 1970, partly as a result of changes in rainfall patterns, but accelerated by human activity.

#### ***Unpredictable Rainfall and Drought***

There is a great variation in total annual rainfall amounts from one year to the next and also the timing of rainfall within the year can vary enormously. Since 1970 there have also been years when drought conditions have occurred, including 1973-1974, 1984, 1987-1988 and 2002. The first rains following such drought conditions result in high erosion and sedimentation in the river systems.

#### ***Floods***

In general the drainage system in the upland areas can cope with high rainfall conditions, however the flood plain areas next to the downstream parts of the main rivers can occasionally flood. This is particularly the case for the Engule micro-watershed on the Jema river system. There were however serious floods on the lower Gumera and Ribb river systems in 1999 and 2000.

#### ***Storms***

The upland parts of all three sub-catchments have all reported that they experience occasional hail storms that are very damaging. However whilst the four upland detailed study micro-watersheds had reported problems with such storms they are absent in Engule on the lower Jema sub-catchment.

#### ***Landslides***

Landslides occur very locally, particularly in the upland parts of the catchments in high rainfall times. In addition the banks of the main rivers experience slumping and collapse due to river bank erosion. This happens in both flood conditions and also in the low flow situation where the outsides of bends undercut the river banks.



### **Seismic Activity**

Despite being relatively close to the rift valley it is reported that seismic activity is not a problem in the proposed project area.

#### **2.1.4 The Social Environment**

The existing natural environmental conditions in the proposed project area are highly modified by human activity due to the long term nature of human settlement in the area and the high population densities. The following section considers the main social conditions in the area in the context of understanding the complex inter-relationship between the natural environment and the human use of resources. There is detailed data in the socio-economic reports produced for the project (See Halcrow, August 2007c, 2007d and 2007e).

##### **2.1.4.1 Political and Institutional Administration**

The political and institutional administration of Ethiopia was essentially feudal in nature until 1975 when it became centrally controlled. Since 1993 things have become highly decentralized with considerable power being vested at the regional level. For the proposed project the key level of government is the Amhara National Regional state, as the project area lies entirely within its boundaries. Below the Region lies the Zone, then the Wereda followed by the Kebele (a village area often comprising more than one settlement) at the lowest level. An assessment of the overall institutional situation in the project area has been carried out for the project (Halcrow et al, August 2007f) and the findings are summarized below split between informal and formal institutions. The relevant institutions for environmental management have been outlined in an earlier report (Halcrow et al, August 2007a) and the arrangements for environmental assessment have been summarized in Section 1.4 above.

#### **Informal Institutions**

A number of informal institutions exist in the five micro-watersheds, including religious, economic, social and conflict-resolving institutions. The most prominent institutions are briefly described below.

<b>Name</b>	<b>Type</b>	<b>Main Functions</b>	<b>Potential</b>
Church and Church Committee	Religious	<input type="checkbox"/> Religious services <input type="checkbox"/> Conflict resolution	<input type="checkbox"/> Resource mobilization <input type="checkbox"/> Promotion of community participation <input type="checkbox"/> Sanctioning of behaviour <input type="checkbox"/> Awareness creation
<i>Mahber</i>	Religious	<input type="checkbox"/> Strengthening of brotherhood and solidarity <input type="checkbox"/> Support of households in distress <input type="checkbox"/> Mutual support	<input type="checkbox"/> Communication <input type="checkbox"/> Solidarity

<b>Name</b>	<b>Type</b>	<b>Main Functions</b>	<b>Potential</b>
<i>Senbete</i>	Religious	<input type="checkbox"/> Religious function <input type="checkbox"/> Support of beggars	<input type="checkbox"/> Communication <input type="checkbox"/> Solidarity
<i>Iddir</i>	Social	<input type="checkbox"/> Provision of mourning and burial services	<input type="checkbox"/> Resource mobilization <input type="checkbox"/> Promotion of community participation <input type="checkbox"/> Communication
<i>Wenfel / Webera</i>	Economic	<input type="checkbox"/> Mutual exchange of labour	<input type="checkbox"/> Promotion of community participation <input type="checkbox"/> Resource mobilization
Community Elders ( <i>Yehager Shimagile</i> )	Conflict resolution	<input type="checkbox"/> Counselling <input type="checkbox"/> Conflict resolution	<input type="checkbox"/> Ability to solve complex problems <input type="checkbox"/> Influencing behaviour, cultural values and attitudes <input type="checkbox"/> Establishment of rules for management of community property <input type="checkbox"/> Mobilization of community resources

### ***Formal Institutions***

#### **Kebele Council**

The Kebele Council is the lowest administrative unit, which is established by the government with formal rules and regulations, duties and responsibilities. The Kebele Council is elected democratically by the community members and it usually has 10 executive and 7 judicial members with the following responsibilities: a) administrative management and judicial services; b) implementation of government policies and strategies; c) collection of taxes and registration of population; d) conflict resolution; and e) awareness creation. The Kebele Council takes all decisions related to political, social, economic and security issues. The Kebele Council is accountable to the Wereda Council and regularly submit reports. As the Kebele Council has government backing, good understanding of the community and local physical environment, as well as strong relations with Wereda administration, it makes it a strong and important stakeholder in any watershed development activities. The main weaknesses are its limited institutional and administrative capacity to plan and manage community-based development activities as well as its inadequate enforcement capacity to protect community properties.

#### **Water Management Committee**

The Water Management Committee is usually formed by the Cooperative Promotion section of the Wereda Office of Agriculture and Rural Development (ARD) with the objective to operate and maintain one or more potable water supply schemes. This committee usually has 5 to 7 male and female members, who are directly elected by the users. To ensure the proper operation and maintenance (O&M) of the potable water supply scheme, the Water Management Committee has the responsibility to collect

(monthly) user fees among all water users, supervise the proper O&M of the scheme, awareness creation and mobilization of community resources. However, most committees do not function properly due to lack of training and commitment among its members to manage the schemes effectively. During the planning, implementation and monitoring of watershed development activities, the Water Management Committee could play an important role, but their institutional capacity needs to be strengthened through the provision of training and advice.

### **Women's Association**

Reportedly, women's associations have been established in all the Kebeles located in the three Project sub-catchment areas and their purpose is to empower women, to promote participation and to ensure the right of women in decision-making and other areas that affect the life of the household. The majority of (married) women are members. The reality is that the performance of the women's associations is less than satisfactory. In the five surveyed micro-watersheds, women rarely participate in the meeting of the existing women's association and the benefits are reported to be unsatisfactory. However, the existing women's associations could be a channel for awareness creation, mobilization of resources, promotion of women's participation in decision-making as well as the planning and execution of (women-specific) watershed development activities, such as vegetable production, off-farm income generation, energy and timesaving technologies.

### **Cooperative Societies**

Cooperative societies are established by the regional government with the support of the Cooperative Promotion section within the Wereda Office ARD. Membership is voluntary and any community member is eligible to become member if they pay a registration fee (Birr 2 to 15) and at least one share. The major objectives of a cooperative are the provision of agricultural inputs and farm equipment, marketing of agricultural produce, operation of flour mills, sale of consumer goods and credit supply. A cooperative is a profit-oriented enterprise and any profit will be distributed among the shareholders in accordance with their number of shares.

The households in Zefie and Kantai are served by the cooperative in Gassay. There is also a cooperative in Maynet Kebele, but its performance is weak and the households in Zefie prefer to use the services of the cooperative located in Gassay. The households in Baskura obtain services from the cooperative located in Debre Tabor as the cooperative in Koley Dongores Kebele does not provide any other services than the sale of basic consumer goods. Lack of funds and poor management qualities are the two most important problems of the two poorly functioning cooperatives in Koley Dongores and Maynet. The households in Engule obtain services from the cooperative in Gerchich, including the supply of agricultural inputs, marketing and flour milling services. In Enkulal, the households have access to the services of the cooperative in Gelawdiwos, including input supply and marketing, flour milling services, sale of consumer goods and credit.

None of the surveyed households<sup>1</sup> in Kantai is a member of a cooperative. In the other four micro-watersheds, however, 70% to almost 90% of the surveyed households are members of a cooperative. All surveyed households with landholdings over one hectare are members of a cooperative as against 72% of the poorer households with smaller landholdings. Only half of the surveyed female-headed households have become a member of a cooperative. In Engule and Zefie, 80% and 45% of the surveyed households reported that the benefits derived from the cooperative are good. In Baskura and Enkual, 70% and 75% of the surveyed households rated the benefits of their cooperative as being moderate. In Zefie, 45% of the surveyed households classified the benefits of the cooperative as poor.

As the cooperative societies play a vital role in the livelihoods of most rural households, they have the potential to support the implementation of integrated watershed development activities, in particular the supply of (improved) inputs and equipment, introduction and distribution of improved technologies, marketing of agricultural produce, provision of short- and medium-term loans, flour milling services and any other services requested by its members.

### **Land Administration Committee**

A Land Administration Committee has been organized in each Kebele to administer, register and certify land use rights. It is a formal institution supported by government rules and regulations. It has the mandate to control land use, environmental conservation, resolution of land-related conflicts, register and certify land use rights as well as relocation and redistribution of land. The members of the Land Administration Committee are 'directly' elected by the community members. Due to its mandate and its strong linkages with the Kebele Council, Development Agents (DAs) and the Wereda Office ARD, as well as local institutions, the Land Administration Committee is a key stakeholder in watershed development, including soil and water conservation. At present, the large majority of the surveyed households in the five micro-watersheds do not have any contact with the Land Administration Committee in their Kebele. They also rate the benefits of this committee as being low or even none.

### **Forest Protection Committee**

The Forest Protection Committee comprises seven members, including the Chairman of the Kebele Council as head of the committee. The DA responsible for NRM acts as secretary of the committee. Although the committee is responsible for the protection and conservation of the community and state forest located within the boundaries of the Kebele, its functioning is not supported by government rules and regulations required to enforce its mandate. Due to lack of regular meetings and effective enforcement mechanisms, as well as weak linkages with government institutions at Wereda level, the performance of the Forest Protection Committees is unsatisfactory. Within the context of

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<sup>1</sup> The number of surveyed households in the five micro-watersheds is as follows: Engule – 10 (13% of total HHs); Baskura – 10 (9% of total HHs); Kantai – 10 (9% of total HHs); Zefie – 9 (7% of total HHs); and Enkual – 8 (32% of total HHs)

integrated watershed development, these committees could play a key role in environmental protection and conservation at Kebele level.

### **Work Groups**

Work groups have been formed in the 1990s to perform communal activities at Kebele level, including soil and water conservation (SWC), reforestation and also construction of community infrastructure, such as schools and health posts. At present, the work groups have been transformed in *Mengistawi Budin* (sub-kebele team) and the village leader is the administrator of one sub-kebele team. Each team is sub-divided into two or more groups of 500 to 100 persons. Each group member is obliged to contribute labour and materials for community infrastructure as required. Sanctions and penalties will be imposed if a group member defaults. Although participation is compulsory, the *Mengistawi Budin* system could be used for the construction of community infrastructure (i.e. potable water supply schemes, access roads) as it has the capacity to mobilize labour and materials. The surveyed households rate the benefits of this system to be low as the quality of the community infrastructure often is poor. The involuntary character of participation may also be a reason for households to consider the benefits of these work groups to be low.

### **Development Agents**

In principle, each Kebele should have three Development Agents (DAs) in the fields of agriculture, livestock and NRM. The main activities of the DAs are the provision of extension services for crop and livestock production, as well as development and management of natural resources. The qualifications of the employed DAs are good, but they lack equipment and the budget required for the effective implementation of their extension and NRM activities. The DAs have developed strong linkages with the Kebele Council and other local institutions, as well as the Wereda Office ARD. The DAs would be the focal point for the planning, preparation, supervision and monitoring of integrated watershed development activities.

### **Non-Governmental Organizations**

Green Horizon is a local NGO, which is supporting forestry activities in Baskura. In the other four micro-watersheds, no NGOs are currently working.

### **Development Programs and Projects**

The GTZ-supported SUN Amhara Project is undertaking SWC activities in Farta Wereda, including gully treatment in Baskura. ILRI is conducting research on animal forage in Zefie. Under the Tana-Beles Integrated Water Resources Development Project, the construction of dams within the Ribb, Gumera and Jema watersheds are planned.

### 2.1.4.2 Demography

Based on information collected from the Wereda Offices, the main demographic characteristics of all Kebeles in the three Project areas are shown in the following table.

Name of Watershed	Demographic Data							
	Total Size (ha)	Number of Villages	Number of Households	Population Size	Households per Village	Population per Village	Average Household Size	Population per ha
<b>Gumera</b>								
Total	210,332	1,220	103,167	467,319				
Average per Kebele	3,969	23	1,947	8,817	96	429	5.0	2.5
<b>Ribb</b>								
Total	184,530	1,012	70,339	360,606				
Average per Kebele	3,549	19	1,353	6,935	85	438	5.2	2.1
<b>Jema</b>								
Total	48,797	191	24,785	127,374				
Average per Kebele	3,050	12	1,549	7,961	145	744	5.2	2.9

In Gumera Watershed, the size of the total population is about 470,000 comprising of about 103,000 households resident in 1,220 villages. On average, a Kebele has about 8,800 inhabitants belonging to about 1,950 households living in 23 villages. The average number of households per village is 96 (429 persons) and the average household size is 5.0 members. On average, the total size of a Kebele is 3,969 ha and the average population density is 2.5 persons per ha.

The population of the Ribb Watershed consists of about 70,000 households with a total size of about 360,000 inhabitants living in about 1,000 villages. On average, a Kebele has the size of 3,549 ha with a total population of 6,935 persons belonging to 1,353 households that are resident in 19 villages. An average village has a total population of 438 persons belonging to 85 households. The average household size is 5.2 members and the population density is 2.1 persons per ha.

The Jema Watershed has a total population of about 127,000 inhabitants belonging to about 25,000 households, who are resident in 191 villages. On average, the size of a Kebele is 3,050 ha and it has 12 villages with a total population of 7,961 persons belonging to 1,549 households. An average village has 145 households with a total population of 744 persons. The population density is the highest of all three Project areas with 2.9 persons per ha.

Based on Census 1994 data derived from the Abbay River Basin Master Plan<sup>2</sup>, the main demographic characteristics of the rural population for South Gondar Zone (Ribb and Gumera Watersheds) and West Gojam Zone (Jema Watershed) are as follows:

<sup>2</sup> MoWR (1998a): Abbay River Basin Integrated Development Master Plan Project, Volume XIV (September 1998)

Area	Annual Growth Rate 1984 - 1994	Population Density 1994 (persons/ha)	% Younger than 15 Years	Average Households Size
West Gojam Zone	3.35%	1.2	47.9%	4.8
South Gondar Zone	2.67%	1.3	43.6%	4.5
Amhara State	2.39%	0.9	44.1%	4.5

Source: MoWR (1998a): p.13.17 and 39

**Population Size:** The estimated number of people and households (both resident and non-resident) with land use rights in the five surveyed micro-watersheds ranges from 153 (25 households) in Enkulal micro-watershed to 871 (130 households) in Zefie micro-watershed. The proportion of non-resident households with land use rights in the five surveyed micro-watershed varies from only 5% in Zefie to 72% in Baskura and Enkulal. The population in all five surveyed micro-watersheds has increased significantly since the 1950s and 1960s due to high fertility rates and in-migration to the surveyed micro-watersheds. The high rural population densities have now reached the point where there is insufficient agricultural land to hand on to the younger generation and when combined with falling crop outputs due to land degradation is resulting in the emergence of landless young households.

**Average Household Size:** The average size of the households in the five surveyed micro-watersheds is 6.1 members, varying from 5.6 in Engule to 6.7 in Zefie. The minimum household size is two and the maximum size is eleven. About one-third of the surveyed households in the five micro-watersheds has 8 or more members. The proportion of small households with less than 5 members ranges from 20% and 25% in Kantai and Enkulal to more than one-third in Baskura and Zefie. The average size of female-headed households is 4.3 persons, while male-headed households have an average size of 6.5 members

**Sex Ratio:** In four of the five surveyed micro-watersheds, about 52% to 58% of the total population is male. Only in Zefie are there more females with 58% of the population.

**Age:** The population in the five surveyed micro-watersheds is relatively young with a median age of approximately 15 years. About 17% of the population is below the age of 5 years and only one-third of the population is older than 18 years. The economically active population (12 to 64 years) comprises almost two-thirds of the total population.

**Migration:** Seasonal/temporary migration has increased in the five surveyed micro-watersheds since the 1980s, mainly due to shortage of land, unemployment, food insecurity and lack of alternative non-farm income generating activities. The estimated proportion of households with one or more seasonal male and female migrants ranges from 10% in Kantai to 40% in Baskura. The proportion of landless and poor households, as well as large households, engaged in seasonal migration is reportedly four times higher than for other household categories. Seasonal migration was only reported by

25% and 33% of the surveyed female-headed households in Engule and Baskura. The annual income from seasonal migration varies from Birr 200 to 3,600. The proportion of households with one or more permanent migrants is estimated at 8% to 20% of all households in four of the five surveyed micro-watersheds. None of the five surveyed micro-watersheds had any in-migrants for the last 25 years.

Martial Status: About 70% to 90% of the surveyed households in the five micro-watersheds contain married couples, whereas 10% to 20% contain either widowed or divorced adults. The households containing widowed and divorced adults are dominated by female-headed households as they have less chance to remarry than widowed or divorced male-headed households.

Religion and Ethnicity: Almost all households in the five surveyed micro-watersheds are Orthodox Christians. Only a few households in the Enkulal micro-watershed belong to the Muslim community. All households in the five micro-watersheds belong to the Amhara ethnic group and Amharic is their mother tongue.

#### 2.1.4.3 *Gender Issues*

A separate project report has been produced on gender issues in the area (see Halcrow et al, August 2007e). The following section is a summary of the results.

##### (a) *Domestic Labour Division*

All of the activities in and around the homestead are usually the main responsibility of the female household members, including cooking, cleaning of house, washing and repairing of clothes, fetching water and fuel wood, child care, taking care of elder and sick household members and shopping. It is not uncommon that male household members assist with the repair of clothes, fetching fuel wood, taking care of children as well as elder and sick household members, and shopping. The repair of the house and other items is a shared responsibility between both gender groups.

##### (b) *Legal Ownership of Assets*

The land use right for arable land is usually owned by both the husband and wife, ranging from 60% in Engule to 100% in Enkulal. In Baskura and Zefie, about one-third of the land use rights are owned by the husband only, whereas one-third of the land use rights in Engule is registered in the name of the wife. In Engule, Kantai and Zefie, the husband is usually the owner of all agricultural equipment and means of transport. In the other two micro-watersheds, these assets are owned by both the husband and wife. The house, as well as large and small livestock, is often owned by both the husband and wife in Baskura, Zefie and Enkulal, whereas these assets are either owned by the husband, wife or both in the other two micro-watersheds. Jewellery is commonly owned by the wife in Engule, Kantai and Zefie. Household utensils are normally owned by almost two-third of the women in Zefie and Enkulal and just by the wives in Baskura. The ownership of a radio is rather mixed, with two-thirds of the husbands are reported to be the legal owner



in Engule and Kantai, whereas both the husband and wife are considered to be the legal owners in Baskura.

(c) *Decision Making Power*

In Engule, Baskura and Kantai, it is usually the husband who takes the decisions with regard to crop production, whereas these decisions are made by both the husband and wife in Zefie and Enkual. The decision to purchase assets is normally made by both the husband and wife, whereas the decision for purchase of food items and utensils is either made by the wife or both the husband and wife. The decision to sell assets and cereals is usually made by both the husband and wife. With regard to the sale of cash crops, large and small livestock, as well as borrowing money, the decision is either made by the husband or both the husband and wife. Decisions related to health care, as well as the education and marriage of children, are usually made by both the husband and wife, except in Kantai where the decision concerning the marriage of children is made by two-third of the husbands.

