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THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

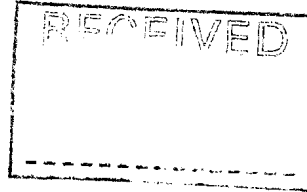
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Addis Ababa 26/2/2007

Ato Negede Lewi
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Subject: APL III - Submission of EIA Reports


Dear Ato Negede,

As per the provisions of the timeframe set for the pre – appraisal and appraisal of the APL III Projects, namely:

1. Aposto – Wendo – Negelle,
2. Gedo – Nekemte,
3. Gondar – Debark, and
4. Yalo – Dallol, we are hereby submitting, in both hard and

soft copies, the final EIA Reports of the Projects, for your information and consumption, addressing / incorporating the comments received at different stages from the Bank.

Sincerely,


ZAID WOLDE GEBRIEL
Ethiopian Roads Authority
Director General



FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
ETHIOPIAN ROADS AUTHORITY

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v 4



**CONSULTANCY SERVICES
FOR
FEASIBILITY STUDY
ENVIRONMENTAL IMPACT ASSESSMENT
AND
DETAILED ENGINEERING DESIGN
AND
TENDER DOCUMENT PREPARATION
FOR
YALO-DALOL ROAD
FINAL EIA REPORT**



IN ASSOCIATION WITH **J & W**

AND



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SABA ENGINEERING PRIVATE LIMITED COMPANY

FEBRUARY 2007

**FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
ETHIOPIAN ROADS AUTHORITY**

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FINAL EIA REPORT



IN ASSOCIATION WITH

J & W

AND



June 2002

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ABBREVIATIONS

| | |
|--------|---|
| ADLI | Agricultural-Development-Led Industrialization |
| ANRS | Afar National Regional State |
| BOPED | Bureau of Planning and Economic Development |
| CEDEP | Consultants for Economic Development and Environmental Protection |
| CSA | Central Statistical Authority |
| CSE | Conservation Strategy of Ethiopia |
| EPA | Environmental Protection Authority |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| EMA | Ethiopian Mapping Authority |
| EMB | Environmental Management Branch of ERA |
| EPA | Environmental Protection Authority |
| EPE | Environmental Policy of Ethiopia |
| ERA | Ethiopian Roads Authority |
| EWCO | Ethiopian Wildlife Conservation Organisation |
| EWNHS | Ethiopian Wildlife and Natural History Society |
| GCRC | Gross Current Replacement Cost |
| IDA | International Development Association |
| IEC | Information, Education and Communication |
| IPS | Industrial Projects Service |
| IUCN | World Conservation Union (International Union for Conservation of Nature) |
| masl | meter above sea level |
| mbsl | meter below sea level |
| MCE | Metaferia Consulting Engineers |
| MEDAC | Ministry of Economic Development and Cooperation |
| OD | Operational Directive |
| PA | Peasant Association |
| PAP | Project Affected Persons |
| RAP | Resettlement Action Plan |
| RCS | Regional Conservation Strategy |
| RECC | Regional Environmental Co-ordination Committee |
| RoWB | Right-of-Way Branch |
| RRA | Regional Rural Roads Authorities |
| RSDPSP | Road Sector Development Programme Sub-Project |
| SIA | Social Impact Assessment |
| TPLF | Tigray People Liberation Front |
| TNRS | Tigray National Regional State |
| UNCED | United Nations Conference on Environment and Development |
| WCMC | World Conservation Monitoring Center |

1. INTRODUCTION AND BACKGROUND

1.1. The Yalo - Dalol Road Project

The Project Road is part of some 400-500 km new road connecting Kasamander on the Dese-Mille Link Road in the south to Dalol near the Ethiopia-Eritrea Border in the north. It is understood that the section Kasamander-Yalo, south of the Project Road, is under construction and the section Ab-Ala-Dalol, north of the Project Road is being designed by Transport Construction Design Enterprise (TCDE). Consequently, the Project Road would form the central part of the Kasamander-Dalol Road. The direct distance between Yalo and Ab-Ala is about 108 km.

The road under consideration in this report is located in the Tigray and Afar National Regional States in the northern and northeastern parts of the country, the starting point at Yalo is about 650 kilometres north from Addis Ababa. Depending on the alternative, some 70 to 180 km of the proposed road alignment is new.

A map of the proposed project is presented in a map after this chapter and the alignment options currently under consideration are shown in map 2.2 on page 16.

The Yalo – Dalol (part Yalo – Ab-Ala) road project to be conducted by Finnroad and associates is divided into two phases. Phase 1 of the project comprises a Feasibility Study and an Environmental Impact Assessment (EIA). Phase 2 is Detailed Engineering Design and Tender Document Preparation.