(d) *Workloads*

The degree of workload for both male and female household members is closely related to the seasonal calendar of agricultural activities. The workload is the highest for male and female household members from May until February, starting with ploughing and sowing in May and June, followed by weeding in August and September, harvesting in November and December and threshing in February. Most agricultural activities are carried out by hand due to the lack of access to (modern) farming and transport equipment. In addition, male and female household members are also daily involved in activities related to livestock. Furthermore, the wife and other female household members also have the responsibility for almost all domestic tasks, including cooking, fetching water and fuel wood, taking care of children, elderly and sick persons.

The number of working days is significantly reduced as it is prohibited for Orthodox Christians to work on Sundays as well as the four to six Saint Days that are celebrated each month and other holydays, such as New Year, Easter and Epiphany.

(e) *Access to Land*

About 12.5% of the (surveyed) female-headed households are landless and the remaining 87.5% have less than 0.5 ha of land. About two-thirds of the female-headed households with land use rights have 3 or 4 different plots. Among the (surveyed) male-headed households, about 55% have less than 0.5 ha, whereas 28% have 0.5 to 1.0. ha and the remaining 17% have more than 1.0 ha. About 50% of the (surveyed) female-headed households with land are unable to cultivate their fields themselves due to lack of oxen, labour and inputs. None of the female-headed households cultivate (additional) land as tenants or sharecroppers. Female-headed households face more serious labour shortages during critical stages of the cropping season. The existing mutual labour exchange systems in the micro-watersheds are not usually available for female-headed households due to social-cultural norms. Most female-headed households are not able to hire labour due to lack of money.

*(f) Access to Rural Credit*

Although rural credit programs are targeted to rural women, only 25% of the (surveyed) female-headed households in the five micro-watersheds have obtained loans as opposed to 43% of the male-headed households. Relatives and saving and credit associations are the main sources of credit for female-headed households. Male-headed households usually obtain loans from micro-finance institutions and banks, as well as other sources.

*(g) Access to Extension Services*

Although health extension services exist in the five micro-watersheds, few women have access to these services. As a result, these services have limited impact on the living conditions and livelihoods of the rural households in the five micro-watersheds.

While 78% of the surveyed male-headed households responded that they have access to extension services from the DAs, the proportion of the female-headed households is only 50%. Similarly, only one-third of the female-headed households have access to veterinary services against two-thirds of the male-headed households.

About two-thirds of the surveyed female-headed households have been involved in Soil and Water conservation (SWC) activities and have planted trees. Among the surveyed male-headed households, 90% had carried out SWC activities and 82% have planted trees.

*(h) Agricultural Production and Food Security*

Reportedly, there are no significant differences in the yields for most crops between male and female-headed households. However, 38% of the surveyed female-headed households have food shortages in years with normal rainfall against 28% of the male-headed households. This is mainly due to the small land use areas owned by female-headed households and the fact that more female-headed households have their landholdings cultivated by tenants/sharecroppers than male-headed households.

*(i) Access to Agricultural Tools and Traction Power*

Only 50% of the surveyed female-headed households reported to have access to sufficient traction power (i.e. oxen) compared to 70% of the surveyed male-headed households. In case of insufficient traction power, 60% of the surveyed female-headed households share oxen with other households as against 93% of the surveyed male-headed households. The remaining 40% of the female-headed households have their land cultivated by tenants or sharecroppers, whereas only 7% of the male-headed households have adopted this strategy to cope with the shortage of traction power.

*(j) Ownership of Livestock*

About 13% of the surveyed female-headed households do not own livestock, as against only 3% of the surveyed male-headed households. About 87% of the female-headed households have less than five animals compared to only 42% of the surveyed male-

headed households. This is mainly due to limited access to animal feed as a result of smaller landholdings. Female-headed households mainly rear small ruminants and poultry, whilst none of the surveyed female-headed households are involved in bee-keeping.

*(k) Non-Farm Income Generation*

About a quarter of the surveyed female-headed households is involved in handicraft as against only 8% of the surveyed male-headed households. Female-headed households are greater than three times more involved in daily labour than male-headed households. Permanent migration is also higher among women than among men.

*(l) Education and Health*

The overall literacy rate among the male adult members of the surveyed households is 49% against 34.5% for the female adult household members. Among the surveyed households in the five micro-watersheds, 21% of the female household members completed the first cycle primary school against 23% for the male household members. About 12% of the male household members completed the second cycle primary education against only 8% of the female household members. However, the proportion of female household members attending secondary high school education is slightly higher than for the male household members, particularly in Baskura and Enkulal.

The proportion of women with health problems is slightly higher than for men, but malaria reportedly affects female-headed households three times more than male-headed households. Access to maternal and child health care is low with less than 20% of the surveyed households in the five micro-watersheds able to make use of this. Almost all women give birth at home assisted by female relatives and/or (untrained) traditional birth attendants. Use of contraceptives is low (20%) and access to family planning services is limited. The existing health posts in the Kebeles are ill-equipped and unable to provide sufficient preventive and curative health services.

*(m) Access to Energy*

The collection of fuel wood and crop residues is mainly the responsibility of women and girls. The collection of dung and the preparation of dung fuel cakes for use in the dry season is also the task of the female household members. The most common health problems related to the use of these fuels within the poorly ventilated houses are eye diseases and respiratory infections.

*(n) Participation in Local Institutions*

Overall, the participation of women in formal and informal institutions at local level is low or even no existent. The only exception is the participation of women in the Water Management Committees, which are responsible for the operation and maintenance of potable water supply schemes.

#### 2.1.4.4 *Settlement Pattern and History*

Before 1991, clustered settlements were common in the three sub-catchments. Following the demise of the Derg regime, the existing settlement pattern in the five surveyed micro-watersheds has been dominated by individual homesteads and (very) small settlements, with only a few households with close blood ties, which are scattered throughout each micro-watershed. The number of settlements in the five surveyed micro-watersheds ranges from 3 in Enkulal to 15 in Zefie. Reportedly, four of the five surveyed micro-watersheds have been inhabited for more than 100 years, whereas the first households settled in Enkulal some 70 years ago.

#### 2.1.4.5 *Landholding, Tenure and Values*

##### *(a) Land Use Rights and Administration*

Up to 1975 land was managed in a feudal system but under the Derg it was nationalized and distributed to peasant farmers. Communal grazing and forest areas were also established at this time. Since 1993 individual rights to cultivate land have been recognized and a program of registration instigated. The rights are in effect de facto leasehold till perpetuity and allow transfer to family members but no sale. Land holdings are often scattered across a range of plots on differing land types and at death these plots can be divided amongst family members, leading to land fragmentation. Due to the pressure on land a class of landless young households is starting to emerge.

All surveyed households in Baskura and Enkulal have land use rights in the micro-watershed as against 90% and 80% in Engule and Kantai respectively. One-third of the surveyed households in Zefie do not have the right to cultivate land in the micro-watershed. In Kantai, all surveyed households have cultivated their lands for the last 10 to 20 years, whereas 90% and 75% of the surveyed households in Engule and Enkulal have had their land use rights for more than 20 years. In Baskura and Zefie, 40% and 30% of the surveyed households have cultivated their fields for less than 10 years.

In Baskura, Kantai and Enkulal, 75% to 80% of the surveyed households have their land either in the upper, middle or lower part of the micro-watershed. In Engule and Zefie, almost 90% and 60% of the surveyed households have plots of land in the upper, middle and/or lower parts of the micro-watershed.

In Engule and Enkulal, the land use rights of all surveyed households have been registered with the Land Administration Department. In Kantai, Baskura and Zefie, the land use rights of 12.5% to 29% of the surveyed households are not yet registered. In Engule, Kantai and Enkulal, two-thirds to three-quarters of the surveyed households have their land use rights registered in the name of both the husband and wife. In Baskura and Zefie, 50% of the surveyed households have their land use rights registered in the name of the husband only. In Kantai, Enkulal and Zefie, the land use rights of 25% to 33% of the surveyed households are registered in the name of a relative.

(b) *Land Tenure*

Almost all the land within the micro-watersheds has individual land use rights. The size of the communal grazing land in the five surveyed micro-watersheds is very small (less than 5 ha). Almost all the land within the micro-watersheds has individual land use rights. The size of the communal grazing land in the five surveyed micro-watersheds is very small (less than 5 ha).

Based on data provided by the Wereda Offices, the land use pattern in the three Project areas is shown in the following table.

Name of Watershed	Land Use						Total
	Cultivable	Grazing	Forest	Waste	Houses & Roads	Other Use	
<b>Gumera</b>							
Total	160,673	18,924	5,281	1,371	13,010	12,165	211,660
Average per Kebele	3,032	357	100	26	245	230	3,994
% of Total Area	76%	9%	2%	1%	6%	6%	
<b>Ribb</b>							
Total	119,176	18,183	4,524	4,210	12,773	26,499	185,366
Average per Kebele	2,292	350	87	81	246	510	3,565
% of Total Area	64%	10%	2%	2%	7%	14%	
<b>Jema</b>							
Total	37,143	5,034	2,760	284	1,471	2,161	48,853
Average per Kebele	2,321	315	173	18	92	135	3,053
% of Total Area	76%	10%	6%	1%	3%	4%	

On average, 76% of the total area in the Gumera Watershed is cultivable land, whereas 9% is used for grazing, 6% for houses and roads and another 6% for other uses. In the Catchment Development Plan for the Gumera Irrigation Project<sup>3</sup>, the Gumera watershed covers a total area of 158,853 ha, which is 52,807 ha (25%) smaller than the total area reported by the Wereda Offices. The land use classification for the study area of 128,339 ha was 75.1% as cultivated, 10.6% as grazing, 6.1% as forest/bush/wood and 6.4% as settlement.

In the Ribb Watershed, 64% of the total area is considered to be cultivable land and 10% as grazing land, while 14% is used for other purposes and 7% for houses and roads. In both watersheds, only 2% is classified as forest. In Jema Watershed, about three quarter of all land is cultivable land, while 10% is used for grazing and 6% is classified as forest land. The remaining 8% is used for houses, roads and other uses.

<sup>3</sup> MoWR (2006): Gumera Irrigation Project – Feasibility Study Phase II; Catchment Development Plan (Final) (November 2006), p.9 and 11.

(c) *Landholding Pattern*

The distribution of different landholding sizes among the surveyed households, as well as the mean landholding size in the five micro-watersheds, are presented in the following table.

Landholding Size	Distribution among Surveyed Households				
	Engule	Baskura	Kantai	Zefie	Enkulal
0.1 – 0.5 ha	20%	50%	60%	56%	13%
0.5 – 1.0 ha	40%	40%	20%	33%	25%
1.0 – 1.5 ha	20%	-	20%	11%	12%
1.5 – 2.0 ha	-	10%	-	-	37%
> 2.0 ha	20%	-	-	-	13%
Mean Landholding					
Mean Landholding per HH	1.75	0.75	0.72	0.77	1.72
Mean Landholding per capita	0.28	0.13	0.11	0.13	0.34
Mean Landholding per Male-Headed HH	2.25	0.75	0.79	0.73	1.71
Mean Landholding per Female-Headed HH	0.75	0.75	0.50	1.0	1.75
Mean Landholding per Resident HH	1.84	0.75	0.70	0.81	2.06
Mean Landholding per Non-Resident HH	1.00	-	0.75	0.50	1.39

The mean landholding per surveyed households in the five micro-watersheds ranges from 0.72 ha in Kantai to 1.75 ha in Engule. The landholding pattern in Baskura, Kantai and Zefie is dominated by very small landholdings, with 50% to 60% of the surveyed households having less than 0.5 ha of arable land, whereas only 10% to 20% of the surveyed households have between 1.0 and 2.0 ha. The distribution of land use rights is more skewed in Engule and Enkulal with 20% and 40% have more than 1.5 ha against 60% and 38% have less than 1.0 ha.

In Engule the mean landholding of the surveyed male-headed households is three times larger than that for the surveyed female-headed households. In the other four micro-watersheds the mean landholding for the surveyed male and female-headed households are not significantly different.

(d) *Land Use Right Fragmentation*

The fragmentation of land use rights among the surveyed households in the five micro-watersheds is shown below.

Number of Plots	Land Use Right Fragmentation among Surveyed HHs				
	Engule	Baskura	Kantai	Zefie	Enkual
1	-	10%	50%	14%	-
2	11%	40%	13%	43%	13%
3	22%	20%	12%	14%	37%
4	33%	-	13%	29%	25%
5	33%	30%	12%	-	25%

The land use rights among the surveyed households in the five micro-watersheds are fragmented, as 50% to 90% of the surveyed household cultivate 3 to 5 different plots, which are often located in the upper, middle and/or lower parts of the micro-watershed. The fragmentation of land use rights is most extreme in Engule, with two-thirds of the surveyed households having 4 or 5 different plots, followed by Enkual where 50% of the surveyed household cultivate 4 or 5 different plots.

*(e) Tenancy and Sharecropping*

In Engule, Baskura and Zefie, 40% to 50% of the surveyed households lease or sharecrop land belonging to other households, as opposed to 12.5% and 20% in Enkual and Kantai respectively. In four of the five micro-watersheds, 75% to 100% of the leased or sharecropped is smaller than 0.5 ha where as in Baskura three-quarters of the leased/sharecropped land is 1.0 to 3.0 ha in area. The main reasons for the surveyed households to lease or sharecrop land are the lack of arable land or insufficient land to sustain the household. However, surveyed households with more than 1 ha of arable land are more involved in leasing/sharecropping land than landless households or households with small land holdings. Female-headed households do not cultivate additional land as tenants or sharecroppers. Surveyed households with their own oxen are more involved in sharecropping or leasing of additional land.

Except in Zefie, 20% to 45% of the surveyed households in the other four micro-watersheds have part of their land cultivated by tenants or sharecroppers, including 50% of the surveyed female-headed households. About 67% to 100% of the land leased or sharecropped is smaller than 0.5 ha. Surveyed households having their land cultivated by tenants or sharecroppers are often too old, ill or too poor to cultivate the land themselves or they do not have oxen or sufficient male labour.

About a quarter of the households engaged in tenancy and sharecropping lease the land, whereby the lease price varies from Birr 100 to 800 per ha, depending on the location and fertility of the plot of land. The most common sharecropping arrangement is that the holder of the land use right receives 50% or 67% of the harvested crop, whereby the sharecropper has to provide the oxen, seeds, fertilizers and all necessary labour. However, it is also reported that the holders of the land use rights in Engule and Baskura only receive 20% or 33% of the harvested crop.

(f) *Soil and Water Conservation*

About 85% of the surveyed households in the five micro-watersheds are reported to have applied different Soil and Water Conservation (SWC) measures. There are mainly soil and stone bunds in and around their fields, as well as field drains to avoid excessive erosion of the soils. Most of the soil and stone bunds were constructed in the mid 1990s. Most of the soil conservation structures built on communal grazing lands have been destroyed.

In each Kebele, a formal institution, known as the *Mengistawi Budin* (sub-kebele group), exists, which is responsible for the execution of community works, including SWC structures, schools and health posts, water source development and tree plantations. Each group has 50 to 100 members and each household is obliged to participate in any activity demanded by the Kebele Council. Following the land redistribution and the allocation of individual land use rights, less communal soil conservation activities have been executed. Individual households are responsible for undertaking SWC activities on their allocated lands themselves, but they often lack the resources to carry out the required activities.

2.1.4.6 *Common Resource Rights*

All households resident within the boundaries of the Kebele have the right to use the communal grazing land in order to feed their animals. However the management of communal grazing land has become problematic with overuse being a major contributor to erosion. Local people also have the right to use water in rivers, streams and springs in order to water their livestock. Similarly, all resident households are entitled to fetch fuel wood in any community forest located within the boundary of the Kebele. The area of communal planted forest in Kantai is 17ha. Communal forests suffer from encroachment and can be problematic to manage. In Engule, which lies next to the perennial river Jema, local people catch and eat fish.

2.1.4.7 *Rural Credit*

In the last 10 years, the proportion of surveyed households in the five micro-watersheds having obtained loans ranges from only 10% in Engule to 70% in Baskura. A micro-finance institution (ACSI) is the sole source of credit for the surveyed households in Engule, Kantai and Enkula. In the other two micro-watersheds, the surveyed households obtained loans from relatives, banks, saving & credit associations, micro-finance institutions or other sources.

In Engule, Kantai and Enkula, the loans taken out by the surveyed households were only for short-term credit (less than 1 year), for the procurement of agricultural inputs (i.e. seeds and fertilizer) and equipment (mainly chemical sprayers) and/or oxen. In the other two micro-watersheds the surveyed households also obtained medium- and long-term loans for the same purposes. The reported annual interest rates range from 2% in Engule to 100% in Baskura. Credit provided through government programs usually have



an interest rate of 12.5 and 15% per year, whereas ACSI applies an annual interest rate of 18%. Land use rights, animals and jewellery are normally used as collateral for informal loans that are obtained from relatives and other individuals. Group collateral is used as collateral by ACSI and saving and credit associations. Kebele Councils and cooperatives are responsible for the repayment of loans that they have distributed among the farmers. Between 40% and 50% of the surveyed households who had obtained loans in Baskura, Kantai and Zefie reported that they defaulted due to crop failure or have used the credit for other purposes.

#### 2.1.4.8 *Domestic Energy and Fuel*

About 80% to 100% of the surveyed households in the five micro-watersheds use oil lamps for lighting their homes, whereas 10% and 13% of the surveyed households in Baskura and Enkulal have electricity, due to fact that they live outside the micro-watersheds where a supply exists. About 10% and 22% of the surveyed households in Kantai and Zefie use crop residues and wood for lighting.

Wood and animal dung are the two most important energy sources for cooking, whereas crop residue is used to a lesser extent. Planted trees (Eucalyptus) around the house is the most important source of fuel wood followed by collection away from the homestead. Only a limited number of surveyed households in Kantai and Engule purchase fuel wood. In the cases where surveyed households fetch fuel wood, the frequency is usually once or twice per week. In Kantai and Engule, the community forests are important sources of fuel wood. In Enkulal, all fuel wood is either obtained from own trees or purchased. In Engule and Zefie, 90% and 80% of the surveyed households fetching fuel wood do not have to walk further than 500m. In Baskura and Kantai, 60% and 50% of the surveyed households fetching fuel wood have to walk more than 500m.

In Engule and Zefie, none of the surveyed households uses fuel-saving stoves. In Baskura, Kantai and Enkulal, 30%, 10% and 13% of the surveyed households reported the use of fuel-saving stoves. Inadequate supply and non-availability of extension services are mentioned as the main reasons for the low adoption rate of fuel-saving stoves. Other issues mentioned included the fire risk to thatched houses and the need in such cases for construction of a separate kitchen. There are human health benefits in using fuel-saving stoves as they produce less smoke.

A declining forest area, in combination with increased use of crop residue as animal fodder, along with a rapidly growing population could result in shortages of fuel wood in the future, especially for households with no or small landholdings. The fact that animal dung is being used as fuel rather than being put on the fields as fertilizer is an indication of a resource system that is under pressure.

Charcoal is produced in the area but is sold for cash to nearby towns.

#### 2.1.4.9 *Domestic Water Supply*

None of the households that are resident in the Engule micro-watershed has access to safe drinking water, as the Jema River and an unprotected spring are the only sources. Most of the surveyed households live more than 300m from the nearest water source and 70% of the surveyed households spend more than one hour of each day to fetch water. In Enkulal, 50% of the surveyed households fetch water from an unprotected spring, while the other 50% use a protected spring or a well with a hand pump. None of the surveyed households in Enkulal has to spend more than one hour per day to fetch sufficient water to meet their domestic needs.