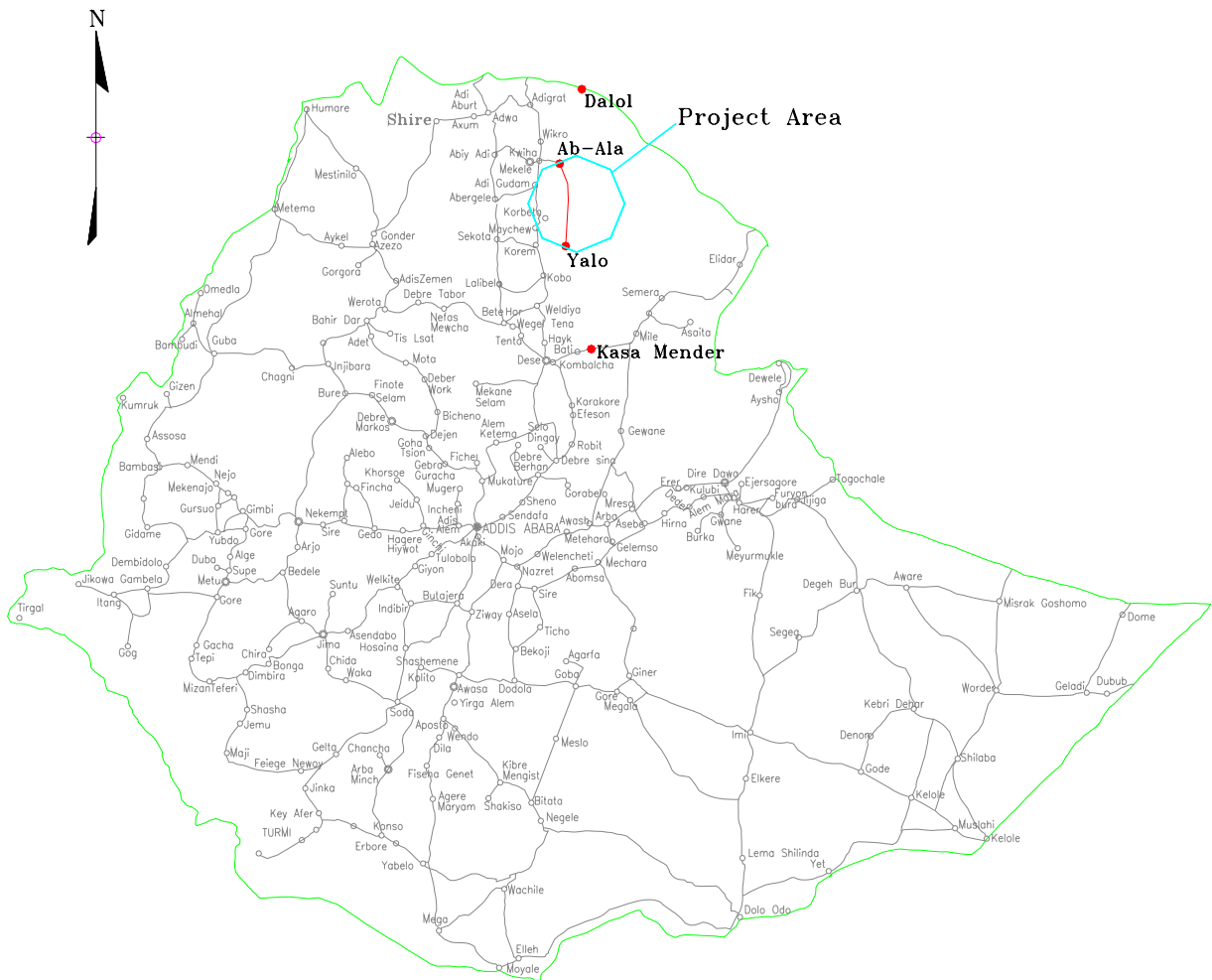
1.2. Purpose of this Report

As part of the Feasibility Study, an Environmental Assessment of the proposed road project has to be carried out. In this report, all the findings about the environmental issues related to environmental legislation and management as well as the findings of the actual environment of the different road alternatives are given. In addition, an assessment of the potential impacts of the different route alternatives is given and a comparison between the alternatives is developed in order to give a comprehensive picture with regard to the environmental and social impacts of the alternatives.

The final decision about the alternative to be chosen for further planning and design will be based on the recommendations presented in this report together with the technical and economical recommendations given in the Draft Final Feasibility Report.

This report also states the environmental and social requirements and recommendations to be observed in future planning&design and implementation of the road project as well as during operation time.

PROJECT LOCATION MAP



2. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1. Environmental Policy of Ethiopia

The major policy framework document with respect to environmental management of Ethiopia is the *Environmental Policy* (EPE) of the FDRE approved by the Council of Ministers in April, 1997. The Policy was prepared under the joint-effort of the Environmental Protection Authority (EPA) and the Environmental Planning Unit (EPU) of the Ministry of Economic Development and Cooperation (MEDaC).

The EPE supports Constitutional Rights through its guiding principles.

The principles are, of course, guiding all infrastructure development in the country, including road project preparation and implementation. The principles include many important issues to be taken into account also in this project, the most relevant being:

- Every person has the right to live in a healthy environment;
- Full environmental and social costs (or benefits foregone or lost) that may result through damage to resources or the environment as a result of degradation or pollution shall be incorporated into public and private sector planning and accounting, and decisions shall be based on minimising and covering these costs;
- Regular and accurate assessment and monitoring of environmental conditions shall be undertaken and the information widely disseminated within the population;
- Natural resource and environmental management activities shall be integrated laterally across all sectors and vertically among all levels of organisation;

In addition to its Guiding Principles the EPE provides Sectoral Environmental Policies and Cross-sectoral Environmental Policies. Environmental Impact Assessment policies are included in the latter.

The EIA policies emphasize e.g. the need of wide range of impacts to be dealt with in EIAs, the early recognition of environmental issues in project planning, public participation, mitigation and environmental management and capacity building at all levels of administration.

The policy establishes the authority of the EPA to harmonize Sectoral Development Plans and to implement an environmental management program for the country. It also imparts political and popular support to the sustainable use of natural, human-made and cultural resources at the federal, regional, zonal, woreda and community levels.

2.2. EIA Legislation and Guidelines

The EPA has issued a *Guideline Document* for EIAs. The document provides a background to environmental impact assessment and environmental management in Ethiopia. The document aims at being a reference material to ensure effective environmental assessment and management practice in Ethiopia for all parties who engage in the process.

The document details the required procedures for conducting an EIA in Ethiopia and the requirements for environmental management. The document has been developed to support the ongoing development of environmental legislation. These requirements are presented on a step-by-step basis. In addition, the document specifies tools that may be considered when engaging in the EIA process. Reference is made to the legislation and policies that potential investors and developers must comply

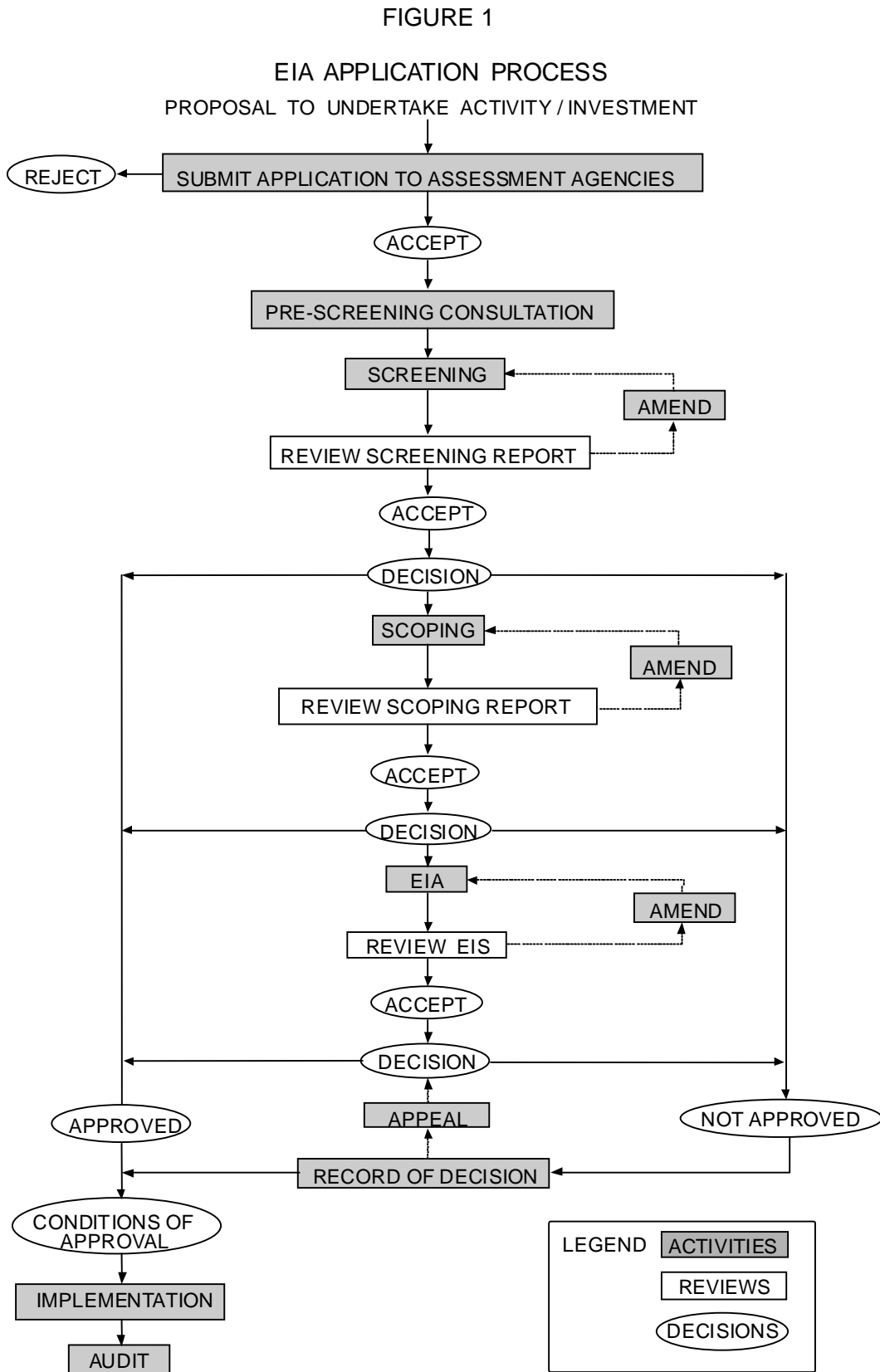
in Ethiopia and key issues for environmental assessment in specific development sectors are detailed for consideration.

The EIA application process is pictured in Figure 1 (for the actual enforcement practice see section 2.3.3).

EPA is preparing the EIA Law of Ethiopia, called *Environmental Impact Assessment Proclamation*. Among other things, the proclamation is defining the different legal organizations concerning Environmental Impact Assessment, outlining the contents of EIAs, and determining the duties of different parties involved in EIAs.

EIA is not currently a legal requirement. However, the intent of these policies is for their promulgation into legislation. In fact, the EPA is expecting to get the legislation in force very soon.

The EPA has also issued the *Environmental Impact Considerations for Transport Sector Projects* (January 1997). On the basis of this document, Environmental Management Branch of ERA (EMB) has issued *Environmental Guidelines* to instruct different parties involved with road sector environmental activities. The main objective of the document is to provide specific guidelines on how to integrate environmental concerns associated with road works into the planning, design and implementation of road works. It is not a legal document, but rather an official guideline to serve the activities of the Ethiopian Roads Authority and its relations with other organizations in environmental issues.



In *Environmental Procedures Manual* produced by the EMB, road projects are divided into two categories concerning the need of EIA. According to the categories given in the Manual, Yalo-Dalol Road Project would fall into “Schedule II Projects” requiring an IEIA (Initial Environmental Impact Assessment).

An IEIA is conducted in the earliest stage of project preparation in order to establish the key environmental issues. IEIA includes a project description, existing conditions, identification of potential impacts, a discussion of alternatives to the project. It may also identify the mitigation needed to significantly reduce or eliminate impacts, and a determination of institutional capabilities to carry out environmental management activities. On the basis of the recommendations made in the IEIA, a decision upon whether an EIA is needed or not would be made.