In Zefie, almost 90% of the surveyed households fetch drinking water from a local stream, unprotected spring or open well, while the remaining 10% have access to safe water from a protected spring. Two-thirds of the surveyed households live within 200m from the nearest water source, while a quarter has to walk more than 300m. About 60% of the surveyed households in Baskura fetch drinking water from a protected well, whereas the other 40% use a local stream and an unprotected spring to satisfy their needs for drinking water. As 80% of the surveyed households do not have to walk further than 200m, they do not spend more than 30 minutes daily to fetch water.

In Kantai, 80% of the surveyed households have access to safe drinking water from a well with a hand pump, while the other 20% fetches water from a stream. As none of the surveyed households lives further than 300m from the nearest water source, almost 90% of them spend less than 30 minutes each day fetching water.

Usually, households living closer to a water source fetch water more frequently than households further away. About 80% of the surveyed households fetch water two to three times per day, whereas the remaining households go more than three times per day.

In years with normal rainfall, 45% of the surveyed households in Zefie reported to have experienced shortages of drinking water for one to six months per year, as the discharge of the natural springs gradually decreases due to increased use and lower water tables. In Kantai, about 10% of the surveyed households reported drinking water shortages. In years with less than normal rainfall, about 30% of the surveyed households experience drinking water shortages, in particular in Kantai where two-thirds of the surveyed households reported water shortages. About 80% of the surveyed households face water shortages for 2 months, while the remaining 20% experience 3 months of water shortages. In dry years, most springs dry up and the volume of water in the streams is reduced. As a result, there is an increasing pressure on the other water sources with more reliable discharges. In Engule, households do not experience water shortages as the Jema River never dries up.

All surveyed households in Engule reported that the quality of the collected drinking water is not good. In the other four micro-watersheds, 20% to 40% of the surveyed households consider the quality of the collected drinking water as being unsafe. One of

the main problems is the contamination of sources by animal waste which could be solved by the provision of suitably designed spring and well heads

Although Water Management Committees have been formed for potable water supply schemes, the management of these systems is poor due to lack of proper training and the lack of effective monitoring and supervision. As user fees for routine maintenance are not (regularly) collected, many potable water supply schemes are not properly maintained. The lack of fences is a major reason that many schemes are frequently damaged and polluted by animals. The lack of ancillary structures, such as washing places and animal drinking troughs, also contribute to the poor functioning, frequent dilapidation and water quality problems of potable water supply schemes. It has been specifically mentioned that the lack of safe drinking water at health centres and schools is a problem.

#### 2.1.4.10 *Sanitation*

In Zefie and Enkulal, 100% and 88% of the surveyed households reported the use of latrines, whereas 60% and 70% of the surveyed households in Engule and Baskura reportedly have toilets. In Kantai, only 40% of the surveyed households stated that they use a latrine. The main reason given for not having a latrine is the lack of adequate space, whereas in Baskura the availability of open space is mentioned as a reason for not installing a latrine. In Engule, lack of awareness and flood-damage are given as a reason for not using a toilet. Organic household waste is usually used for compost making, whereas non-organic waste is dumped in open fields.

#### 2.1.4.11 *Human Health*

##### (a) *Health Problems*

Except in Kantai, malaria is the most important health problem in the micro-watersheds. Cold/flu and dysentery are the second most important health problems, followed by typhoid and stomach ailments. The incidence of malaria in the highlands is surprising but it is thought that migrants to and from the area near the border with Sudan have been responsible for bringing the disease into the area. Poor hygiene, environmental conditions and unsafe drinking water are considered to be the main causes of the reported health problems in the five micro-watersheds. Other health problems include tuberculosis, pregnancy and delivery complications, skin and eye diseases, respiratory infections and sexually transmitted diseases. The incidence of health problems is higher during the rainy season when the work load is high and food a shortage of food is experienced.

On average, 36% of the surveyed households in four of the five micro-watersheds reported to have health problems during the last 6 months, ranging from only 13% in Enkulal to 80% in Engule. Malaria affected almost 30% of the surveyed households in the past 6 months. Malaria prevention and control services are ill-equipped and understaffed. In addition, 88% of the surveyed households reported stomach ailments

due to unsafe drinking water collected from rivers, streams, unprotected springs and open wells.

About 75% of the surveyed households in four of the five micro-watersheds visit the local health post in cases of serious illness, whereas the remaining 25% of the surveyed households consult traditional healers or stay at home. In Enkulal, however, none of the surveyed households are reported to have visited the local health post. Child delivery always takes place at home and the pregnant women are assisted by either traditional birth attendants or female relatives. The level of ante and post natal care is low, as the local health posts do not have the equipment or staff with the necessary skills and experience.

According to the focus group discussions, less than 25% to 50% of the population in the reproductive age use modern contraceptives, such as the pill and condom. The relatively low use of contraceptives is due to cultural norms and values, social pressure of relatives and friends, as well as lack of access to health services as the average walking distance to the nearest health centre is 2 hours.

Almost 85% of the surveyed households in four of the five micro-watersheds reported that their children were vaccinated. In Enkulal, however, 25% of the surveyed households stated that their children were not vaccinated. Child malnutrition seems to be moderate, but it could become critical at time of food shortages.

#### *(b) Health Infrastructure*

All the five Kebeles, in which the five surveyed micro-watersheds are located, have a health post. As the health posts have been constructed through community participation, their physical state is poor. The main tasks of these local health facilities include the provision of family planning, child and maternal health care, disease prevention, environmental hygiene and sanitation activities. The health posts are staffed with health extension workers. Except for the procurement of drugs and the payment of salaries, all other operating costs must be paid for by the community. The result is that the health posts lack operating funds and the level of service is not satisfactory. The health centres at Wereda level are often not better than the local health posts.

#### *2.1.4.12 Human Nutrition*

About 85% of the surveyed households reported that they never eat meat, ranging from 100% in Baskura, Kantai and Enkulal to 50% in Engule. Milk and other dairy products are never consumed by 37% of the surveyed households, varying from 11% in Kantai to 67% in Zefie. About three-quarter of the surveyed households never eat eggs, whereas pulses are never consumed by about 70% of the surveyed households in Baskura, Kantai and Enkulal. Vegetables are not part of the weekly menu for three-quarters of the surveyed households, ranging from 100% in Kantai and Enkulal to 40% in Baskura. Only 10% of the surveyed households in Baskura and Kantai reportedly consume fruit one to three times per week.

Some 30% of survey households in the micro-watersheds claim to have food shortages in normal years. In bad years (normally due to low rainfall) 57% say that they experience food shortages, although this varies from 90% in Kantai down to 20% in Engule.

#### 2.1.4.13 Education and Literacy

On average, 42% of the adult members of the surveyed households in the five micro-watersheds are literate, ranging from 32% in Engule to 67% in Enkulal. The overall literacy rate among the male adult members of the surveyed households is 49% against 34.5% for the female adult household members. The literacy rates for the surveyed households in the five micro-watersheds are presented below.

	Literacy Rates for Adult Members of Surveyed HHs				
	Engule	Baskura	Kantai	Zefie	Enkulal
Total	32%	41%	42%	36%	67%
- Male HH members	37%	36%	59%	42%	74%
- Female HH members	26%	31%	30%	31%	59%

Among the surveyed households in the five micro-watersheds, 21% of the female household members completed the first cycle primary school against 23% for the male household members. About 12% of the male household members completed the second cycle primary education against only 8% of the female household members. However, the proportion of female household members attending secondary high school education is slightly higher than for the male household members, in particular in Baskura and Enkulal.

About 11% of the surveyed households in the five micro-watersheds do not send their children in the age group of 6 to 13 years to primary school due to lack of money and shortage of labour. However, one-third of the girls aged 6 to 13 years do not attend primary education as they have to work at home or they are ready to marry. Another problem is that school-going children stay at home due to labour shortage, seasonal migration, illness or lack of interest. The number of days that school-going children among the surveyed households in the five micro-watersheds do not attend school ranges from 15 to 120 days, in particular during the cropping season.

None of the five surveyed micro-watersheds has a primary school, but there is a primary school in the same Kebele where the children attend. In four of the five micro-watersheds, the walking distance to the nearest primary school is less than 1 hour. In Engule, however, most children have to walk for 2 hours to the nearest primary school.

The quality of the primary school buildings is poor, as they are usually built through community participation using local construction materials. Most schools are unsafe and unhygienic and they have insufficient furniture and operating budgets. They usually depend on income generated through the sale of crops and grasses grown within the school compound. There is also a critical shortage of qualified teachers and books. The schools are managed by a parent-teacher school management committee and it is

formally responsible for overlooking the management of the school, organizing community contributions for maintenance, supporting children from poor households, promoting enrolment, ensuring security as well as monitoring and supervising the performance of teachers and students. In most schools, however, the role of this committee is limited to raising contributions for the salaries of the guards.

Most households in the five micro-watersheds do not send their children to secondary school as the distance to the nearest secondary school is too far (more than 3 to 5 hours walk) and the costs to sustain students in the nearest town are too high. Therefore, education for the large majority of children ends in Grade 8.

#### 2.1.4.14 *Archaeological and Cultural Sites*

In the wider sub-catchment area Gelowdiwos Kebele has a 500 year old Ethiopian orthodox Coptic church and also mosques constructed in the 16<sup>th</sup> century. There are also many old churches on hill tops surrounded by protected woodland. Within the micro-watersheds there is such a 15<sup>th</sup> century church on a hill in Engule which is surrounded by protected woodland.

#### 2.1.4.15 *Landscape Aesthetics*

The wider sub-catchment areas contain areas of important landscape value, including spectacular volcanic plugs west of Baskura, along with the natural forest of Alemsaga. Lake Tana is of important landscape value. The upstream part of the Enkual micro-watershed has the remnant of the Nifara natural forest, with significant bio-diversity. The topography of the Engule area is quite attractive rolling landscape whilst the other four micro-watersheds are hilly. The hill top churches surrounded by protected natural forest significantly add to the unique landscape nature of the area.

### 2.1.5 **Socio-Economic Environment**

#### 2.1.5.1 *Livelihoods*

##### *(a) Agriculture*

Cropping Pattern: The cropping pattern of the five surveyed micro-watersheds is dominated by the cultivation of cereals on more than 90% of the total cultivated land. In order to satisfy the need for more food and cash income for a rapidly growing population, the cultivated area has increased considerably in the last two to three decades by converting forests and grazing lands into crop land. The existing cropping patterns for the five surveyed micro-watersheds as a proportion of the total estimated cultivated area are presented in the table below.

Crop	Proportion of Total Estimated Cultivated Area				
	Engule	Baskura	Kantai	Zefie	Enkual
Teff	6%	19%	11%	-	39%
Barley	5%	19%	30%	1%	8%
Wheat	2%	19%	26%	10%	20%
Millet	20%	6%	-	-	2%
Sorghum	-	15%	-	-	-
Maize	56%	5%	-	-	12%
Beans	6%	13%	2%	1%	-
Oil seeds	4%	1%	-	-	14%
Potato	-	3%	32%	1%	6%
Vegetables	-	-	-	-	-
Pepper	-	-	-	-	-

Climatic and altitudinal conditions, the influence of extension services, market conditions, soil fertility, access to improved seeds and fertilizer, as well as plant diseases and pests, are factors that influence the prevailing cropping patterns in the five surveyed micro-watersheds. The proportion of households in the five surveyed micro-watersheds that are cultivating various crops is shown in the following table

Crop	Proportion of Households Cultivating Crop				
	Engule	Baskura	Kantai	Zefie	Enkual
Teff	30%	80%	50%	-	100%
Barley	60%	90%	70%	89%	63%
Wheat	10%	70%	60%	100%	75%
Millet	50%	30%	-	-	13%
Sorghum	-	60%	-	-	-
Maize	100%	80%	-	-	100%
Beans	40%	70%	10%	78%	-
Oil seeds	20%	10%	-	-	63%
Potato	10%	60%	70%	89%	50%
Vegetables	-	-	-	11%	-
Pepper	-	-	-	11%	-

As the area used for the cultivation of pulses is small compared with cereals, the significance of pulses as an input to crop rotation in order to restore soil fertility is minimal. The production of vegetables is very limited and only a small number of households use small-scale irrigation. Fruit crops are not produced in the five surveyed micro-watersheds. However, there may be significant potential for growing highland fruits, such as apple, as well as warm climate fruits, such as mangos and papaya, around homesteads and around the fields as a soil conservation measure.

Crop Yields: The reported yields for the various crops cultivated in the five surveyed micro-watersheds are given below.

Crop	Reported and Potential Yields (t/ha)					
	Engule	Baskura	Kantai	Zefie	Enkulal	Potential Yield <sup>a</sup>
Teff	2.67	0.95	1.60	-	0.56	1.8
Barley	3.85	2.04	1.75	1.25	1.00	2.8
Wheat	1.20	1.02	2.29	0.43	0.81	3.0
Millet	0.64	0.51	-	-	0.80	n.a.
Sorghum	-	0.82	-	-	-	n.a.
Maize	1.38	1.73	-	-	1.43	6.0
Pulses	1.04	1.11	0.77	0.90	-	n.a.
Oil seeds	0.40	0.08	-	-	0.29	n.a.
Potato	8.33	19.80	9.39	4.36	3.70	9.0
Vegetables	-	-	-	3.33	-	n.a.
Pepper	-	-	-	1.67	-	n.a.

<sup>a</sup> Source: Interim Report (Final), p.37

The reported crop yields in the five surveyed micro-watersheds vary considerably. The reported yields for teff and barley in the Engule micro-watershed seem to very high compared with the potential yield. Similarly, the reported yield for potato in Baskura is significantly higher than the potential yield. However, overall the reported yields for the major crops are (much) lower than their potential yields.

**Agronomic Practices:** The main issues with regard to the existing agronomic practices in the five surveyed micro-watersheds are as follows:

- None of the surveyed households reported to have improved ploughs;
- Sowing is usually done by hand/broadcasting after four to five times of ploughing;
- Row planting of maize, sorghum and potato is not commonly practiced;
- Over-sowing of sorghum and maize is used to control weed growth as well as to provide animal feed through thinning;
- Most crops require weeding three to four times, which is carried out manually and consumes more than one-third of the labour required for crop production;
- Herbicides are not used due to their high prices and shortage of supply;
- Traditional support systems, such as wenfel, are commonly used to cope with labour shortages during the cropping season, in particular the harvesting season;
- Harvesting is normally carried out with a sickle;
- Harvested crops are immediately stored near the homestead to free the land for animal grazing on the crop residuals;
- Cattle and pack animals are used for threshing of cereals on circular grounds prepared near the homesteads;



- Cereals are usually stored in gotera/gota made of sticks and/or mud in the residential houses and storage losses are significant due to insects, rodents and fungal diseases; and
- Most households do not have access to modern equipment, such as chemical sprayers. This is particularly the case for female-headed and poor households.

Irrigated agriculture is limited to a very small proportion of the total estimated cultivated area and almost all crop production in the five micro-watersheds is rain-fed. Except in years with an extreme drought, crop failures due to climatic variation are not common. Intercropping of maize and millet with potato is becoming an adaptive strategy to cope with increasing land shortage and food insecurity, in particular in Baskura and Zefie. Increasing scarcity of arable land and low crop yields make it impossible for the majority of farmers to leave part of their land fallow for at least one year.

Use of Improved Seeds: In four of the five surveyed micro-watersheds, 80% to 100% of the households are reported to use improved seeds, mainly for the cultivation of teff, wheat, maize and potato. In Enkual, 37.5% of the households do not use improved seeds. The large majority of surveyed households (70% to 100%) in the five micro-watersheds have only started to use improved seeds during the last 10 years. The local cooperative is the major supplier of improved seeds. Higher prices and supply shortages are the two main problems with regard to the use of improved seeds. The supply of improved vegetable seeds and planting materials is very limited.

Use of Fertilizer: In Engule and Enkual micro-watersheds, all surveyed households reported the use of chemical fertilizers as opposed to 60% to 80% of the surveyed households in the other three micro-watersheds. Chemical fertilizers are mainly used for maize, teff, wheat, barley and potato. About two-thirds of the households use fertilizer for the cultivation of only a single crop, while the remaining third apply fertilizer to two or more crops. High costs and/or the use of organic compost are the main reasons given for households not using chemical fertilizers. About two-thirds of the households with smaller landholdings (less than 0.5 ha) use chemical fertilizers, whereas all households with more than 1 ha of arable land use chemical fertilizers. About 70% to 100% of all surveyed households in the five micro-watersheds use DAP and Urea, whereas the other households only use DAP. About two-thirds of the households have been using fertilizer for less than 10 years. The cooperative societies are the main source for obtaining fertilizer for almost all surveyed households in the five micro-watersheds. About 80% to 100% of the surveyed households reported that they have easy access to information on fertilizer application. The DAs are the most important source of information and advice for the households in four micro-watersheds, while 50% of the households in Engule received advice from the input supplier. Due to increasing prices of fertilizer, most households have reportedly reduced the rate of application in recent years. The reported fertilizer application rates for the five micro-watersheds are presented in the table below.

Application Rate	Reported Fertilizer Application Rates				
	Engule	Baskura	Kantai	Zefie	Enkulal
< 50 kg/ha	40%	-	13%	29%	-
50-100 kg/ha	50%	83%	87%	29%	-
100-150 kg/ha	10%	17%	-	43%	100%

The majority of households in the five micro-watersheds apply more than 50 kg of fertilizer per hectare and the application rate of households with small landholdings (less than 0.5 ha) is lower than for households with larger landholdings.

Application Rate (kg/ha) by Size of Landholding	Reported Fertilizer Application Rates (kg/ha)				
	Engule	Baskura	Kantai	Zefie	Enkulal
< 0.5 ha	43	100	88	90	150
0.5 – 1.0 ha	69	117	100	100	150
1.0 – 1.5 ha	125	-	100	150	150
1.5 – 2.0 ha	-	100	-	-	150
> 2.0 ha	100	-	-	-	150

**Weeds, Pests and Diseases:** Almost all households have problems with weeds (i.e. *adayo, metch, serdo, muja, wajima, lambut* and *almua*) as well as crop diseases (i.e. *shibshiba, wag, mitch*, rust and blight) and pests (i.e. stalk borer, weevil, aphids, cut worms and rodents), which reduce the yields by 25% to 50% in the five surveyed micro-watersheds. Information and advice on effective methods for crop protection could be easily obtained from Wereda staff and DAs, but the impact of these extension services is often (very) limited as the large majority of households do not have access to the necessary inputs due to high costs or non-availability.

**Use of Agro-Chemicals:** About 60% to 90% of the surveyed households in four of the five micro-watersheds use chemicals to control weeds, pests and diseases, whereas only 20% of the surveyed households in Kantai reported using agro-chemicals. The cooperative is the sole supplier of agro-chemicals in Baskura, Kantai and Enkulal. In Engule and Zefie, the surveyed households obtain their agro-chemicals (mainly) from private suppliers. The most important reason for not using agro-chemicals is the lack of experience and the fact that they are considered too costly or not available in the (local) market.

**Labour Shortage:** During the cropping season, 30% to 60% of the surveyed households in the five micro-watersheds reported a shortage of labour, particularly during planting, weeding and harvesting. One adopted strategy to cope with the labour shortage is the mutual exchange of labour, locally known as *wenfel* or *webera*. In four of the five surveyed micro-watersheds, 50% to 90% of the households are reportedly involved in the mutual exchange of labour, while only 25% of the surveyed households in Enkulal have adopted this strategy. Usually, less than 5 labour days are exchanged per cropping season. Other strategies used to cope with labour shortages are the

employment of children and sharecropping of land. Only wealthier households in the five micro-watersheds hire labour at critical stages of the cropping season, ranging from only 10% of the surveyed households in Baskura to 40% and 50% in Kantai and Engule respectively. In addition to the provision of food and shelter, the daily wage of hired labour varies from Birr 6 to 15, with 80% of the households paying Birr 10 or more per day. In Engule, Baskura and Enkula, 70% to 90% of the surveyed households reported that it is difficult to hire daily labourers.

**Agricultural Labour Division:** The most commonly adopted strategy used by households to cope with labour shortage is to mobilize as many household members as possible during the cropping season, including children. Land preparation, ploughing, seed selection, sowing, fertilizing, weeding, application of chemicals, harvesting, threshing and transport are agricultural activities for which the male household members have the main responsibility. However, female household members usually assist the male household during the execution of field activities. Female household members are mainly responsible for cleaning and storing the harvested crops, together with male household members. Marketing seems to be a shared responsibility between male and female household members. Sharecropping or leasing of the land is the most preferred strategy for female-headed households in order to solve the shortage of male labour, as well as to obey cultural norms and values.

**Crop Marketing:** Overall, two-thirds of the cereal production in the five surveyed micro-watersheds is used for home consumption and the remaining one-third is sold. The proportion of the harvested grain crops marketed in the five micro-watersheds is presented in the table below.

Crop	Proportion of Crops Marketed				
	Engule	Baskura	Kantai	Zefie	Enkula
Teff	38%	-	-	-	-
Barley	39%	12%	-	7%	-
Wheat	22%	6%	12%	13%	24%
Millet	25%	-	-	-	-
Maize	27%	11%	-	-	1%
Vetch/Chick Pea	38%	48%	-	20%	-
Oil seeds	100%	-	-	-	100%
Potato	-	21%	43%	5%	33%

Compared with the other four surveyed micro-watersheds, households in Engule sell significantly more of their harvested grain crops, ranging from 22% of their wheat crop to 39% of their barley crop. Vetch/chick pea and oil seeds, and to a lesser extent wheat and potato, are the major cash crops for the farming households in the five micro-watersheds. In four of the five surveyed micro-watersheds, 30% to 40% of the households sell their agricultural produce immediately after the harvest. In Enkula, however, 83% of the surveyed households are reported to market their crops immediately after the harvest. The main reason for selling the agricultural produce

immediately after the harvest is to have money for urgent social and economic obligations, such as the payment of taxes or the repayment of loans. If the produce is not sold immediately after the harvest, 80% to 100% of the households market their crops more than 3 months after the harvest, mainly to benefit from higher prices. In Engule and Zefie, 80% to 90% of the produce is sold to local retailers, whereas 44% and 57% of the marketable crops are directly sold to consumers in Baskura and Enkulal respectively. In Kantai, cereals are sold to local retailers, middle men, wholesalers and consumers. There are (weekly) markets within a distance of one to three hour walk from the five micro-watersheds, where households can sell their agricultural produce.

*(b) Livestock*

Livestock Population: About 95% of the surveyed households in the five micro-watersheds own one or more animals. On average, one household has 2.8 head of cattle, 0.6 head of equines and 2.7 head of sheep and goats. About 81% of the households in the five micro-watersheds own at least one ox, whereas 85% have at least one cow and 70% also have poultry. Sheep are raised by 62% of the households and 25% also produce honey. The reported number of livestock in the five surveyed micro-watersheds is presented in the following table.

Type of Animal	Reported Number of Animals by Surveyed HHs					
	Engule	Baskura	Kantai	Zefie	Enkulal	% of HHs
Oxen	12	17	14	12	11	81%
Cow	24	11	10	11	10	85%
Sheep	12	27	28	47	6	62%
Goat	1	5	0	2	2	13%
Donkey	0	0	1	3	0	9%
Mule	3	6	8	5	2	38%
Horse	0	0	0	2	0	4%
Poultry	42	16	20	20	20	70%
Beehive	2	6	4	14	9	25%

Oxen are mainly used for traction in order to plough the land, whereas cows are raised for dairy production. The main purpose of raising sheep is to sell them live when the household needs money. Mules, donkeys and horses are mainly used for transport of goods and humans, as well as for traction power.

Livestock Feed and Water: Communal grazing land, weeds and crop residues are the main sources of animal feed. Most of the current communal grazing lands were previously crop lands before they were converted to grazing land during the Derg regime. The management of communal grazing lands is weak and they are often seriously degraded due to uncontrolled use, leading to overgrazing. Crop residues are mainly used to feed cattle, but they are also an important source of energy for most households in the five micro-watersheds. The cultivation of fodder crops (e.g. grasses, alfalfa) and trees is not widely practiced in the five surveyed micro-watersheds.

Between 25% and 45% of the surveyed households in four of the five surveyed micro-watersheds reported that there is insufficient animal feed in years with normal rainfall, whereas 78% of the surveyed households in Zefie face shortages in normal years. With normal rainfall most households only have a shortage of animal feed for less than 3 months in years, although 20% to 66% of the households in four of the five micro-watersheds also reported shortages of more than 3 months. The most common strategy to cope with animal feed shortages is to use weed from the cropped fields, while households in Engule usually use stored crop residues. In years with less than normal rainfall, households in Baskura and Kentia reported to have serious shortages of animal feed and water. Sale of animals and using weeds are the most common strategies to cope with water and animal feed shortage in years with less than normal rainfall.

Labour Division: Grazing and watering of animals, fetching fodder, slaughter of animals, skin preparation, marketing of live animals and processing of honey are the main responsibilities of the male household members. Women usually assist the male members with fetching fodder. Female household members have the main responsibility for cleaning the shed, collection of manure, preparation of dairy products, poultry keeping and marketing of animal products. The care of sick animals, processing of meat and processing of wool are shared responsibilities.

Livestock Products and Utilization: In the five surveyed micro-watersheds, 80% to 100% of the dairy products and meat are used for home consumption. In four of the five micro-watersheds, 47% to 70% of the skins and eggs are consumed by households themselves. In Kantai, however, more than 80% of the skins and eggs are sold. In Engule and Baskura, all honey is sold, whereas 33% to 50% is used for home consumption in the other three micro-watersheds.

Access to Veterinary Services: In Engule and Kantai, 88% and 100% of the households reported that they do not have access to veterinary services, whereas 80% to 100% of the surveyed households in the other three micro-watersheds reportedly have access. The DAs and/or Wereda staff are the only sources for veterinary services. In Zefie and Enkulal, 67% and 75% of the surveyed households stated that it is easy to purchase veterinary drugs against 50% and 38% in Baskura and Engule respectively. In Kantai, all surveyed households reported that it is not easy to procure the necessary veterinary drugs. Private suppliers are the only source for procuring veterinary drugs.

Marketing: In Baskura and Zefie, 70% and 100% of the surveyed households reported the sale of live animals (sheep and poultry) against 11%, 22% and 50% in Kantai, Engule and Enkulal respectively. The main reasons for selling live animals are the procurement of agricultural inputs, payment of taxes and other, often urgent, needs. The majority of households sell live animals to other livestock owners and to a lesser extent to middlemen. Animal products, such as skins, eggs and honey, are mainly sold to local retailers and consumers. There are (weekly) markets within a distance of one to three hours walk from the five micro-watersheds, where households can sell their live animals and livestock products. Lack of information on market prices and low prices are the main problems with regard to the marketing of live animals and livestock products.

*(c) Off-Farm Income Generation*

Only in Engule and Enkulal are handicrafts carried out, with 25% and 30% of the surveyed households being involved, in particular with the production of pottery, beer brewing, blacksmithing and carpentry. Other activities include charcoal production, weaving and small scale tanning of hides. Handicrafts are predominantly undertaken by poor households and the monthly income from such activities ranges from Birr 10 to 100. Only in Enkulal does one of the surveyed households derive an income from running a shop and transport business, whilst one of the surveyed households in Engule have income from a government job. The monthly incomes from the existing off-farm incomes in the five micro-watersheds vary from Birr 10 to 200. Between 10% and 33% of the surveyed households in the five micro-watersheds have one or more members working as daily labourers, ranging from 5 days per year in Baskura, 20 days per year in Kantai to 300 and more days in Engule. About one-quarter of the surveyed households engaged in daily labour obtain less than Birr 100 per month, whereas another 56% earns between Birr 100 and 300 per month.

Brewing and selling of local beer as well as the sale of roasted cereals and boiled pulses, are off-farm income-generating activities that are mainly undertaken by women and girls.

*(d) Forestry*

About 80% to 100% of all surveyed households in four of the five micro-watersheds have planted trees around their houses and/or fields. In Zefie, however, only 40% of the surveyed households have planted trees. The actual number of trees planted by the surveyed households varies considerably. In Engule and Zefie, 75% and 45% of the surveyed households have planted more than 1,000 trees. In Baskura and Kantai, 56% and 50% of the surveyed households have planted less than 100 trees, whereas the remaining surveyed households have planted 100 to 1,000 trees. In Enkulal, about 65% of the households have planted 100 to 1,000 trees.

Eucalyptus is the most common planted tree followed Cordia, Bisana, Olea and Acacia. Bamboo is also grown in Zefie. Planted trees are mainly used as fuel wood and timber. They are often an important source of cash income for the households in the five micro-watersheds as well. Reportedly, tree planting in the five micro-watersheds is restricted due to the lack of seedlings for the most needed trees. In Baskura, a group of households have developed individual nurseries with the support of a local NGO and the seedlings are sold to other households.

*(f) Fisheries*

It is reported from the Engule micro-watershed that some people do catch fish in the perennial Jema river for direct consumption but not for sale. None of the surveyed households in the micro-watersheds have indicated that they derive an income from fisheries.

*(g) Industry*

The main centres of industry in the three sub-catchments lie in the towns which are outside the areas of the five micro-watersheds. The main activity for local agricultural processing is the use of grinding machines. It is reported that the lack of these is a major constraint to agricultural development in the micro-watersheds.

*(h) Household Incomes and Expenditure*

The sources of cash income, as well as the average annual cash income for the surveyed households in four of the five micro-watersheds, are shown in the table below.

Source	Proportion of Cash Income for Surveyed Households				
	Engule	Baskura	Kantai	Zefie	Enkulal
Sale of crops	43%	13%	24%	36%	n.a.
Sale of livestock products	11%	5%	19%	3%	n.a.
Sale of live animals	16%	62%	25%	44%	n.a.
Handicraft	8%	-	-	-	n.a.
Business/petty trade	7%	-	31%	8%	n.a.
Daily labour	12%	20%	1%	5%	n.a.
Other (i.e. government job)	2%	-	-	4%	n.a.
Average Annual Cash Income (Birr)	3,247	997	1,429	1,583	n.a.
- Male-headed household	3,704	1,060	3,000	2,058	n.a.
- Female-headed household	1,650	500	545	200	n.a.

In Engule, the sale of crops is the most important source of cash income for the surveyed households, with 43% of their total annual cash income. In the other three micro-watersheds, the sale of live animals forms the most significant source of cash income, ranging from 25% in Kantai to 62% in Baskura. In Kantai, cash income from business/petty trade is the most important source, whereas daily labour is the second most important source of cash income in Baskura. Honey is an important source of cash income for some of the surveyed households. Petty trade and daily labour are important sources of cash income for female-headed households with small or no landholdings. Female headed households with land use rights to large land areas derive more cash income from the sale of crops than households with small and very small landholdings. None of the households with more than 2.5 ha of land generates cash income from off-farm activities and seasonal migration.

The average cash income for the surveyed households is the highest in Engule with Birr 3,247 per year, whereas the average annual cash income in Baskura is only Birr 997. In Kantai and Zefie, the average annual cash incomes are Birr 1,429 and Birr 2,058 respectively. In four of the micro-watersheds, the average annual cash income of the surveyed female-headed households is significantly lower than for the surveyed male-headed households, varying from Birr 1,650 (45% of male-headed household) in Engule

to only Birr 200 (10% of male-headed household) in Zefie. Reportedly, 10% of the surveyed households receive remittances from household members and/or relatives, who are employed elsewhere. The overall average cash income per capita is less than Birr 100 per year for about 25% of the surveyed households in four of the five surveyed micro-watersheds. The largest proportion of surveyed households with an annual cash income per capita of less than Birr 100 can be found in Baskura (33%) and Zefie (56%).

In the five micro-watersheds, the surveyed households spent, on average, 25% of their cash expenditure on purchasing food items such as coffee, tea, salt, sugar, spices and cooking oil. This ranges from 21% in Engule to 32% in Enkulal. On average, 22% of the cash expenditure of the surveyed households is used for the procurement of agricultural inputs, varying from 12% in Baskura to 46% in Enkulal. Surveyed households in Engule, Baskura and Kantai also spent 22% to 26% of their cash expenditure on the purchase of live animals. Expenditures on clothes ranged from 9% in Engule to as much as 30% in Zefie. The average expenditure on health care and education was 4.2% and 3.8% respectively of the total cash expenditure. The average cash expenditure for the surveyed households in the five micro-watersheds is Birr 2,196, ranging from Birr 3,224 in Engule to Birr 1,407 in Zefie.

(i) *Asset Ownership*

The ownership of agricultural and non-agricultural assets for the surveyed households in the five micro-watersheds is summarized in the table overleaf.

In the last 5 years, 59% of the surveyed households in the five micro-watersheds have purchased livestock and 61% have procured (traditional) agricultural equipment, whereas 20% had purchased a radio and 11% had obtained other assets. Due to rising population numbers and falling land fertility there is an emerging problem of households not having sufficient land to give to newly establish households. There are signs that a class of young households having no rights to agricultural land is emerging.

Asset	Asset Ownership for Surveyed Households				
	Engule	Baskura	Kantai	Zefie	Enkulal
Average Land Use Right (ha)	1.8	0.8	0.7	0.8	1.7
Average Number of Trees	3,280	205	284	1,638	1,619
Average Number of Livestock	5.2	6.6	6.1	9.1	3.9
Average Number of Traction Animals	2.0	1.7	1.8	1.8	1.8
Households with Livestock	40%	50%	80%	88%	38%
Households with Agricultural Equipment	70%	70%	60%	100%	100%
Households with Radio	50%	60%	10%	45%	38%
Average Land per Capita (ha)	0.3	0.1	0.1	0.1	0.3



## 2.1.5.2 Infrastructure and Communications

### (a) Roads

Baskura, Kantai, Zefie and Enkual are located along or in the vicinity of an all-weather road. The existing road between Baskura and Kantai will become an asphalt road and the construction works started at the beginning of 2007. The lack of a bridge across the Kantai River limits the accessibility of Kantai in the rainy season. Road access to Engule and the Jema sub-catchment in general is very poor. Engule is connected with the Kebele centre by a track which is only accessible in the dry season. Due to the lack of a bridge over the Engule River, the micro-watershed can only be reached by walking about 2km. from the nearest dry season road access (see Plate 15).

### (b) Railways

No railways are located in the five micro-watersheds and their Kebeles

### (c) Navigation

The only waterborne navigation in the area is on Lake Tana. None of the waterways located within the boundaries of the five micro-watersheds and their Kebeles is used for navigation. There are no boats even the main perennial rivers in the sub-catchments.

### (d) Energy and Power

None of the five micro-watersheds is linked to the electricity grid. The only energy sources for lighting are lamp oil and crop residues. Fuel wood, dung and crop residue are used for cooking. Water energy is not used to run water mills in any of the five surveyed micro-watersheds.

There are no flour mills located in the five micro-watersheds. In Engule, households use a private flour mill that is situated in an adjacent micro-watershed or the Kebele centre at a distance of 9 km. In Baskura, households have access to a private flour mill in the Kebele centre at a distance of 3 km, whereas Debre Tabor at a distance of 10 km is another option. Households in Kantai and Zefie are served by a private and a cooperative flour mill in the town of Gassay, a distance of 3km and 10 km respectively. A private and a cooperative flour mill are located in Gelawdiwos at a walking distance of 15 minutes. Long waiting times and regular breakdowns, as well as high service prices, are the main problems with the flour mills used by the surveyed households in the five micro-watersheds.

### (e) Telecommunications

Of the five micro-watersheds, only Zefie has a telecommunication service (which is wireless), that was established at the end of 2006 in the Kebele office. However, the other four micro-watersheds have access to telecommunication services at distances of between 3km to 6 km away.

#### 2.1.6 **Social Risks and Hazards**

The following section identifies the main social implications of natural hazards (see Section 2.1.3) that have been accentuated by human activity.

##### ***Erosion and Land Degradation***

Soil erosion is a major hazard in the area, including sheet, gully and river bank erosion, and is a significant contributor to land degradation and declining soil fertility. This is resulting in the reduction in crop yields, made worse by the animal dung being used for domestic fuel rather than organic fertilizer, not helped by the high price of chemical fertilizer which is imported.

Soil erosion, including declining soil fertility, is a major problem for all landholding households in the five micro-watersheds. In combination with limited or lack of use of chemical and organic fertilizers, households with small landholdings (less than 1 ha) increasingly face food shortages in years with normal rainfall, as the agricultural production from their fields is insufficient to satisfy the food requirement of the household throughout the entire year. Another major problem is the serious degradation of the communal grazing land, which has resulted in reduced availability of animal feed for the households in the five micro-watersheds.

##### ***Low and Unpredictable Rainfall and Drought***

Although the five micro-watersheds are not located in particularly drought-prone areas, the existing vulnerability of the area for food production means that the unreliability and timing of rainfall can have significant impacts. In years with less than normal rainfall, the number of households with food shortages is two to three times higher in three of the five micro-watersheds than in years with normal rainfall.

##### ***Food Security and Famine***

Within the three sub-catchments it is reported that parts of the Ribb and north Gumera areas have received food aid in nine of the last 12 years whilst south Gumera has had aid once in the last 12 years. The area of the Jema sub-catchment has not received food aid in the last 12 years. According to the focus group discussions, a household is considered to be food insecure if it faces at least four months of food shortage. The proportion of surveyed households facing food shortages in years with normal rainfall and less than normal rainfall is presented in the following table.

	<b>Proportion of Surveyed Households with Food Shortages</b>				
	<b>Engule</b>	<b>Baskura</b>	<b>Kantai</b>	<b>Zefie</b>	<b>Enkulal</b>
<b>Normal Rainfall</b>	20%	30%	30%	45%	25%
2 months	100%	-	-	-	-
3 months	-	-	100%	-	50%
4 months	-	29%	-	67%	50%
5 months	-	71%	-	33%	-
<b>Low Rainfall</b>	20%	50%	90%	45%	88%
< 4 months	100%	67%	100%	20%	71%
4 – 8 months	-	33%	-	20%	29%
> 8 months	-	-	-	60%	-

In years with normal rainfall, 25% to 45% of the surveyed households in the four micro-watersheds reported to have food shortages for four to five months (May to September). In Engule, 20% of the surveyed households face food shortages for 2 months in normal years. Landless and female-headed households and households with very small landholdings, as well as households with many members, are more likely to face food shortages than male-headed households with more than 1 ha of arable land.

In years with less than normal rainfall, the proportion of surveyed households with reported food shortages increases significantly in Baskura (20%), Kantai (60%) and Enkulal (63%), whereas the proportion of surveyed households with food shortages in Engule and Zefie remains the same. The proportion of surveyed households with at least 4 months of food shortages is high in Zefie (80%) followed by Baskura (33%) and Enkulal (29%). In Engule and Kantai, none of the surveyed households faces food shortages of more than 3 months in years with less than normal rainfall.