Project categories according to "*Environmental Procedures Manual*":

| | |
|--|---|
| <p>EPA Schedule I Projects: Require an EIA</p> | <p>EPA Schedule II Projects: Require an IEIA in order to determine if an EIA is necessary</p> |
| <p>Are defined as "Projects which may have significant environmental impacts, and therefore require detailed field review and a full Environmental Impact Study (EIS)" [EIA] (<i>Procedural Guidelines, p 11</i>).</p> <p>For the road sub-sector, these include "major urban roads, new and upgraded motor ways / express roads and rural road programs" (<i>Procedural Guidelines, p 12</i>).</p> | <p>Are defined as "projects whose type, scale or other relevant characteristics have the potential to cause some significant environmental impacts but are not likely to warrant an EIS (EIA)" [EIA].</p> <p>For the road sub-sector, these include "upgrading/rehabilitation of major rural roads" (<i>Procedural Guidelines, p 13</i>).</p> |
| <p>More detailed information on the requirements of the EPA can be found in: * <i>Environmental Impact Assessment Guideline Document</i>", EPA, July 2000</p> <p>If you do not have a copy of these documents, you should obtain them. The user of this manual should note that in the EPA guidelines, the terms IEIA and IEIS, as well as the terms EIA and EIS are used, assessment referring to the process, and statement referring to the document. For the purposes of simplicity, this manual will use the general terms IEIA and EIA only.</p> | |

As seen in above, there is no clear mention about construction of rural roads in the categories, only rural road programs are deemed subject to EIA in Schedule I Projects Category. And, in Schedule II Category major rural road upgrading/rehabilitation is deemed subject to IEIA.

In *Environmental Guidelines* of ERA the categories are described somewhat differently:

- a) Projects Requiring an Initial EIA

These are road projects that have the potential to cause some significant environmental impacts but not likely to warrant an EIA study. These are projects like:

- upgrading rehabilitation of roads, and
- other works of similar extent

b) Projects Requiring a Full EIA Study

These are projects that are likely to have a severe impact on the environment. Therefore a self-standing EIA is required that in turn requires a specific Terms of Reference for its fulfillment. Projects of such nature may include

- New/upgrading of major roads,
- New/upgrading of regional roads, and
- Other works of similar extent

It is understood by the Consultant that the Environmental Guidelines document is still a draft version, and as such not yet a comprehensive, official paper to be referred to when deciding upon when a project should be subject to EIA or not.

Furthermore, concerning the Yalo-Dalol Road Project Feasibility Study and Environmental Assessment, it is understood that the assessment process is adapted like it would be a project subject to EIA, whatever the judicial status of the documents stated herein is at present in the country. This has been most probably the fundamental idea when preparing the TOR for this project, as well.

2.3. Organizations

2.3.1. Ethiopian Roads Authority

Ethiopian Roads Authority (ERA) is the implementing agency of the Yalo - Dalol road project during planning and design phases. Planning and design is carried out in close co-operation with the Regions involved by the proposed road. Regional Authorities will become “project owners” during road construction, and the road would be under Regional Authorities to administrate and to maintain after completing the road construction works. ERA will be involved with the road project until operation phase, because of it’s capacity in supervision and monitoring, especially concerning environmental matters. ERA has an advisory role to Regions’ roads activities even during operation phase.

The Right-of-Way Branch (ROWB) in Legal&Protection of Roads Division and the Environmental Management Branch (EMB) in Planning and Programming Division are the two ERA units involved in the identification and the mitigation of environmental and social impacts. The EMB is accountable for planning and monitoring while the ROB is accountable for the implementation of expropriation/compensation operations when required. The EMB addresses analytical issues such as TORs, Resettlement Action Plan (RAPs), EIA reviews, and evaluations, while the ROWB is accountable for registration of (Project Affected People) PAPs, establishment of compensation committees, assessment and establishment of compensation rates and payment of compensation.

The EMB and the ROWB provide the general direction for the planning of the expropriation/compensation tasks, ensure co-ordination in the mitigation of social impacts among sub-projects, monitor and document the implementation. Basic principles regarding resettlement/rehabilitation will be executed during the project preparation phase as that is the phase that defines most actions to be undertaken during project implementation.

The role of the EMB in ERA is not only to support road planning and implementation in general, but even more importantly, to see all individual road projects through the EIA review and environmental management process. This includes, screening and scoping with the

Environmental Protection Authority (EPA), writing TOR for the studies to be done, supervising EIA preparation, reviewing the results, ensuring that the needed contract specifications are written and incorporated into tender documents, monitoring during construction, participating in hand-over and performing operational phase evaluation.

The Environmental Management Branch would be responsible principally for but not limited to the following specified tasks:

- preparing and later revision and updating Environmental Guidelines for the ERA regarding environmental assessment for roads.
- providing liaison with EPA and EPU.
- collecting and analyzing field environmental and social data for road segments scheduled for new construction, rehabilitation/upgrading works.
- preparing or supervising the environmental and social assessment reports for the ERA.
- facilitating the integration of environmental concerns into all the road projects: road maintenance, rehabilitation and construction.
- monitoring contractors during construction activities.
- monitoring/evaluating post-construction activities of contractors.
- enhancing public awareness via consultations and other dissemination means at different levels and regions of the country.
- representing the ERA at national and regional environmental meetings.

ERA established the Environmental Management Branch (EMB) in January 1998. The scheme was originally presented in the RSDP. At present, the EMB has a staff of four people: Chief of the Branch, one ecologist, one hydrogeologist and one sociologist.