The main cause for the reported food shortage is lack of enough land, followed by declining soil fertility due to lack of access to fertilizers, as well as lack of access to off-farm income opportunities. The most common strategies to cope with food shortages include the sale of animals, food aid, obtaining loans and seasonal migration.

In Baskura and Kantai, 90% of the surveyed households with food shortages have received food aid between once and three times in the last 25 years. Except in Engule, 22% to 90% of the surveyed households in the other four micro-watersheds have participated in food-for-work programs in 1999 and 2000 following severe floods in the Gumera and Ribb watersheds. In Baskura and Kantai, 90% of the surveyed households reported to have participated in food-for-work programs in the last 25 years, of which 78% and 67% have participated three times. In Zefie and Enkulal, 22% and 38% of the surveyed households participated once or twice in food-for-work programs.

### ***Disease***

Malaria is a serious problem, even in the highland areas. Epidemics of malaria and typhoid are reported to have occurred in Zefie and Engule micro-watersheds. There is a widespread incidence of crop pests and diseases in all five micro-watersheds, along with animal diseases.

### ***Floods***

In 1999 and 2000, floods caused significant damage to crops, land, livestock and other assets of most households in Baskura, Engule, Kantai and Zefie micro-watersheds.

### ***Storms***

Hail storms are quite common and they cause damage to standing crops, in particular fruit crops and vegetables.

### ***Earthquakes***

Despite being relatively close to the Rift Valley earthquakes have not been mentioned as a hazard in the area.

### ***Pollution***

The main pollution problem is at well and spring heads and caused by animal waste.

### ***Social Instability/Conflict***

The whole project area lies within the Amhara ethnic area. Based on information collected during the baseline surveys in the five micro-watersheds, there appear to be no serious social conflicts between groups within the Kebeles or between Kebeles.

### ***Economic Instability***

Of the five micro-watersheds it would seem that Engule is more economically stable than the four upland areas despite the fact that it has the most difficult road access.

### ***Political Instability/War***

The last political event that caused political instability was the civil war between the EPRDF and the Derg regime during the 1980s and early 1990s, during which many households lost their livestock and other assets, in particular in the Gumera and Ribb watersheds. Since the demise of the Derg regime, there is political stability in the Amhara National Regional State.

### 2.1.7 **External Constraints and Linkages**

When considering a river basin, catchment or watershed management approach, understanding the nature of the environmental linkages between differing parts of the area is important. The existing environmental situation in one part of a catchment can impose constraints upon the range of possible interventions in another. For the four upland detailed study micro-watersheds the main issue is how any existing environmental situation downstream of them may constrain what can be considered as an intervention within the micro-watershed. For the Engule detailed study micro-watershed the situation is more complex, as it lies at the downstream end of the Jema sub-catchment and alongside the main river. Care has to be taken to consider if a proposed intervention in the lower-catchment will pre-empt future intervention possibilities upstream of it.

## 2.2 **Identification of the Main Environmental Constraints to Rural Development**

The key environmental constraints to development in the area are summarized below.

### 2.2.1 **Human Population Pressure**

The level of human population pressure in the area has now reached the stage where there is a lack of land to hand on to family members. A class of landless young households is now emerging. The situation is made more difficult by environmental degradation in the area which is causing falling crop yields. The key issue is how to increase agricultural productivity in the area within the existing environmental constraints. Solutions need to address the issue of more efficient resource use and the role of technology in achieving this objective. Increasing the range of alternative sources of economic livelihood outside agriculture is a critical consideration.

### 2.2.2 **Land Degradation**

The problem of human population pressure on the existing land resource is being compounded by land degradation, and particularly erosion, which is a significant reason for falling crop yields. Erosion is itself a result of human population pressure, amongst other factors, and creates a downward environmental spiral.

### 2.2.3 **Climate and Climate Change**

There is evidence that relatively rapid changes in climatic patterns since 1970, and particularly more extreme conditions (both wetter and dryer) are having an influence on the ability of the natural environment to sustain the human population levels found in the area. With the population already vulnerable, a reduction in annual rainfall, the timing of rains and floods can have serious implications for crop production and hence household livelihood levels.

### 2.2.4 **Rural Energy Balance**

A serious problem with the rural energy balance is emerging in the area. A crucial indicator of this problem is the number of households burning animal dung as domestic

fuel rather than using it as natural fertilizer on their fields. Some micro-watersheds are experiencing shortages of fuel wood and there can be competition for the use of crop residues between fuel and animal fodder.

#### 2.2.5 **Livestock Numbers**

The increasing numbers of livestock are putting severe pressure on the natural environment. The situation has now been reached where a major change in livestock management is required in order to try and reduce further environmental degradation. The current open grazing system needs to be converted to a homestead based stall fed system if the current livestock numbers are to be sustained without causing yet more environmental degradation.

#### 2.2.6 **Human Health Conditions**

Both diarrhoea disease and malaria are serious problems in the project area, with malaria having been brought into the highland area by people migrating to and from places near the border with Sudan. The main reason for diarrhoea disease (which includes dysentery and typhoid) is the lack of safe drinking water.

#### 2.2.7 **Education Provision**

The education facilities in the five micro-watersheds cater for up to and including Grade 8 but the quality of the buildings, equipment and staffing is poor. However the biggest problem would appear to be that there is no provision in the Kebeles above Grade 8 and children have to travel long distances and be resident away from home to further their education past this level. This is costly and only those children from better off families or with relations living close to the places with higher level schooling can access these facilities.

#### 2.2.8 **Access**

All weather road access is reasonable to the four highland micro-watersheds and is in the process of being upgraded. Road access to the Jema sub-catchment and the Engule micro-watershed is poor at the best of times and impassable during the rainy season. This has deteriorated recently as the newly built dam at Koga has caused the existing road alignment to flood. There are also problems with a lack of wet season footbridges over small rivers in many of the micro-watersheds, particularly the access into Engule.

### 2.3 **Identification of Human Needs**

An initial identification of local peoples perception of livelihood problems in the in the five detailed micro-watersheds was carried out in the early phase of the studies and the results were outlined in Table 10 of the Interim Report (Halcrow, September 2007). A detailed needs assessment was produced in October 2007 based upon the results of a series of group discussions carried out in each of the five detailed study micro-watersheds during late September and early October 2007. The detailed needs assessment allowed local people to prioritize the importance of eight given subject areas

corresponding to development sectors and then to identify and prioritize specific needs within each of the eight sectors. The results of the sector prioritization are given in Table 1. The conclusions from the analysis are that overall cropland management (including erosion management and the need to increase agricultural production) was the first priority in four of the micro-watersheds and the second in the other (Engule). The difficulties of access to Engule were considered by local people to be the most important problem in that micro-watershed. Overall health problems were rated second followed jointly by education and safe drinking water supply. The need for off-farm income was rated fifth alongside livestock management issues with forestry the lowest priority of the eight sectors.

Within each sector a range of differing needs were identified and ranked within each micro-watershed. These stated needs have formed the basis for drawing up a range of type interventions and also intervention formulation within each of the micro-watersheds. However it is proposed that the final selection of detailed interventions and particularly their locations will be carried out during the implementation phase of the project.

## **3 The proposed interventions and alternatives**

### **3.1 The Proposed Interventions**

The proposed interventions have been drawn up using the results of the needs assessment, modified and re-prioritized with an overall technical consideration. The listing of the possible interventions to be considered is given in Table 2. The items given in Table 2 constitute types of interventions that can be considered for each of the micro-watersheds, depending upon local people's needs and conditions in the area. For the purposes of environmental assessment, the classification of interventions has been simplified and grouped into component type classes as shown in Table 3. The nature of these type interventions is described below.

#### **3.1.1 Type Interventions**

There are eleven broad groupings of proposed interventions that correspond to development sectors and are listed in Table 3. However the last type of intervention is capacity building which cuts across all of the sectors. It is anticipated that the detailed selection of intervention items from the long list in Table 2 will be carried out during the first phase of the implementation stage of the project and in close collaboration with local people. The ordering of the interventions in Tables 2 and 3 follows that given in the main report, grouped around themes rather than by the priority given by local people or systematically by development sectors, components and sub-components.

In the initial identification and ranking of problems carried out in the detailed study areas, the lack of access to safe drinking water was considered to be the highest priority for intervention by local people. However when local people were later asked to prioritize the eight main development sectors, human health and water supply were ranked second and third (see Table 1) with education fourth. However in Engule micro-watershed in the Jema sub-catchment improvements to access were by far the most important priority. For the four upland micro-watersheds cropland management (essentially land resources management, including soil and water conservation) was rated as the highest priority. The list of interventions given in Table 3 and arranged by component and sub-component are discussed below in the order in which they are given in the table, which itself relates to the grouping and ordering in the main report. Items 1 to 6 are themed under the title of livelihoods promotion and items 7 to 10 as promotion of sustainable landscape management.

##### **(i) Access and Communications**

The sub-components in this category include improvement of existing rural access roads (under the proviso that no new land acquisition will be required), including upgrading and provision of adequate drainage, both cross drainage through culverts (the inadequacy of which is causing serious erosion problems in some places) and side



drainage. There will also be a program for provision of new internal access paths and improvement of existing ones. In addition there will be a program for improvement and provision of new footbridges over watercourses. The priority intervention for communications is to expand the existing provision of community radio telephones down to the Kebele level.

(ii) Human Health

The priority proposed intervention for human health in the micro-watersheds is to upgrade the physical condition of the buildings currently used as health posts. However in order to fully address the stated needs of local people, the health posts will then need to be adequately equipped with their role expanded into curative measures and not just preventative ones.

(iii) Education

The priority intervention proposed for education improvement in the area is to renovate the existing school buildings. However in order to fully address local peoples stated needs the schools will then need to be provided with appropriate furniture and equipment, including consumable items. The problem of providing adequate housing for teaching staff also needs to be addressed. An integrated approach with the institutions responsible for education is required in order to maximize the benefits of the proposed intervention.

(iv) Crop Production

The emphasis for cropped agricultural development is to be on assisting and promoting the existing agricultural extension programs by providing logistical support, particularly for the Development Agents working in the areas. Specific interventions include provision of furniture and equipment for farmer training centres and demonstrations aimed at increasing crop production and profitability.

(v) Livestock Production

The highest priority livestock intervention is to provide and improve animal health posts and associated facilities. In addition it is proposed to develop perennial pasture and forage and to promote the feeding and fattening of animals at homesteads. There are also proposed sub-components for the promotion of dairy production and processing as well as sheep and poultry. In addition it is proposed to provide support for the Development Agents responsible for livestock development. The improvement in local pasture will be assisted by the partial and rotational closure of existing grazing areas to allow them to recover and be improved

(vi) Non-farm Income Generation Activities

The non farm income generation component is split into three main sub-components. The first is the provision of community flour mills for producing flour as this is regarded as the highest priority by local people in order to retain the value added to crop production in the local community. This is assessed separately from the second and third components which make provision for technology innovation and micro-credit financing.

*Technology innovation*

The technology innovation fund will support the introduction of technologies new to the area, which will have benefits particularly in terms of raising productivity generally and addressing energy needs in particular.

Promotion of more fuel efficient stoves is a priority intervention for rural energy and when linked with the expanded tree planting (proposed as part of the forestry and agro-forestry component) should go some way to addressing the rural energy problem which is acute in some areas. If successful the use of fuel efficient stoves should then allow all animal dung currently being used a fuel to be used as organic fertilizer.

(vii) Soil and Water Conservation

There are 13 sub-components proposed under the soil and water conservation component.

These include physical soil and water conservation measures, including planting, and also land management in the form of closure of land to access by livestock. The physical soil and water conservation measures include the construction of bunds, check dams and bench terracing, along with the provision of cut-off drains and waterways plus gully reshaping. The planting program includes planting of vegetative fencing, vetiver grass, leguminous hedgerows and forestry planting in micro-basins.

(viii) Water Supply

The main priority is to improve the provision of safe drinking water to the local population. This will be achieved by providing hand pumps to existing wells and the development of springs. In addition there will be a roof rainwater harvesting program for those buildings in the area that have suitable roofs.

*Sanitation*

Overall the provision of latrines at the household level in some of the micro-watersheds in the area is reported to be relatively high. A demonstration program will be implemented to show the benefits of latrine provision to those households who have not already taken advantage of this technology.

(ix) Irrigation

The proposed irrigation component is aimed at the construction of very small scale gravity and pumped interventions at the local level comprising individual households or clusters of neighbouring households.

(x) Forestry and Agro-Forestry

The priority proposed measure for forestry is to set up tree nurseries to allow accelerated tree planting to take place. There are also proposals for demonstrations for forestry and agro-forestry system and sub-system promotion along with research and development units for this work. Under other intervention components it is also proposed to instigate a closure policy for existing forest areas to allow for recovery and improvement. There are also significant forestry promotion interventions proposed in the soil and water conservation component.

(xi) Capacity Building

The proposed capacity building component is an over-arching program aimed at providing a strengthened enabling framework for assisting the implementation of the proposed interventions and sustaining its outcomes. Whilst the capacity building component is considered critical to try and ensuring that the proposed program is to be successfully implemented, the inclusion of it at a component in the environmental assessment is considered unhelpful and unnecessary, as it is likely to further confuse what is in effect a preliminary strategic environmental assessment.

### 3.1.2 **Selection of Intervention Components for each Micro-Watershed**

It is envisaged that the final selection of detailed components for each of the micro-watersheds will not be made until the initial phase of the implementation stage of the project, and would be carried out in close consultation with the local people. Only at this stage will it be possible to quantify in detail the types of each intervention and their locations in each micro-watershed. However all of the interventions are small scale in nature and preliminary estimates are being made for the purpose of costing the project.

The majority of the physical works being proposed will be carried out by local people and in many cases on their land on which they have individual cultivation rights. Whilst local people have said that they are willing to use materials that they already have and also provide their labour, it will be important to establish what labour is available in which places and when. The need for paid labour will need to be assessed and how this is to be carried out and the way in which it can be integrated with existing safety net works programs. A general consensus is now emerging that the use of food for work can have serious adverse impacts on the local economy if not handled carefully. There is now a move to use cash for work targeted at landless, poor and marginal household members.

## **3.2 Alternative Interventions**

It is customary in detailed environmental assessment work to carry out a comparative analysis of the potential impacts of a proposed project against a future situation assuming that the project were not implemented. It is also important to consider alternative interventions. This is particularly the case if one proposed intervention would then preclude the implementation of another or a similar thing in a different location. Due to the small scale and independent nature of the proposed interventions they are, in the main, independent of each other. The only way that one could preclude an other is if at the detailed formulation stage there would be a cap on the total budget for each micro-watershed and decisions would have to be made as how best to use the available resources.

## **4 Project scoping and public consultation**

### **4.1 Public Participation in Intervention Formulation**

As can be seen from the outline given in Section 3, the scope of the proposed project is very wide, covering eleven major components and with sub-components within these. The proposed project has specifically been formulated following a pro-active needs assessment participatory approach as outlined in Section 2.3 above. The existing environmental constraints to development in the area were identified in consultation with people in the detailed study areas and have been summarized in Section 2.2. Detailed group discussion meetings were then held in each of the detailed study five micro-watersheds where local people prioritized their needs by the eight sectors that were drawn up from the initial participation work. During the detailed village meetings the participants also itemized their desired interventions within each sector. The prioritization of sectors has been given in Table 1. The compilation of theme based proposed interventions based on the output from the needs assessment is given in Table 2.

This highly participatory approach is the antithesis of many proposed projects where a pre-conceived idea is proposed to local people and their reaction to this is then gauged. In this latter case a requirement of the environmental assessment is to record local people's reaction to the proposed project and if there are objections then to modify the design to gain majority public acceptance. There is often a requirement to produce a public response document and obtain a No Objection Certificate from the local population before the proposed project can go further. In the case of the proposed project there is obviously no need to follow this methodology, the project formation having come out of the expressed needs and desires of local people. As part of the participation work the level of commitment that local people were prepared to make in implementation of the project was gauged. The overall reaction was that people were prepared to give their time and use materials that they already have in their possession to implement the project. However the seasonal availability of donated labour is likely to be an important issue and will need to be addressed during the final formulation of each of the micro-watershed sets of interventions. It should also be clearly understood that the final selection of interventions, their size and specific location will be carried out during the early phase of the implementation stage of the project.

### **4.2 Other Development Proposals in the Micro-Watersheds**

The main wider river basin interventions that have been proposed in the three sub-catchments are possible dams and downstream formal irrigation developments. All of these lie downstream of the five detailed micro-watersheds, although the Engule micro-watershed, lying as it does at the downstream end of the Jema sub-catchment, is immediately upstream of a proposed dam site. The on-going road rebuilding program in the upland areas and connecting the four micro-watersheds in the Ribb and Gumera

sub-catchments has already been mentioned and it is envisaged that this will have a significant impact in improving access to the area.

Smaller scale on-going interventions have been indicated in Section 2.1.4 when identifying the organizations working in the area. These include the NGO Green Horizon which has been carrying out tree planting work in Baskura and also GTZ funded watershed management demonstrations near Baskura. Due to the small scale and independent nature of the interventions been put forward for the proposed project there would appear to be little problem with proposed interventions affecting other proposed projects. In fact there is a very strong case to be made for the watershed management interventions being tried before any dams and irrigation development is constructed downstream of the micro-watersheds so that the degree of success of erosion control and reduction in sediment can be seen.

## **5 Environmental scoping and bounding**

### **5.1 Environmental Scoping Methodology**

The screening of potential environmental impacts for the proposed project (both adverse and positive) has been carried out by drawing up a systematic listing of environmental issues (“components”) for the area. The listing is based upon an initial environmental screening carried out for the area by field visits and also assisted by the results of the first stage public participation work. The listing is given in Appendix E and has formed the framework for the baseline description of the area given in Section 2.1.

Using the listing of environmental issues, an impact scoping matrix was compiled with the twelve broad categories of intervention as columns across the top. Each category of intervention (see Table 3 for the details of the intervention categories and their sub-components) was then screened against the key environmental issues identified for the three wider sub-catchment areas. Those issues which were considered as existing environmental constraints for a specific proposed intervention were identified and marked with the # symbol in the relevant box of the matrix. The potential impacts of the proposed intervention package were then indicated for each environmental component, with a + symbol for a likely positive impact, a – symbol for a potential adverse impact (assuming no targeted mitigation program was instigated) and a zero for those items where it was considered there would be no major change between the future with and without project situation. The completed matrix is given in Appendix F. It can be seen that some environmental components have zero ratings across all of the proposed interventions and in a simplified presentation of the results it would be worth deleting these rows from the matrix. It must be remembered that the matrix is a working tool intended for use by practitioners and no attempt has been made at this stage of the project formulation process to quantify and value impacts. The aim is just to identify potential impacts to see if these are significant and particularly if there are adverse impacts which will require targeted mitigation measures.

### **5.2 Delineation of Impact Boundaries**

The locations of the three sub-catchments and the five detailed micro-watersheds and their relationship to Lake Tana, are clearly shown on the map given as Figure 1. The adjacent micro-catchments (totalling approximately 81,000ha in five clusters) are also clearly shown. These five clusters are the areas in which it is proposed to implement the project over a five year period. In the case of the Jema sub-catchment this includes nearly all of it. From Figure 1 it can be clearly seen that the proposed intervention micro-watersheds in the Ribb and Gumera sub-catchments lie in the upstream highland areas where as the Engule micro-watershed lies at the downstream end of the Jema sub-catchment.

The areas of the micro-catchments are relatively small, with none of the five detailed study areas being greater than 400ha. The smallest is Baskura at 137ha and the largest Kantai at 384ha. Zefie is 229ha, Enkulal 350ha and Engule 319ha. Due to their small size the locations given in Figure 1 use a symbol. The boundaries of the detailed study micro-watersheds have been plotted on the 1:5,000 scale detailed satellite imagery that has been rectified and ground truthed in the field. It should be noted that the boundaries of many of the micro-watersheds are not watershed or catchment boundaries in the true sense. Engule for instance is just one side of a watershed and Zefie is part of a hillside. However the boundaries have a rationale to them, often defined by village areas over which a specific community hold land rights.

From the perspective of environmental assessment, a major consideration for impact area delineation is the possibility that impacts in one area may have knock on effects into other areas, particularly downstream, but also may constrain future development in upstream areas. The nature of the proposed interventions is highly discrete and one of the hoped for impacts to downstream areas is to be the reduction in sedimentation, assuming that the erosion management interventions are successful. This is considered a major positive impact and a central focus of the objective of the proposed project. Due to the small scale and discrete nature of the proposed impacts, the cumulative effect of impacts is likely to be of greater importance than the spatial knock on effects. The likely nature of cumulative impacts is discussed in Section 7.



## 6 Impact assessment

### 6.1 Impact Assessment of the Possible Interventions

An initial impact assessment of the broad components and some sub-components of the proposed interventions (listed in Table 3) has been carried out using a screening matrix of the types of interventions against key environmental issues. The matrix is given as Appendix F. The interventions assessed are classified into twelve separate components and sub-components as listed in Table 3. The aim of the assessment exercise is to identify if any of the potential interventions could cause possible adverse impacts. If any serious adverse impacts were identified, then the objective of the exercise is to see if appropriate mitigation measures could be drawn up (including reformulation and redesign) that would avoid the potential adverse impacts. If it were found that any of the proposed interventions, despite implementing mitigation measures, were to still result in adverse impacts, then consideration would need to be taken to eliminate that particular intervention from the proposed project. It must be remembered that at this stage in intervention formulation generic type interventions are being considered and that the detailed selection and specific location of intervention elements will be carried out in consultation with local people as part of the initial stage of the project implementation process.

The predicted environmental impacts are briefly described below by environmental issue/component, working systematically from the natural to the social and economic environment as shown in the first column of the matrix in Appendix F.

#### 6.1.1 Impacts on the Atmosphere

The existence of dust in the atmosphere, even in the wet season, is due to the very fine nature of the soils in the area and this factor has been noted as an existing constraint to development. Some large scale construction activities (particularly road building) could make this temporarily worse. However, despite the fact that local people regard poor road access as the most important constraint to economic development in the Jema Valley, it has been decided that the major and costly road construction program that would be needed to address this problem lies outside the scope and resources of the proposed project. The road improvement element of the access and communications component of the project would be limited to improving existing road alignments and solving the existing poor road cross and side drainage that is resulting in severe erosion in some places (Zefie in particular). Whilst there will be some increase in dust generation during the time of the construction works to improve the existing roads, the fact that they are on existing alignments will mean that the incremental increase is likely to be limited and appropriate construction management techniques (spraying etc) can go some way to ameliorating this problem. There is no doubt that in the longer term the extra traffic generated will increase the dust problem, especially in the dry season. However the on-going program to provide a sealed road through the four clustered micro-watersheds in

the highland areas of the Rib and Gumera sub-catchments is likely to significantly reduce atmospheric dust irrespective of the project interventions.

The other significant factor that effects air quality at the household level (and hence human health, particularly that of women) is the smoke produced by burning wood and animal dung for cooking. Only 10% of households currently have improved cooking stoves that use fuel more efficiently and produce less smoke than existing arrangements. A major component of the proposed project is to manufacture and distribute a significant number of improved stoves to the households in the project area. This should result in considerable improvements in domestic air quality. The renovation of existing school and health centre buildings should also result in improved air quality conditions for children and the sick, as would the expansion of latrine provision. There is no doubt that the promotion of grain mills will result in increased noise levels. The detailed location of the mills will need to consider this problem plus the generation of dust at the very local level.

#### 6.1.2 **Impacts on Climate**

Due to the small scale nature of the proposed interventions there are unlikely to be any significant changes caused to climatic patterns. However there is the scope in the long term for widespread tree planting to cause small scale beneficial change in micro-climate, particularly rainfall and temperature. Rainfall, temperature and sunlight act as existing constraints to development that would need to be taken into consideration in project design, and particularly the way in which these are changing with rainfall events becoming more intense with an increasing number of dry years since 1970.

#### 6.1.3 **Impacts on Water Resources**

In terms of surface water quantity, the proposed sets of interventions for land resources management and the promotion of forestry and agro-forestry are likely to produce beneficial reductions in local rainfall flooding by retarding run-off. If the program were eventually to be expanded in geographical coverage to all of the upland sub-catchments of Lake Tana, then this could also significantly reduce main river flooding. The retention of water and promotion of infiltration into the groundwater table would provide an increased resource for abstraction, particularly in the dry season. Improving the abstraction of ground water by providing pumps on wells will safeguard the supply of safe drinking water for domestic use and is a major proposed intervention. Care will need to be taken to ensure that abstraction is restricted to sustainable levels and conflicts do not develop both between use for domestic water supply and small scale irrigation, nor between neighbouring communities using the same aquifer.

The proposed program for improvement of safe domestic water supply and demonstration of sanitation facilities should result in some improvements in water quality, as the risk of pollution to both surface and groundwater from human and animal waste is reduced. It would seem logical to target the water supply and sanitation improvements at the schools and health centres. Care will need to be taken to ensure that increased take up of latrines does not result in infiltration of polluted water into groundwater table,

especially as it is planned to allow for more springs fed from local aquifers to be developed for safe drinking water supply.

Surface water quality, in terms of reduced sediment, should improve significantly as a result of the soil and water conservation interventions that are targeted at reducing erosion, particularly sheet and gully erosion. Similarly livestock management measures which include the closure of grazing areas and forestry areas to animals, should significantly reduce the risk of soil erosion and sedimentation. The promotion of appropriate tree planting programs as part of the soil and water conservation, and also within the forestry and agro-forestry components, should also assist in reducing erosion and sedimentation.

#### **6.1.4 Impacts on Land Resources**

The proposed soil and water management and also the crop production interventions should go some way to overcoming the existing constraints of land topography, particularly by the provision of terraces and bunds, along with appropriate cultivation techniques such as improved ploughing. The promotion of organic manuring, appropriate fertilizer use and mulching should all help increase soil fertility. The land resources management program is specifically aimed at reducing erosion, particularly sheet and gully erosion. The proposed integrated program with livestock management, forestry and agro-forestry, along with the promotion of fuel efficient stoves should all significantly contribute to reducing soil erosion. The proposed measures include the closing off of grazing and forestry areas to livestock and the promotion of a homestead based livestock fattening systems. The provision of adequate roadside and cross drainage to the existing road network in the highland micro-watershed clusters should also significantly reduce gully erosion. The reduction in erosion should also reduce the incidence of land smothering and help enhance soil capability.

#### **6.1.5 Impacts on the Biological Environment**

The proposed closure of forest areas and grazing lands to animals should promote the recovery of natural vegetation and the habitats for terrestrial flora and fauna. In addition the interventions included in the forestry and agro-forestry component, plus the indirect impacts of the manufacture and supply of fuel efficient stoves, should also promote terrestrial habitats. In addition the vegetation planting program proposed as part of the soil and water management program (especially the promotion of indigenous species) will extend habitats and widen bio-diversity, including those in the existing environmentally sensitive areas. This should help strengthen the protected woodland areas west of Baskura and also that in Inkulal, in addition to those around hill top churches.

#### **6.1.6 Changes to Natural Risks and Hazards**

There is an important distinction to be made between changes in environmental conditions caused by natural occurrence and those that come about as a result of human action. The ability of humans to cope with these changes in the natural environment is also critical in assessing potential environmental risk and is outlined in Section 6.1.9

below. The degree to which the proposed interventions are likely to be successful is also at risk due to potential changes in natural conditions, irrespective of the impacts of the interventions.

The proposed interventions have been specifically designed to address recent changes in the natural environment, particularly erosion and land degradation brought about in part by changes in rainfall patterns. The soil and water management component specifically aims to arrest the current serious nature of erosion and land degradation in the area by using an inter-sectoral development approach encompassing integrated land use for forestry, crop production and livestock management, as well as the directly induced erosion caused by deficient road drainage. The mechanisms by which these interventions operate are complex and highly inter-related, both within the natural environment and also between the natural and human/social environment. If the proposed interventions are effective then wet season rainfall run-off can be intercepted more effectively and diverted into groundwater aquifers, providing an improved resource for human use for longer periods into the dry season. This will also reduce the risk of gully erosion and landslides.

#### 6.1.7 **Social Impacts**

The enhancement of human livelihoods is a central objective of the proposed project and is focused on human needs using the results of the needs assessment as the basis for intervention formulation.

With regard to gender issues, the provision of more safe domestic water supply points will make life easier for women and girls who have the main responsibility for collecting water. This will allow the time presently used for water collection to be re-directed to other activities, including education. The benefits of improvements to health centres are likely to also provide relatively greater benefits to women, whilst similar improvements to school buildings will also probably be of greatest benefits to girls. The increased provision of fuel efficient stoves will reduce the health risks current created by smoke whilst cooking and again will be particularly beneficial to women. The promotion of additional fuel wood sources, particularly at the homestead, will reduce the time currently spent by females in collecting fuel. There are also likely to be health benefits in reducing the amount of animal dung being handled when used for domestic fuel. There are also targeted programs for poultry production and promotion of small ruminants that will favour females.

Many of the proposed interventions could promote social equity and even in the case of interventions that may provide greater benefits for the already better off households, none of the interventions should unfairly disadvantage poorer sections of the community.

If the interventions are successful, it is likely that land values will increase as productivity and output rises from the existing cultivated land area. The proposed interventions have components specifically aimed at improving management of communal resources, particularly grazing and woodland. If these programs are successful, then such resources will be managed in a more environmentally sustainable manner. The benefits

of the forestry and agro-forestry programs, plus the soil and water management and forage production interventions should help in trying to go some way to solving the rural domestic energy problems in the area. The promotion of non-farm income generating activities should also lessening the pressure on the existing natural resources.

The targeted interventions to improve human health by increased provision of safe domestic water supply and sanitation, along with renovation of health posts, should be significant and were considered to be a very high priority by local people. The hoped for increase in crop production and diversification of crop types should have benefits to human nutrition. The renovation of school buildings should improve education levels to some extent, but the fundamental issue of providing education at the local level beyond Grade 8 still remains a serious constraint. The issue can only be addressed by fundamental change in the system of education provision that lies beyond the scope of the proposed project.

With regard to landscape aesthetics, the proposed erosion control, tree planting and improved management of the existing protected areas, particularly woodland, should all result in improvements to the landscape.

#### 6.1.8 **Economic Impacts**

The economic enhancement of existing household livelihoods is the primary goal of the proposed project. There should be widespread improvements to the crop production system, homestead production, livestock output, forestry and small scale agricultural processing, along with opportunities for the generation of non-farm income. A fundamental benefit should be the easier access to improved services resulting in reduced travelling times. The rehabilitation of the existing road network and improvements to footpaths and the provision of more footbridges should also allow the benefits of improved service provision to be felt by a larger number of people. However this increased stimulated demand will need to be taken into consideration in the sizing and location of the detailed interventions during the initial phase of the project implementation.

#### 6.1.9 **Changes to Social Risks and Hazards**

Provided that the proposed interventions are successful, then the local community should be better able to cope with future changes to the level of natural environmental risks and hazards. The risk of increased erosion should be reduced and the consequences of greater variability in the rainfall patterns should be ameliorated by improved provision of domestic water supply provision that is reliable throughout the dry season. The improvements to drainage and the retention of water on the land as part of the soil and water management and road rehabilitation components should reduce the incidence of flooding by retarding run-off. The incidence of human disease should also decrease as a result of the targeted interventions, except in the case of irrigation provision where great care will be needed, particularly to try and prevent the increase in habitats for malaria carrying mosquitoes. Crop pests and disease, livestock disease and

pollution by human waste should all reduce if the targeted interventions are successfully implemented.

Overall, social stability should be improved, although care will be needed to ensure that the provision of targeted benefits is not unfairly taken up by the wealthier sections of the community and prove socially divisive. Economic stability should also be improved and the hopefully the need to resort to food aid will be reduced.

#### 6.1.10 **Conclusions from the Impact Screening**

The results of the initial screening of environmental impacts indicate that there are likely to be considerable potential positive impacts due to the way in which the proposed interventions have been targeted at current environmental issues identified through a needs assessment methodology. The only adverse impacts that could possibly arise and which need to be considered during the detailed formulation of interventions are:

- The possible competition for use of water between domestic water supply and irrigation. There will be a need to fix sustainable abstraction rates and priorities for use.
- The real risk of increasing the incidence of malaria through the promotion of irrigation.
- The requirement to ensure that there is no need for land acquisition that would seriously delay the fast track approach to the project.

There could be complex inter-related impacts created by improved access to services. These can only be addressed once the detailed locations and types of interventions have been fixed during the initial phase of the implementation of the project. There is also the need to consider the nature of direct construction impacts once the methods for implementation of the detailed components have been fixed.

## 6.2 **Detailed Impact Assessment of the Proposed Micro-Watershed Projects**

It is not yet possible or sensible to carry out a detailed impact assessment of the proposed interventions. To do such an assessment requires the location and size of the selected components to be known. During the initial phase of the implementation of the project consideration would then need to be given to the degree to which the potential impacts, both positive and in rare cases adverse, should be quantified and valued. It is important that valuable resources are not wasted by trying to do this in great detail, but work is targeted at the key significant impacts and a constructive approach is followed that allows potential adverse impacts to be identified as early as possible so that corrective action can be taken. It is however vital that the key environmental indicators are identified and sufficient baseline data is collected to monitor changes, both as a result of the project and also those that would have occurred in a without project situation.

## **7 External and cumulative impacts and constraints and impact classification**

### **7.1 External Impacts and Constraints**

Due to the small scale and relatively discrete nature of most of the proposed interventions there are unlikely to be major issues of upstream and downstream impacts, constraints and problems of pre-empting future development possibilities. The locations of the four intervention clusters in the Ribb and Gumera sub-catchments (see Figure 1) are located in the upstream areas and as a result there are likely to be few upstream constraints created by implementation of the proposed interventions. The cluster in the Jema sub-catchment covers almost all of it but the area lies in the mid part of the wider upper Abbey catchment that feeds into Lake Tana. There are no proposed interventions that entail major abstraction of water and/or diversion and as a result even in the Jema sub-catchment area there are no major problems with potential future abstraction of water from upstream of the area jeopardizing the possible benefits of the project.

### **7.2 Cumulative Impacts and Constraints**

Of greater potential significance than upstream and downstream constraints and impacts is the possibility of significant cumulative impacts occurring when the proposed program is replicated out from the initial core areas around the detailed studies into the five clusters totalling some 80,600ha. These cumulative impacts can be both positive and adverse and can also bring about accelerating benefits as well as proportionally greater adverse impacts than the sum of the individual impacts. The potential adverse impacts are so small and with careful planning can be avoided that cumulative positive impacts are likely to greatly outweigh any possible minor adverse cumulative impacts. However the nature of the detailed locations of the roads to be improved will not be finally known until the initial phase of the project implementation program is under way. Care will need to be taken with the connectivity of the proposed network to assess possible cumulative impacts, both positive and any that could be adverse for some communities. These could relate to some areas that will not have their access improved and could be relatively disadvantaged as other places are able to take advantage of improved communications.

### **7.3 Conclusions in Relation to Donor Requirements and the Regulatory Framework**

The matrix given as Appendix F has a row at the bottom that indicates the likely classification of the twelve types of interventions according to the environmental guidelines of the World Bank and also under the Ethiopian system as used in the Amhara National Regional State. These are discussed separately below.

### 7.3.1 Donor Impact Assessment Classification

The proposed project is to be managed by the World Bank and will need to be in conformity with their environmental safeguards system that has been outlined in Section 1.3.5. The World Bank system has a categorization of interventions under which those in Category A are likely to have the highest risk of causing significant adverse impacts. Such Category A projects require a high level of scrutiny, with the Bank's own environmental staff normally being involved directly in the review work. Provided that there is no requirement for land acquisition (a pre-condition for the proposed road improvement program) then none of the interventions will be in Category A. Some components will definitely be in Category B and are indicated as such in the matrix given as Appendix F. Others will definitely be in Category C (health and education improvements) whilst four (crop production, livestock production, the provision of grinding mills and the forestry component) could be in B or C depending upon their scale and if there is a significant increase in agricultural chemical use, or any new species or breeds are introduced. It is already possible to conclude that as there is no Category A intervention proposed then there is no need to carry out a full EIA according to the World Bank guidelines. In addition the following World Bank safeguard policies and procedures can be satisfied and there is no need to invoke the special measures if these could not be met:

#### *4.04 Natural Habitats*

One of the micro-watersheds (Enkulal on the southern side of the Gumera sub-catchment) has an area of locally protected natural forest within it at its upstream end. As part of the interventions for forestry management the protected area will be subject to a closure policy to prevent grazing and incursion into the area to allow its condition to improve.

#### *4.09 Pest Management*

Within the intervention component for cropped agriculture there will be a sub-component on integrated pest management. It is highly unlikely that large quantities of agricultural chemicals will be used, partly for the reason that the prices of such chemicals are high, as they are imported.

#### *4.10 Indigenous People*

All of the people in the wider proposed project area belong to the large Amhara ethnic group and there are no groups of minority indigenous people as defined by the World Bank.



#### *4.11 Physical Cultural Resources*

The oldest items of physical cultural resources in the area are the churches which are located on hill tops and surrounded by small areas of protected natural forest and/or grassland. None of the proposed interventions will adversely impact these areas.

#### *4.12 Involuntary Resettlement*

None of the proposed interventions will require land acquisition (in fact this was a pre-requisite of intervention formulation). As a result there will be no involuntary resettlement.

#### *4.36 Forests*

As with Natural Habitats, the proposed interventions are designed to strengthen the current management system of forest lands by instigating a policy of closure to allow them to regenerate. In addition there is a proposed programme for planting of trees, with an emphasis on indigenous varieties that will also provide economic and environmental benefits.

### **7.3.2 Implication for Conformity to the Regulatory Framework in Ethiopia**

The environmental procedures and classification of potential impacts for all work in the Amhara Regional State currently follow the Environmental Impact Assessment Procedural Guideline (Series 1, dated November 2003) of the Environmental Protection Authority of the Federal Democratic Republic of Ethiopia. Under Annex III of the guideline there is a schedule of types of proposed intervention that require an Environmental Impact Assessment as part of the regulatory process for permitting development. The need for an EIA under these regulations is indicated in the bottom row of the matrix given as Appendix F. Again there are distinctions depending on the scale and size of the proposed interventions. An EIA is required for the following reasons:

- If the road improvements are regarded as major (no specific length or size is stipulated)
- If the health component were to have a disease control aspect
- If the school building program were to include new buildings
- If there is likely to be an increase in agricultural chemical use
- If new breeds and species were to be introduced for the crop and livestock production components and also the forestry component
- If degraded land is to be rehabilitated (a major objective of the soil and water management component)
- If the irrigation component for the project were to cover a total of more than 50ha

From the above it can be seen that at least seven of the twelve components require the project proponent to carry out an EIA and submit this to the regional environmental regulatory authority. The authority then has to review the EIA and decide if permission

will be given for the project to go ahead or if modifications are required to ensure that the proposed interventions are in conformity with the objectives of environmentally sound and sustainable development. It is thus crucial for the timely implementation of this fast track project that these procedures are followed and that the project proponent (BoARD) is adequately equipped to deal with these requirements to avoid any unnecessary delay in project implementation.