The practical problem concerning the capacity of the unit is not only the number of workers in duty but also the difficulty to keep the staff permanently employed. The tendency seems to be that the staff is difficult to keep due to low salaries. Despite ERA already had a salary reform, it still is a problem especially among experts of other than engineering discipline. A new salary reform is accepted by ERA management, but the implementation has not yet taken place, and until that the operations carried out by the EMB and the capacity is not on a sustainable ground.

The duties of the EMB are extensive in terms of the present staff of the Branch. It might be advisable to strengthen the unit on one or two experts to cope with all the tasks reasonably.

2.3.2. Rural Roads Authority

In FDRE there are nine (9) Rural Roads Authorities (RRAs), one in each Region. The road maintenance works of the RRAs are financed through the Ethiopian Road Fund established in 1997. The revenue sources of the fund are:

- Government budget
- Fuel levy
- Vehicle license renewal fee
- Overloading fine, and
- Other road tariffs which may be fixed as necessary

The fund is managed by the Board, in which there are a chairperson, 4 federal government representatives, 6 regional and municipality representatives and 4 private sector representatives.

Of the Road Fund's annual budget 70% is allocated to ERA, 20% to Regional Road Authorities and 10% to selected municipalities. The budget for the year 2000 was 250 million Birr, of which 48,500,000 Birr was allocated to Regional Road Authorities.

The share for each Region is calculated by criteria based on total road length (RR30 and RR50) and population size (the weights 80% and 20% respectively). The percentage for Tigray is 1.49% and for Afar 0.43%, and the budgets 3,606,856 Birr and 1,050,856 Birr respectively.

It is understood that much of the road maintenance work on Afar side close to Tigray is carried out by Tigray Regional Road Authority.

2.3.3. Environmental Protection Authority

In order to sustainably manage the resources of the country, the Environmental Protection Authority directly accountable to the Council of Ministers, was established by Proclamation 9/1995.

Among the powers and duties given to the EPA under the above Proclamation and pertinent to the objectives of these guidelines are:

- to prepare environmental protection policy and laws; and upon approval follow up their implementation;
- to prepare directives and systems necessary for evaluating the impact of social and economic development projects on the environment; monitor and supervise their implementation; and
- to prepare standards that help in the protection of soil, water and air as well as the biological systems they support, and follow up their implementation.

Thus, all project proponents and executing bodies (agencies) in the country should operate in close cooperation with the EPA to ensure that proper mitigating measures be designed and implemented especially for projects with an adverse effect on the environment. That is, an Environmental Impact Statement should be prepared by project proponents and be examined, commented and approved by the EPA.

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

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

At the regional level, the Federal EPA has devolved responsibility to the Regional equivalent to the EPA. The regional authorities should ideally establish an EPA-type institution to deal with environmental issues at the regional level. This is, however, a long-term objective. In the interim period the Regional Environmental Co-ordination Committee (RECC), which

comprise responsible officers from different sectoral Bureaus must take the responsibility at the Regional level.

Seeing as that the RECC's are not sectoral based they can be viewed as being independent of the outcome of a specific EIA. Due to competence and capacity limitations, the RECC may choose to designate a specific sectoral Bureau to take responsibility for an EIA process. The sectoral Bureau must not, however, have a vested interest in the outcome of the EIA process. This is particularly important where a sectoral agency houses the secretariat of the RECC. The Federal EPA should act in an advisory capacity to the Regional EPA-type organisations.

It is the responsibility of the regional EPA bodies to inform the Federal EPA of projects that may be of national significance. Therefore the Federal authority should only be involved in EIA processes where a proposed activity may:

- have an environmental effect across the international boundaries of Ethiopia,
- have an environmental effect across regional boundaries within Ethiopia,
- have an effect on an environment of national or international significance, including but not limited to natural forests, wetlands, national parks, cultural heritage sites etc
- have a Federal government department, the relevant regional authority or another statutory body as the proponent,
- have the Federal Investment Authority as the investment approval body

Alternatively Federal EPA may have an EIA referred if agreed to between the Federal authority and the regional authority. This would typically happen in complicated EIA's where the Regional authority feels that it does not have the capacity or competency to deal with the application.

2.4. Significant Non-Environmental Policies

2.4.1. Resettlement/Rehabilitation Policy Framework

Resettlement and rehabilitation are recognized civic rights in the Ethiopian legislation. Article 44 No.2 of the Constitution of the Federal Democratic Republic of Ethiopia states:

“All persons who have been displaced or whose livelihoods have been adversely affected as a result of state programs have the right to commensurate monetary or alternative means of compensation, including relocation with adequate state assistance.”

This is the basis for compensation procedures established by ERA, as well as for the legal framework for the present resettlement and rehabilitation policy framework. By signing the credit agreements for the RSDPSP and the RRP with IDA, The Federal Democratic Republic of Ethiopia committed itself to abide the involuntary resettlement policy of the World Bank. Thus, the legal framework of the RSDPSP is the Ethiopian constitution as transcended into ERA procedures, and the World Bank Operational Directive (OD) 4.30 on involuntary resettlement and its operational policy as explained in the resettlement and rehabilitation guidebook. As the implementing agency of the RSDPSP, RRP and of all sub-projects, ERA is the implementing agency of the resettlement and rehabilitation operations. Mitigation of adverse social impacts are therefore subject to ERA operational procedures in conjunction with the requirements of the Ethiopian Environmental Protection Authority (EPA); the World Bank policy requirements (on World Bank funded roads) and the potential requirements of multilateral and bilateral donors.