## 8 Environmental management program

As part of best practice environmental assessment methodology, once any potential adverse impacts have been identified it is normal to suggest possible mitigation measures that would adequately address these adverse impacts. In addition it is normal to also identify potential enhancement measures so that the predicted positive impacts can be maximized. As stated in Section 6.1.10, there are two possible adverse impacts that could be induced by the proposed irrigation intervention. These are significantly increasing the risk of waterborne and water related disease, particularly malaria, and also the need to ensure that any abstraction for irrigation from groundwater will not threaten its use for domestic water supply provision. Great care will be needed in drawing up the detailed formulation of the irrigation component to minimize these risks and it may be necessary to implement a targeted program for the provision of treated mosquito nets. It may be necessary to carry out an analysis of residual adverse impacts on the as designed irrigation interventions.

The pre-requisite that there should be no land acquisition for any of the proposed interventions will mean that the intended fast track approach for the project will not be threatened. The proposed interventions are designed to be environmentally pro-active and as part of the detailed formulation process in the initial stage of the project implementation, then these interventions should be refined, based upon their nature and location, to maximize environmental benefits.

The environmental screening matrix given in Appendix F indicates that ten of the twelve types of intervention require consideration of the environmental consequences of construction impacts during their final formulation. The exceptions to this are the provision of grain mills and also the manufacture and supply of energy efficient stoves which are not envisaged to have direct construction impacts.

An initial appraisal of the environmental risk that implementation of the project would entail indicates that this should be minimal, due to the fact that the consequences of failure of the project are that the envisaged benefits would not occur. There should be no induced adverse impacts as a result of the project not being successfully implemented. It is difficult to perceive of a situation where the future without project situation would be better environmentally than a future with project situation where the hoped for benefits failed to materialize. The major issue would be that the resources expended on a project that failed to meet its expectations could perhaps have been used in a better way to achieve desired policy objectives.

The next crucial step in the environmental assessment process can only be taken once it is decided who will be the project proponent. The recommendation is for this role to be entrusted to the Regional Bureau of Agriculture and Rural Development (BoARD). The proponent will then be responsible for arranging for an environmental assessment to be carried out following the requirements of the Regional Environmental Protection, Land

Administration and Use Agency. This PIP environmental assessment report is structured in such a way that it can be used as a basis for a report required to be produced by the project proponent.

It must be remembered that the detailed interventions for each micro-watershed will be finally fixed in consultation with local people during the initial phase of the project implementation process. The detailed environmental assessment work to be carried out by the project proponent should consider type interventions along the lines of the environmental screening process and indicated in Table 3.

Before, during and after project implementation there will be a need to monitor key environmental parameters to see if the project objectives are being met. These parameters are likely to include:

- Any changes in land degradation
- Sediment levels in the river system
- Household livelihoods, including health conditions and education levels
- Levels of agricultural production, including data on crops, forestry and livestock

A monitoring programme can be drawn up once the detailed nature of the interventions has been finalised.

## 9 Conclusions, recommendations and future environmental management program

### 9.1 Conclusions

The main conclusion from the initial environmental screening of the twelve types of proposed intervention is that the only major potential adverse impacts could come from the irrigation component. These two impacts are the risk of increasing water related disease, particularly malaria, and the risk of groundwater abstraction for irrigation resulting in reducing the amount of water available for domestic supply. The latter impact can be minimized by appropriate design. To mitigate the risk of increased malaria a targeted program for provision of treated nets may need to be considered. In order to remain a fast track project, the pre-condition that none of the interventions shall require any land acquisition can not be over-emphasized. A key environmental management requirement is to maximize the positive environmental impacts of the proposed interventions by careful detailed formulation during the initial phase of the project implementation program. There are no major issues of upstream and downstream induced impacts and constraints. The nature and degree of potential cumulative adverse impacts would need to be considered. However the main cumulative impacts are likely to be positive and the design of the interventions should be carried out to maximize these.

It is already possible to conclude that there will be no interventions that would be classified under the World Bank Category A and that necessitate a full EIA to be carried out. The following World Bank safeguard policies and procedures can be satisfied and there is no need to invoke the special measures needed if these could not be met:

- 4.04 Natural Habitats
- 4.09 Pest Management
- 4.10 Indigenous People
- 4.11 Physical Cultural Resources
- 4.12 Involuntary Resettlement
- 4.36 Forests

Under the Ethiopian regulatory framework for environmental assessment at least seven of the twelve types of intervention considered will require an EIA to be carried out according to the procedures managed by the Amhara National State EPA. The proposed implementing agency is the Amhara National State Bureau of Agriculture and Rural Development. Once their role is confirmed then they will be responsible, as the project proponent, to ensure that an EIA is carried out and submitted to the regulatory authority in a timely manner.

## 9.2 Recommendations

It is recommended that from an environmental management point of view that the proposed project be given the go ahead following the regulatory requirements for environmental assessment in Ethiopia. Once the project proponent is confirmed then they should arrange for the necessary EIA work to be carried out and submitted to the regulatory authority for it to be reviewed in the required manner. It is imperative that these procedures are followed in a timely manner so that there is no delay in the proposed fast track approach that the project has been designed to follow.

## 9.3 Future Environmental Management Program

The next crucial step in the environmental assessment process can only be taken once it is finally confirmed who will be the project proponent. The recommendation is for this role to be entrusted to the Regional Bureau of Agriculture and Rural Development (BoARD). The proponent will then be responsible for arranging for an environmental assessment to be carried out following the requirements of the Regional Environmental Protection, Land Administration and Use Agency. The PIP Environmental Assessment (Annex F) is structured in such a way that it can be used as a basis for a report required to be produced by the project proponent.

It must be remembered that the detailed interventions for each micro-watershed will be finally fixed in consultation with local people during the project implementation process.

The detailed environmental assessment work to be carried out by the project proponent should consider type interventions along the lines of the headings indicated in Table 3.

Before, during and after project implementation there will be a need to monitor key environmental parameters to see if the project objectives are being met. These parameters are likely to include:

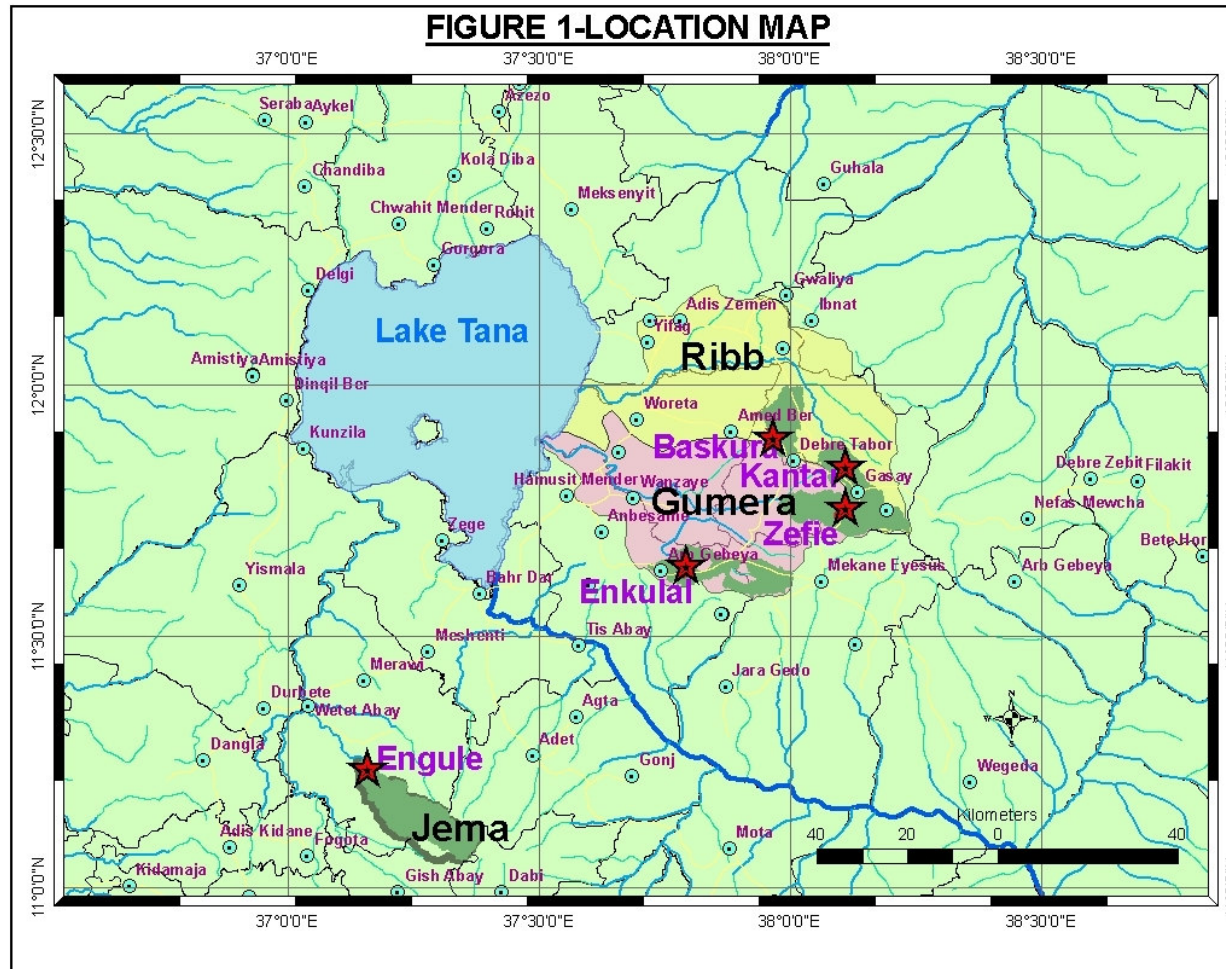
- Any changes in land degradation
- Sediment levels in the river system
- Household livelihoods, including health conditions and education levels
- Levels of agricultural production, including data on crops, forestry and livestock

A monitoring programme can be drawn up once the detailed nature of the interventions has been finalised.

# Appendices

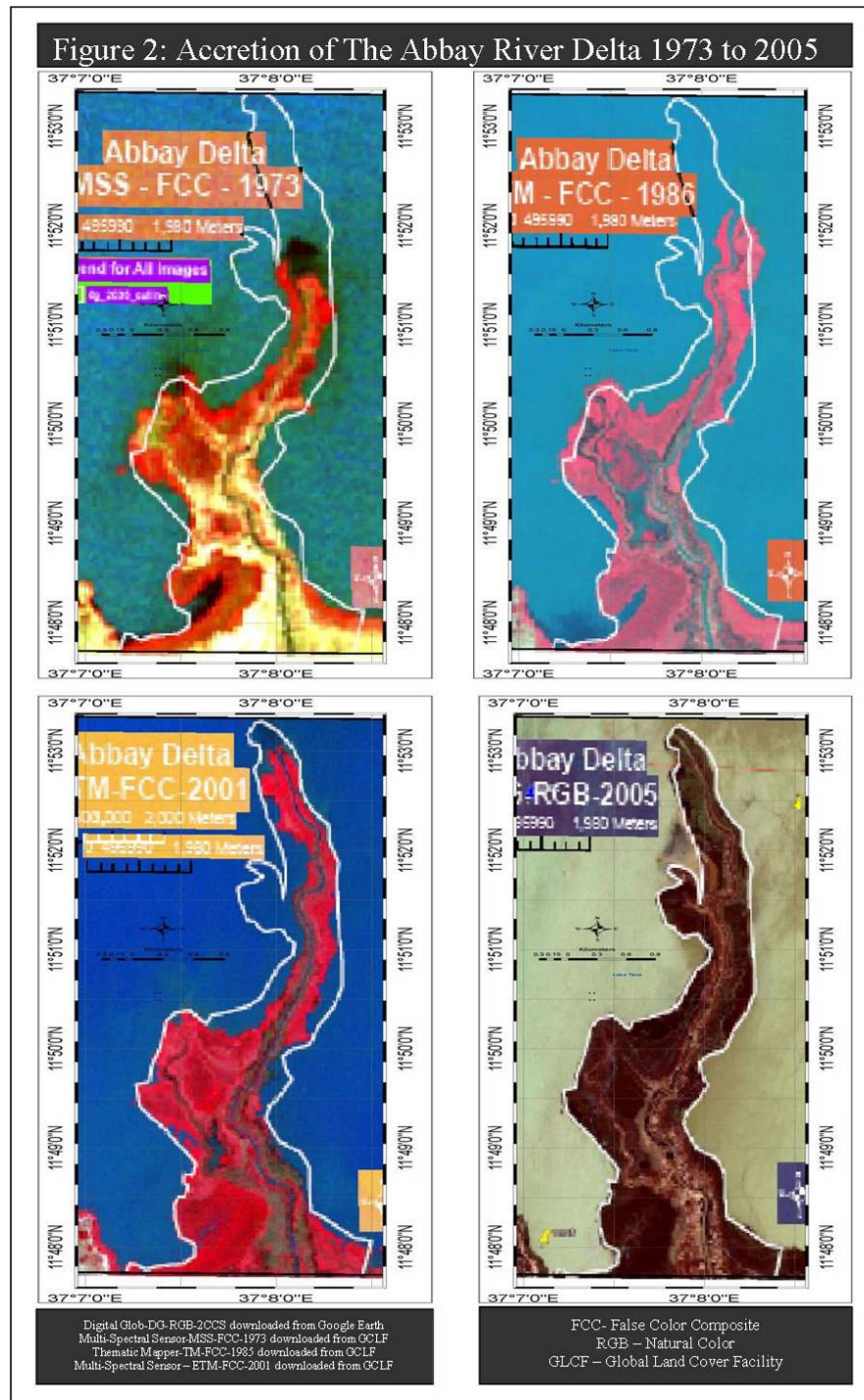
## Appendix A: Figures

Figure 1 Location Map





**Figure 2 Accretion of the Upper Abbay River Delta 1973 to 2005**



## Appendix B: Tables

**Table 1 Results of the Needs Assessment by Sector**

Ranking by communities of the importance of development sectors for each of the micro-watersheds

<b>Sector</b>	<b>Baskura</b>	<b>Kantai</b>	<b>Zefie</b>	<b>Enkualal</b>	<b>Engule</b>
<b>1 Cropland</b>	1	1	1	1	2
<b>2 Human Health</b>	2	3	2	4	3
<b>3 Water Supply</b>	4	2	4	5	4
<b>3 Education</b>	3	5	3	3	5
<b>5 Off-Farm Activities</b>	6	6	5	2	8
<b>5 Livestock</b>	5	4	6	6	6
<b>7 Access</b>	8	7	7	8	1
<b>8 Forestry</b>	7	8	8	7	7

Source: Group discussions at each micro-watersheds, late September/early October 2007

## Table 2 Interventions List

### THEME A – LIVELIHOODS PROMOTION

#### *COMMUNITY ENTRY POINTS*

##### **A: Access and Communications**

- Improvement of rural access roads
- Provision and improvement of internal access paths and footbridges
- Provision of telephones posts

##### **B: Renovation of public buildings**

- Refurbishment of local health posts
- Refurbishment of local schools

#### *CROP PRODUCTION*

##### **A: Farmer Training Centres**

- Provision of classroom furniture and equipment

##### **B: Demonstrations**

- Demonstrations for increased crop production and profitability

##### **C: Development Agent Support**

- Provision and improvement of office facilities, equipment and transport

#### *LIVESTOCK PRODUCTION*

##### **A: Animal Health Post Provision**

- Construction of buildings and Kraals
- Provision of office furniture, tools and equipment
- Provision of training courses for farmers

##### **B: Animal Feed Supply Provision**

- Improvement of communal pasture (including closure of existing grazing areas)
- Establishment of nursery for forage plants
- Demonstrations for pasture and forage promotion and improvement

##### **C: Dairy Production Promotion**

- Delivery system for artificial insemination
- Provision of liquid nitrogen, semen and equipment
- Demonstrations to promote increased dairy production

##### **D: Dairy Processing Promotion**

- Provision of dairy processing centres and equipment

- Demonstrations to promote dairy processing

#### **E: Sheep Promotion**

- Provision of sheep breeding stock
- Demonstrations of sheep equipment
- Demonstrations of sheep rearing

#### **F: Poultry and Honey Promotion**

- Demonstrations of poultry breeding stock
- Demonstration on poultry keeping and honey production

#### **G: Animal Fattening**

- Provision of breeding stock for large and small ruminants
- Animal fattening demonstrations

#### **H: Support to Development Agents for Livestock**

- Provision of office facilities, equipment and transport for District Agents

### ***NON-FARM INCOME GENERATION***

#### **A: Provision of Community flour mills**

#### **B: Technology and innovation fund**

#### **C: Micro-credit facility**

## **THEME B – SUSTAINABLE LANDSCAPE PROMOTION**

### ***SOIL AND WATER CONSERVATION, WATER SUPPLY AND SANITATION AND IRRIGATION PROVISION***

#### **A: Soil and Water Conservation**

- Closure of selected land areas to animals
- Planting of vegetative fencing
- Development of forestry in micro-basins
- Cut-off drain provision
- Construction of waterways with stone checks
- Construction of bench terracing
- Planting of vetiver hedgerows
- Rotational closure of land to animals
- Planting of leguminous hedgerows
- Plant agro-forestry in micro-basins
- Construction of stone faced bunds

- Construction of stone check-dams
- Gully reshaping

**B: Water Supply and Sanitation Provision**

- Roof water harvesting
- Construction of low cost micro-ponds
- Provision of hand pumps for wells
- Development of springs
- Demonstration of improved sanitation facilities

**C: Irrigation Development**

- Construction of small scale irrigation (gravity and pumped)

***FORESTRY AND AGRO-FORESTRY***

**A: Agro-forestry Demonstrations and Establishment of Nurseries**

- Establishment of forestry protection and harvesting research and development units
- Demonstrations for forestry and agro-forestry system and sub-system promotion
- Establishment of tree nurseries

**B: Support to Development Agents for Forestry and Agro Forestry**

- Provision of office supplies, equipment and transport

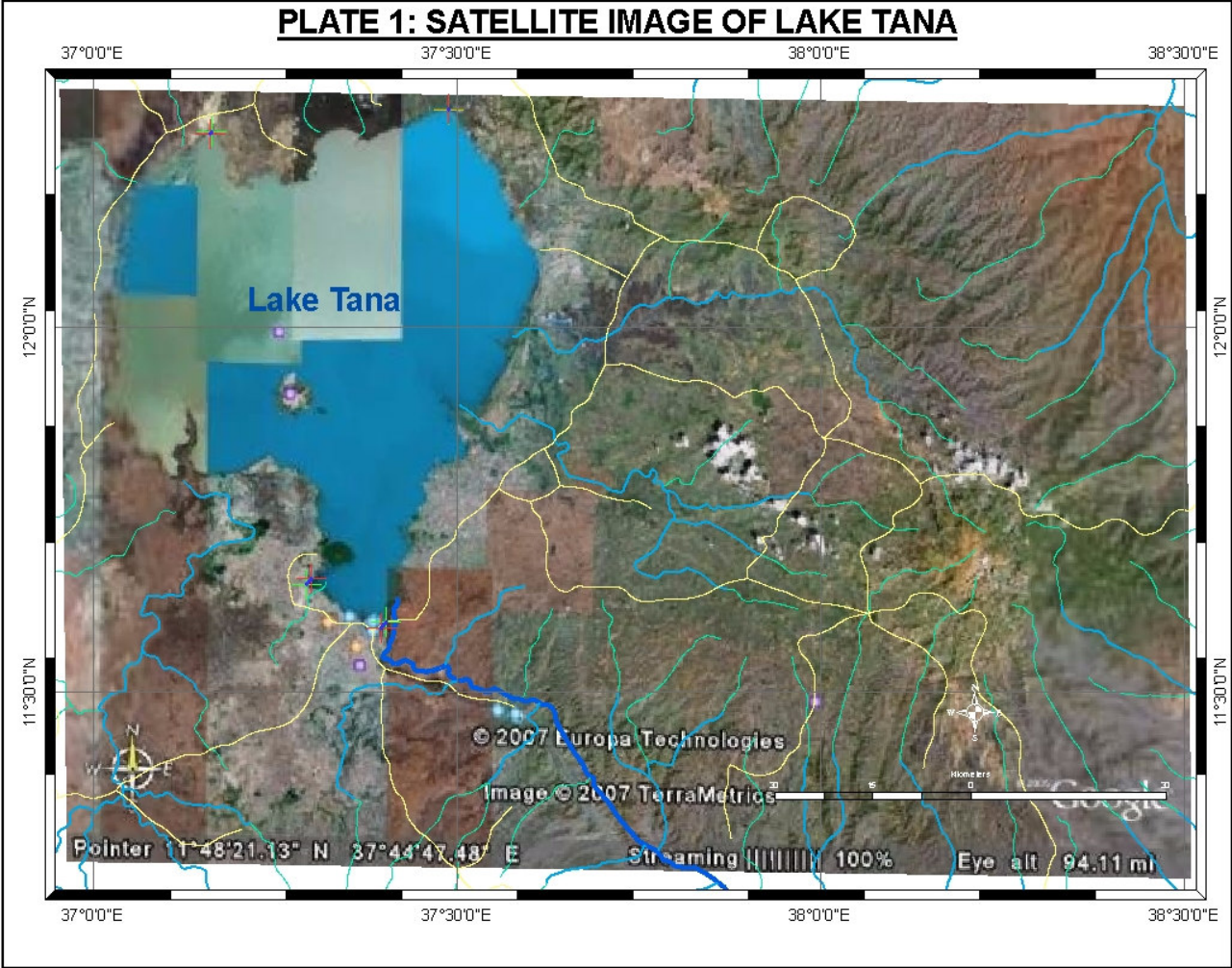
**THEME C - CAPACITY BUILDING**

**Table 3 Intervention Component List for Environmental Assessment**

- 1 Access and Communications**
  - 1.1 Improvement of existing rural roads
  - 1.2 Provision and improvement of internal access paths and footbridges
  - 1.3 Provision of telephone posts
  
- 2/3 Renovation of public buildings**
  - 2.1 Refurbishment of local health posts
  - 3.1 Refurbishment of local schools
  
- 4 Crop Production**
  
- 5 Livestock Production**
  
- 6 Non-Farm Income Generation**
  - 6.1 Provision of grinding mills
  - 6.2 Technology and innovation fund
  - 6.3 Micro-credit facility
  
- 7 Soil and Water Conservation**
  
- 8 Water Supply and Sanitation**
  - 8.1 Water supply
  - 8.2 Sanitation
  
- 9 Irrigation**
  
- 10 Forestry and Agro-Forestry**
  
- 11 Capacity Building**

# Appendix C: Photographic Plates

Plate 1 Satellite Image of Lake Tana



**Plate 2 Lake Tana 2007**





**Plate 3 Blue Nile immediately downstream of the lake**



**Plate 4 Upland erosion Zefie**



**Plate 5 Sheet erosion Engule**



**Plate 6 Gully erosion Zefie**



**Plate 7 Gully erosion Enkual**



**Plate 8 Gully erosion Engule**



**Plate 9 Gully erosion Engule**



**Plate 10 Main river bank erosion Engule**



**Plate 11 Accretion in Jema River**



**Plate 12 River bank spring Jema River**



**Plate 13 Enkulal micro-watershed with natural forest**



**Plate 14 Engule tree**



**Plate 15 Footbridge to Engule**



## Appendix D: Environmental assessment checklist

### 1 Natural environment

#### 1.1 Natural Physical Environment

Atmosphere

Air (dust)

Climate

Rainfall

Temperature (frost)

Sunshine

Water Resources

Surface Water

Quantity

Local Rainfall Flooding

Main River Flooding

Drainage

Low Rainfall

Low River Flows

For Irrigation

Quality

Chemistry

Pollution (organic waste)

For Domestic Water Supply

For Irrigation

Erosion

Sheet

Gully

River Bank

Sedimentation

Land Smothering

Accretion (in rivers)

Groundwater

Availability

Domestic Water Supply

Irrigation

Quality

Pollution (organic waste)

Land Resources

Topography

Land Type (AEZ)

Soil

Type

Quality



- Physical
- Chemistry
- Waterlogging
- Erosion
  - Sheet Erosion
  - Gully Erosion
  - River Bank Erosion
- Smothering
- Capability

## **1.2 Natural Biological Environment**

- Terrestrial Habitats
  - Flora
  - Fauna
- Freshwater Habitats
  - Flora
  - Fauna
  - Fish
- Bio-diversity and Conservation
- Sensitive and Protected Areas
- Endangered Species

## **1.3 Natural Risks and Hazards**

- Erosion/land Degradation
- Low Rainfall/Drought
- Flood
- Storms
- Landslides
- Seismic Activity

## **2 Human environment**

### **2.1 Social Environment**

- Political and Institutional Administration
- Demography
- Gender Issues
- Social Equity
- Settlement Pattern and History
- Land Holding, Tenure and Values
- Common Resource Rights
  - Forestry/Fuelwood
  - Grazing
  - Fodder
  - Fish
- Domestic Energy and Fuel
- Domestic Water Supply
- Sanitation
- Human Health
  - Waterborne Disease (diarrhoea)

- Insect-borne Disease (malaria)
- Mental Health
- Human Nutrition
- Education and Literacy
- Archaeological and Cultural Sites
- Landscape Aesthetics

## **2.2 Economic Environment**

- Economic Livelihood
  - Agriculture
  - Homestead Production
  - Livestock
  - Forestry
  - Fisheries
  - Industry
  - Other Cash Income
- Transport Infrastructure and Communications
  - Footpaths
  - Roads
  - Bridges
  - Navigation
  - Energy and Power
  - Telecommunications

## **2.3 Social Risk and Hazards**

- Erosion/Land Degradation:
  - Sheet Erosion
  - Gully Erosion
  - River Bank Erosion
- Low Rainfall/Drought
- Floods
- Storms
- Human Disease
- Famine
- Crop Pests and Disease
- Animal Disease
- Pollution
- Earthquakes
- Social Instability/Conflict
- Economic Instability
- Political Instability/War

## **3 External constraints and impacts**

- Upstream Constraints
- Upstream Impacts
- Downstream Constraints
- Downstream Impacts

### Appendix E: Environmental scoping matrix by components

MAIN ENVIRONMENTAL ISSUES	Access and Communications	Human Health	Education	Crop Production	Livestock Production	Non-Farm Income (Mills)	Improved Stoves	Soil and Water Conservation	Water Supply	Sanitation	Irrigation	Forestry and Agro-Forestry
<b>NATURAL ENVIRONMENT</b>												
<b>Natural Physical Environment</b>												
Atmosphere:												
Air (dust)	+/-	# +	# +	0	0	-	+	0	0	+	0	+
Climate:												
Rainfall	#	0	0	#	#	0	0	#	#	#	#	#
Temperature (frost)	0	0	#	#	#	0	#	#	#	#	#	#
Sunshine	0	0	0	#	0	0	0	#	0	0	#	#
Water Resources:												
Surface Water:												
Quantity:												
Local Rainfall Flooding	#	#	0	#	0	0	0	+	#	#	#	+
Main River Flooding	#	#	0	#	0	0	0	#	#	#	#	0
Drainage	#	#	0	#	0	0	0	# +	0	#	#	+
Low Rainfall	0	0	0	#	#	0	0	#	#	0	#	#
Low River Flows	0	0	0	#	0	0	0	#	#	0	#	0
Insufficiency for Irrigation	0	0	0	#	0	0	0	# +	# (-)	0	# (-)	#
Quality:												
Chemistry												
Pollution (organic waste)	0	#	0	0	# (+)	0	0	0	# (+)	+	# (-)	0
For Domestic Water Supply	0	#	0	0	0	0	0	0	# +	+	# (-)	0
For Irrigation	0	0	0	#	0	0	0	0	0	0	#	0
Erosion:												
Sheet Erosion	0	0	0	#	# (+)	0	(+)	+	0	0	(+)	+
Gully Erosion	+	0	0	#	# (+)	0	(+)	+	0	0	(+)	+
River Bank Erosion	0	0	0	#	0	0	(+)	+	0	0	0	+
Sedimentation												
Land Smothering	0	0	0	#	#	0	(+)	+	0	0	#	+
Accretion (in rivers)	0	0	0	#	#	0	(+)	+	0	0	#	+
Groundwater:												
Availability:												
For Domestic Water Supply	0	#	0	0	#	0	0	0	#	+	(-)	0
For Irrigation	0	0	0	#	0	0	0	#	# (-)	0	#	#
Quality:												
Pollution (organic waste)	0	#	0	0	(+)	0	0	0	+	+	(-)	0

MAIN ENVIRONMENTAL ISSUES	Access and	Human		Crop	Livestock	Non-Farm	Improved	Soil and Water	Water			Forestry and
	Communications	Health	Education	Production	Production	Income (Mills)	Stoves	Conservation	Supply	Sanitation	Irrigation	Agro-Forestry
Land Resources:												
Topography	#	0	0	# (+)	#	0	0	# (+)	0	0	#	#
Land Type (AEZ)	0	0	0	#	#	0	0	#	0	0	#	#
Soil												
Type	0	0	0	#	#	0	(#)	#	0	#	#	#
Quality:												
Physical	0	0	0	# +	#	0	0	# +	0	0	#	#
Chemical	0	0	0	#	0	0	0	#	0	0	#	#
Waterlogging	+	0	0	#	0	0	0	# +	0	0	(-)	#
Erosion:												
Sheet Erosion	0	0	0	# +	# +	0	(+)	+	0	0	(+)	+
Gully Erosion	+	0	0	# +	# +	0	(+)	+	0	0	(+)	+
River Bank Erosion	0	0	0	#	0	0	(+)	+	0	0	0	+
Smothering	+	0	0	#	#	0	(+)	+	0	0	#	+
Capability	0	0	0	#	#	0	0	+	0	0	#	+
<b>Natural Biological Environment</b>												
Terrestrial Habitats												
Flora	0	0	0	0	+	0	(+)	+	0	0	(?)	+
Fauna	0	0	0	0	+	0	(+)	+	0	0	(?)	+
Freshwater Habitats:												
Flora	0	0	0	0	0	0	0	0	0	0	(?)	0
Fauna	0	0	0	0	0	0	0	0	0	0	(?)	0
Fish	0	0	0	0	0	0	0	0	0	0	(?)	0
Bio-Diversity and Conservation	0	0	0	0	+	0	(+)	+	0	0	(?)	+
Sensitive Areas (Protected Areas)	0	0	0	0	+	0	(+)	+	0	0	0	+
Endangered Species	0	0	0	0	0	0	0	0	0	0	0	0
<b>Natural Risk and Hazards</b>												
Erosion/Land Degradation	+	0	0	0	+	0	+	+	0	0	(+)	+
Low Rainfall/Drought	0	0	0	# +	#	0	0	0	#	0	#	#
Flood	+	#	#	#	0	0	(+)	#	0	#	#	+
Storms	0	0	#	#	0	0	(+)	#	0	0	#	# 0
Landslides	+	0	0	#	0	0	0	# +	0	0	#	# +
Seismic Activity	0	0	0	0	0	0	0	0	0	0	0	0

MAIN ENVIRONMENTAL ISSUES	Access and	Human		Crop	Livestock	Non-Farm		Soil and Water	Water			Forestry and
	Communications	Health	Education	Production	Production	Income (Mills)	Improved Stoves	Conservation	Supply	Sanitation	Irrigation	Agro-Forestry
<b>HUMAN ENVIRONMENT</b>												
<b>Social Environment</b>												
Political and Institutional Administration	#	#	#	0	#	#	0	0	#	0	0	#
Demography	#	#	#	#	#	#	#	#	#	#	#	#
Gender Issues	+	# +	# +	0	0	+	+	0	# (+)	#	(?)	# +
Social Equity	+	+	+	0	0	+	#	0	+	+	(?)	0
Settlement Pattern and History	#	#	#	0	#	#	#	0	#	#	#	0
Land Holding, Tenure and Values	#	0	0	# +	# 0	0	0	# +	#	0	(+)	# 0
Common Resource Rights:												
Forestry/Fuelwood	0	0	0	+	# +	0	+	+	0	0	0	+
Grazing	0	0	0	+	# (?)	0	0	+	0	0	0	0
Fodder	0	0	0	+	# +	0	0	+	0	0	0	+
Fish	0	0	0	0	0	0	0	0	0	0	0	0
Domestic Energy and Fuel	+	#	0	+	+	#	+	+	0	+ ?	#	+
Domestic Water Supply	+	#	0	0	0	0	0	0	+	0	#	0
Sanitation	0	#	0	0	0	0	0	0	0	+	0	0
Human Health:												
Waterborne Disease (diarrhea)	+	+	0	0	0	0	0	0	+	+	-	0
Insect-borne Disease (malaria)	+	+	0	0	0	0	0	0	0	0	-	0
Mental Health	+	+	0	0	0	0	0	0	0	0	0	0
Human Nutrition	0	+	0	+	0	+	(+)	+	0	0	+	0 (+)
Education and Literacy	+	0	+	0	0	0	0	0	0	0	0	0
Archaeological and Cultural Sites	0	0	0	0	0	0	0	0	0	0	0	0
Landscape Aesthetics	?	0	0	0	+	0	+	+	0	0	(?)	+
<b>Economic Environment</b>												
Economic Livelihood												
Agriculture	+	+	+	+	0	+	+	+	0	(+)	+	0
Homestead Production	+	+	+	+	+	+	+	+	0	(+)	+	+
Livestock	+	0	0	+	+	0	+	+	0	0	0	0 (+)
Forestry	+	0	0	+	+	0	+	+	0	0	(+)	+
Fisheries	0	0	0	0	0	0	0	0	0	0	0	0
Industry	+	0	0	0 (+)	+	+	+	0	0	0	0	+
Other Cash Income	+	+	+	0 (+)	+	+	+	+	0	0	(+)	+
Transport Infrastructure and Communications:												
Footpaths	+	0	0	0	0	#	#	0	0	0	#	0
Roads	+	0	0	0	0	#	#	0	0	0	#	0
Bridges	+	0	0	0	0	#	#	0	0	0	#	0
Navigation	0	0	0	0	0	0	0	0	0	0	0	0
Energy and Power	0	0	0	+	+	#	+	+	0	+	#	+
Telecommunications	+	0	0	0	0	0	0	0	0	0	0	0

MAIN ENVIRONMENTAL ISSUES	Access and	Human		Crop	Livestock	Non-Farm	Improved	Soil and Water	Water			Forestry and
	Communications	Health	Education	Production	Production	Income (Mills)	Stoves	Conservation	Supply	Sanitation	Irrigation	Agro-Forestry
<b>Social Risk and Hazards</b>												
Erosion/Land Degradation:												
Sheet Erosion	0	0	0	# 0	+	0	+	+	0	0	(+)	+
Gully Erosion	+	0	0	#	+	0	+	+	0	0	(+)	+
River Bank Erosion	0	0	0	#	0	0	+	+	0	0	0	+
Low Rainfall/Drought	0	0	0	#	#	(+)	+	0	+	0	#	# 0
Floods	+	+	0	#	0	(+)	+	+	+	#	#	+
Storms	0	0	0	#	0	(+)	+	0	0	0	#	#
Human Disease	+	+	0	0	0	0	+	0	+	+	-	0
Famine	+	+	+	0	0	+	+	+	0	0	(+)	0
Crop Pests and Disease	+	0	0	# +	0	#	0	0	0	0	#	0
Animal Disease	+	0	0	0	# +	0	0	0	0	0	0	0
Pollution	0	+	0	0	+	0	+	0	+	+	(-)	0
Earthquakes	0	0	0	0	0	0	0	0	0	0	0	0
Social Instability/Conflict	+	+	+	+	0	+	+	+	+	0	(-)	0
Economic Instability	+	+	+	+	+	+	+	+	+	0	+	+
Political Instability/War	0	0	0	0	0	0	0	0	0	0	0	0
<b>EXTERNAL CONSTRAINTS</b>												
Upstream Constraints	0	0	0	0	0	0	0	0	0	0	(?)	0
Upstream Impacts	0	0	0	0	0	0	0	0	0	0	0	0
Downstream Constraints	0	0	0	0	0	0	0	0	0	0	(?)	0
Downstream Impacts	0	0	0	0	0	0	0	+	0	0	(-)	0
<b>DIRECT CONSTRUCTION IMPACTS</b>												
Land Acquisition	0	0	0	0	0	0	0	0	0	0	0	0
Compensation	0	0	0	0	0	0	0	0	0	0	0	0
Resettlement	0	0	0	0	0	0	0	0	0	0	0	0
Construction Management	#	#	#	0	#	0	0	#	#	#	#	#
<b>ENVIRONMENTAL ASSESSMENT CLASS</b>												
World Bank	B **	C	C	B? ***	B?	B?	B	B	B	B	B	B? ****
Amhara Regional State EPA (National Guideline)	EIA?			EIA?	EIA?			EIA?			EIA?	EIA

Source: Field Studies August-October 2007

Legend:

- + = Probable Positive Impact
- = Probable Adverse Impact
- 0 = No Impact Expected
- # = Constraint/Link
- N/A = Not Applicable

? = Insufficient data or understanding or too site specific to give Rating

() = Uncertainty Exists with Rating

\* = Major Impact

\*\* If no land acquisition

\*\*\* If no significant increase in the use of agricultural chemicals

\*\*\*\* If small scale and no land clearance

## **Appendix F: References and bibliography**

### **References**

Halcrow et al, August 2007a, Environmental Assessment Interim Report, Integrated Watershed, Management (Ethiopia) sub-Watershed Project of Fast Track Projects of Eastern Nile Subsidiary Action Programme, For ENTRO, Addis Ababa, Ethiopia

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- Federal EIA Proclamation 299/2002
- Federal Environmental Impact Assessment Guideline Document of May 2000 (has the sector guidelines in it)
- Federal Environmental Impact Assessment Procedural Guidelines Series 1, November 2003
- Federal Environmental Pollution Control Proclamation 300/2002
- Federal Rural Land Administration and Use Proclamation 456/2005 (supersedes proclamation 69/1997?)
- Federal Wildlife Proclamation 192/1980 (new draft stalled by Federal/Regional dispute)?
- Federal Forest Proclamation 192/1980 (new draft Federal Forest Policy?)
- Federal National Biodiversity Strategy and Action Plan, 2005
- ANRS Forestry Conservation, Development and Utilization Proclamation 1999
- ANRS Forestry Resources Conservation Inspection and Movement Guideline 1998 (has an attached inventory of managed forestry areas in the Region)



**Other documents required but not yet located:**

***Federal Level:***

EPA EIA Guideline for Soil Conservation for Cultivated Lands? Is this superseded by the Agriculture Sector work in the EIA guideline of May 2000?

***Regional Level:***

\*Amhara National Regional State, Amhara Regional Conservation Strategy July 1997

\*Amhara National Regional State Environmental Policy

\*Amhara National Regional State EIA guidelines and procedures

Amhara National Regional State Land Administration and Use Proclamation 46/2000, and its associated guidelines and procedures

Woody bio-mass project outputs