The Resettlement/Rehabilitation Policy Framework clarifies the principles of social impact mitigation in the process of addressing social impacts induced by project operations. It provides guidelines to stakeholders participating in the rehabilitation/resettlement operations to ensure that project affected persons (PAPs) will not be impoverished by the adverse social impacts. The basic principles imply that PAPs should be compensated for loss of assets at replacement costs; be given opportunities to share project benefits; and be assisted in case of relocation or resettlement. Focus is on restoring the income earning capacity of the affected persons by improving or at least sustaining the living conditions prior to project operations or to resettlement. In this respect, detailed designs of the sub-projects are to be carried out taking into account ways to reduce adverse social impacts. Each sub-project needs to provide a right of way report after mobilization including identification of houses to be relocated, land to be requested and the number of persons to be affected by operations.

The policy framework sufficiently places emphasis both on the compensation issues and the process required for the implementation of resettlement/displacement. During project identification, social screening/social impact assessment (SIA) needs to be conducted to determine whether or not a detailed resettlement action plan is required. If more than 200 persons are affected by a sub-project a resettlement action plan (RAP) needs to be prepared. Resettlement plans are to be considered as a development strategy rather than just as cash compensation, which alone is normally inadequate. Voluntary settlement may form part of a resettlement plan, provided measures to address the special circumstances of involuntary resettlers are included. Preference is expected to be given to land-based resettlement strategies for people dislocated from agricultural settings. If suitable land is unavailable, non-land-based strategies for creating employment or self-employment opportunities may be used. Where only a few people are to be relocated, appropriate compensation for assets, logistical support for moving, and a relocation grant may be the only requirements. In regard to involuntary resettlement there is also a need to estimate the capacity of the receiving area(s) to sustain additional population under the conditions introduced by the resettlement operations.

ERA uses two methods to conduct valuation of property for resettles: replacement cost and compensation. Replacement-cost approach is based on the premise that the costs of replacing productive assets that have been damaged because of project activities or improper on-site management can be measured. These costs are taken as a minimum estimate of the value of measures that will reduce the damage or improve on-site management practices and thereby prevent damage. Approach involves direct replacement of expropriated assets and covers an amount that is sufficient for asset replacement, net depreciation, moving expenses and other transaction costs. This minimum value is then compared to the cost of the new measures. Within the road sector, this is based on analyzing current construction costs relative to design, materials employed, workmanship and final finish of the subject properties. Compensation approach is based on the willingness of owners of a resource to give up their rights to that resource. In general, four questions will be addressed: what to compensate for (e.g. land, structures, business, fixed improvements or temporary impacts); how to compensate; when to compensate; and how much to compensate.

2.4.2. Interim Poverty Eradication Strategy

Poverty in Ethiopia is widespread and multifaceted. It is estimated that 45.5% of the population live below the poverty line. Poverty is prevalent both in urban and rural areas, with the coverage of 33% and 47% of the respective population. Since the rural areas account for about 85% of the population, poverty is primarily a rural phenomena. Thereby, all interventions should assess the impact also from the perspective of poverty eradication. Road network coverage and its share of total budget are considered as indicators of poverty.

The interim PRSP presents a broad picture of the poverty eradication strategy that Ethiopia has pursued in recent years and intends to elaborate in its preparation of a full fledged PRSP in the coming months. Ethiopia has been following a long-term strategy of Agricultural-

Development-Led Industrialization (ADLI) adopted in the mid-1990s. As ADLI envisages a growth process that is inherently poverty reducing, it is possible to assess the nexus between policies and programmes and reduction of poverty. Paper also indicates the targets accepted for the reduction of poverty by the year 2015. It draws on:

- the strategy of ADLI
- decentralization and empowerment
- judiciary and civil service reform
- institutional capacity building in public and private sectors.

In the interim strategy the components of welfare and intermediate/outcome indicators are specified as follows:

| Components of Welfare | Intermediate/Outcome Indicators |
|------------------------|---|
| Poverty and Inequality | Poverty headcount Poverty gap Average income |
| Food security | Percentage of farmers covered by extension program Yield for major food crops Agriculture share of total budget Food consumption variability |
| Health | Infant mortality rate Under 5 child mortality rate Maternal Mortality Rate Access to health services Immunization of children Health share of total budget |
| Education | Gross enrolment ratio Repetition rates Ratio of female to male students Number of primary schools Primary school drop out rate Education share of total budget |
| Clear water supply | Access to clean water Clean water share of total budget |
| Road | Road network coverage Road share of total budget |

2.4.3. HIV/AIDS Policy

The problem of infectious diseases in Ethiopia is becoming critical due to the steady emergence of the HIV/AIDS that has been spreading fast during the last two decades (Health Policy, 1998). It is estimated that 9.3% of the Ethiopian population is infected with HIV/AIDS and 250,000 have died of the disease in 1997 alone (UNAIDS, 1998). A substantial health crisis may emerge in the country, unless an integrated effort to stop the spread of the epidemic is enforced. Having understood the magnitude of the problem as well as the huge resource needed to combat HIV/AIDS, the Ethiopian Government issued a policy, which calls for an integrated effort of multi-sectoral response to control the epidemic. The Ethiopian Government's HIV/AIDS policy urges communities at large, including government ministries, local governments and the civil society to assume responsibility for carrying out HIV/AIDS awareness and prevention campaigns. In line with this policy, ERA has taken the initiative to develop and implement an HIV/AIDS awareness and prevention strategy for the road sector. The strategy will comprise three phases:

- (a) An awareness and prevention campaign for ERA headquarters staff (966 persons – 732 males and 234 females) in Addis Ababa;
- (b) An awareness and prevention campaign for ERA districts staff and projects (15,000 persons);
- (c) The continuation and consolidation of awareness and prevention campaign for domestic and international contractors.

The overall objective of ERA’s HIV/AIDS awareness and prevention strategy is to contribute to reducing HIV/AIDS incidents in the transport sector. This will not only contribute to strengthening national efforts to halt the epidemic but also support international initiatives to stop the spread of the disease. Operational objectives are to:

- promote continuous sectoral, gender related information, education and communication (IEC) messages about HIV/AIDS infections, protection, counseling and care;
- support capacity building needs of ERA’s medical branch in addressing HIV/AIDS;
- increase availability and accessibility of condoms;
- establish a sectoral policy that will safeguard human and civic rights and avoid discrimination of ERA staff who are infected by HIV/AIDS;
- contribute to the national efforts in establishing indicators that will ensure effective monitoring and evaluation.

Each sub-project of the RSDPSP is a subject of the HIV/AIDS strategy.

2.5 World Bank Operational Directive (Od) 4.30

Involuntary Resettlement

Introduction

1. This directive describes
 - bank policy and procedures on involuntary resettlement, as well as the conditions that borrowers are expected to meet in operation involving involuntary resettlement
 - planning and financing resettlement components or free-standing projects are an integral part of preparation for projects that cause involuntary displacement.
 - Any operation that involves land acquisition or is a category A or B project resettlement requirements early in the project cycle (para,20)
2. Development projects that displaced people involuntary generally give rise to severe economic, social, and environmental problems: production systems are dismantled; productive assets and income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community structures and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished. Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out.

Policy objectives

The objectives of the Banks resettlement policy is to ensure that the population displaced by a project receives benefits from it. Involuntary resettlement is an integral part of the project design and should be dealt with from the earliest stages of project (para, 28) taking into account the following policy considerations:

- (a) Involuntary resettlement should be avoided or minimized where feasible, exploring all viable alternative project designs. For example, realignment of roads or reductions in dam height may significantly reduce resettlement needs.
- (b) Where displacement is unavoidable, resettlement plans should be developed. All involuntary resettlement should be conceived and executed as development programs, with resettlers provided sufficient investment resources and opportunities to share in project benefits. Displaced persons should be (i) Compensated for their losses at full replacement cost prior to the actual move;(ii) assisted with the move and supported during the transition period in the resettlement site; and(iii) assisted in their efforts to improve their former living standards, income earning capacity, and production levels or at least to restore them. Particular attention should be paid to the needs of the poorest groups to be resettled.
- (c) Community participation in planning and implementing resettlement should be encouraged. Appropriate partners of social organization should be established, and existing social and cultural institutions of resettlers and their hosts should be supported and used to the greatest extent possible.
- (d) Resettlers should be integrated socially and economically into host communities so that adverse impacts on host communities are minimized. The best way of achieving this integration is for resettlement to be planned in areas benefiting from the project and through consultation with the future hosts.
- (e) Land, housing, infrastructure, and other compensation should be provided to the adversely affected population, indigenous groups ethnic minorities, and pastoralists who may have usufruct or customary rights to the land or other resources taken for the project. The absence of legal title to land by such groups should not be a bar to compensation.

3. PROJECT DESCRIPTION

3.1. Purpose and Background of the Road Project

The Government of the Federal Democratic Republic of Ethiopia (GoE) formulated the Road Sector Development Programme (RSDP) covering the period 1997-2007. In January 1996, the Programme was submitted to a donors' conference in which the donor community responded by pledging some US\$ 1.1 billion for the implementation of the Programme.

The NDF credit is part of the above donor support and includes financing of the Yalo-Dalol Road Project, i.e. Feasibility Study, Environmental Impact Assessment (EIA) and Detailed Engineering Design and Tender Document Preparation. It is expected that the International Development Association (IDA) will support the actual construction provided the road is found feasible.

One of the most important development objective of the road is to promote agricultural potential in the Afar region and to provide intra regional links between the important market places in eastern and northern Afar Region. In addition, the Project Road is part of some 400-500 km new road connecting Kasamander on the Dese-Mille Link Road in the south to Dalol near the Ethiopia-Eritrea Border in the north. The region is believed to have mineral deposits, primarily gold, marble and base metals. The desire is to open the area to exploration and subsequent resource extraction.

The project area is divided into two parts by a mountain range up to 30 km wide in south-north direction. Permanent habitation with water and farming is found west of the mountain range while nomadic Afars with cattle live east of the range. There is limited potential for living on the mountains.

The three woreda headquarters of the project area on the Afar side are Yalo, Leilé (Megale) and Ab-Ala. Leilé is located on the mountains. The three woreda headquarters on Tigray side falling within the project area are Raya Azebo, Hintalo-Wajirat and Enderta. The existing roads and tracks are concentrated more in the west of the mountain range. There are trails in east-west direction connecting areas on both side of the mountain range.

The first discussions with the authorities can be summarized as: the opinion of the regional authorities in Asaita is that the road should be located in Afar Region throughout its whole length for the reason that the road is included in Afar Region's 5-year plan. In Mekele the regional authorities support the idea of the road being constructed to Afar side, because they see that there is no need for a parallel road to the main road which is relatively close to the project area.

3.2 Route Alternatives

The Consultant has conducted extensive field investigations and public consultation in the two regions and at zonal and woreda headquarters as well as carried out a detailed survey of the existing roads in the project area. The consultations and the survey have brought additional light to the question of route alternatives. Thus, the Consultant has redefined the initially presented route alternatives between Yalo and Ab-Ala. One of these redefined alternatives (A) is located west of the mountain range, one (B) crosses the mountain range and one (C) is located east of the mountains. The alternative routes have been presented in the attached Map 2.2 and are described below.

Alternative A

This alternative, located partly in Afar Region, partly in Tigray Region, uses the existing road links wherever possible. The route follows the existing Yalo – Bala Junction road till Addis Ketema, then turns to Weira Wuha, taking a shortcut new road passing Bala Junction; from Weira Wuha the alignment follows the existing Bala Junction – Mehoni road via Siblalu River to Mehoni. From Mehoni the alignment follows the existing Mehoni – Ago River road link close to Ago River. The route then is aligned east across the terrain to the track road connecting Ab Ala and Leilé and connects

to that track somewhat south of Gela – Iso. From there, the alignment follows the Ab Ala – Leilé track road all the way to Ab Ala, utilising the same alignment as alternative B. The road length is 149 km.

Alternative B

This alternative, located entirely within Afar Region, follows earth surfaced trail from Yalo to Diminum village traversing a mostly flat terrain, utilising the dry wadi banks. From Yalo it follows the route of Alternative C for some 20 km and (by turning left) runs along Bubuysi River for about 20 km following a flat terrain. The alignment from Diminum village then follows a seldom used and hardly passable trail across a mountainous stretch of app. 30 km to Leilé. Then it climbs the mountain range for some 25 km up to Leilé, capital of Megale Woreda. From Leilé it runs northerly direction and joins the route of the Alternative A after some 30 km; then it totally follows this route for some 50 km and terminates at Ab-Ala. The road length 138 km.

Alternative C

This alternative, also located entirely within the Afar Region is located mostly east of the mountain range. It continues from the end of TCDE design (km 199+000) and follows the flat to rolling terrain on the eastern side of the mountains and connects in the north with Ab-Ala – Afdera Road. The section between this junction and Ab-Ala is considered part of the project in order to make the alternatives compatible and to fulfil the requirements of the proposed objective, i.e. that the road has to connect Yalo with Ab-Ala. This section is mountainous. The road length is 168 km.

3.3. Type and Extent of the Road Project

The road construction is planned to be funded by IDA. Thus, a contractor will be appointed through a standard tender/ bidding process, which rarely specifies the exact work methodology, borrow pit locations, source of labour etc. to be applied for the project.

Consequently, it is impossible at present to describe the exact work methodology and approach, the exact locations from where material will be extracted, the composition of the labor force etc. It is up to the Contractor to propose solutions for these parameters, again within the general framework of the tender documents.

Depending on the alternative, the expected types of road construction works will vary significantly from section to section, ranging from rehabilitation/upgrading the existing road to construction of a new road. Furthermore, different activities of the works may vary in extent and number throughout the alignment.

When assessing the environmental impacts, following activities are expected to take place (the width of the gravel road is expected to be 6.0 m):

Rehabilitation/Upgrading

- Grading and re-shaping of the road profile
- Improvement of the subgrade and subbase (in places)
- Regravelling of entire road with sub-base and wearing course material
- Repairs/replacement of existing culverts
- Construction of new culverts
- Erosion protection, where needed.

Construction

- Clearing of a corridor
- Earthworks to provide a reasonable alignment. The quantities vary depending on the type of the terrain (extent growing from flat to mountainous terrain)
- Construction of subgrade (shaping and compaction of earth base)
- Improvement of subgrade (in places), by adding selected material
- Construction of culverts
- Construction of structures for river crossings (Irish crossings and fords)
- Placing and compaction of sub-base and wearing course material
- Erosion protection.

4. APPROACH AND METHODOLOGY

4.1. General

The primary purpose of conducting an Environmental Impact Assessment (EIA) is to ensure that the environmental effects of proposed activities are adequately and appropriately considered before decisions are taken. Thus, EIA is aiming at improving decision making and ensuring that the proposed intervention is environmentally sustainable. Furthermore, environmental assessment of development projects aims at ensuring that investments achieve intended benefits.

EIA complements the detailed engineering, economic and environmental studies where options are examined for constructing a new road alignment between Yalo and Ab-Ala. These studies together lead to the detailed engineering design and tender document preparation.

The objective of the EIA is to ensure that the most feasible road alignment will be selected; negative environmental and social impacts will be mitigated and positive strengthened; impacts will be monitored and that collaboration between partners at different levels takes place and/or is institutionalised.

The first significant decision, the selection of the alternative to be subject to more detailed environmental study and after that detailed engineering design, is made on the basis of this Preliminary Draft Findings Report. The principle is that the environmental and social issues are considered together with the technical and economical when selecting the most feasible alternative. The environmental impacts are presented as a relative change compared to the existing situation, and the impacts are not put into monetary values.

The alternatives are compared to each other and to the zero-alternative, which means the alternative that nothing is done concerning the road connection. The analytical method in comparing the alternatives means that the impacts connected to each alternative are not weighed with regard to each other, and thus, they should not be counted up but treated and considered independently.

4.2. Environmental Study

The Consultant has reviewed all the essential documents, interviewed different organizations and authorities, assessed the typical practices of environmental management of road projects in Ethiopia and assessed the capabilities of the organizations in fulfilling their duties in the environmental management. Besides opinions also some data about the road environment has been obtained in the meetings. All information and understanding is exploited when completing the EIA and especially when compiling the Environmental Management and Monitoring Plans for the Project.

Primary data particularly on physical environment, ecological aspects, and cultural and historical resources were collected by carrying out field investigation throughout the proposed road. This survey has helped to update the secondary data and assumptions used during the preparation of the Preliminary Findings Report, as well as to obtain additional data.

Secondary data analysis comprising the existing documentation has been used for assessing the relevant national environmental policies, laws and regulations as well as significant non-environmental laws and policies related to the expected environmental and social impacts of the intervention. Several guidelines (prepared by EPA and ERA) concerning EIA have been reviewed and the instructions and processes pictured in those documents have been discussed in the negotiations with various authorities.

The checklist for preliminary scoping of different impacts likely to result from the road project was prepared at very early stage of the project to guide the assessment work. In the preliminary scoping, all potential (positive and negative) impacts were identified. This scoping was intended to help focus on the essentials in data collection, during field trips and in interviewing different authorities,

stakeholders and individuals. The checklist has been continuously updated and adjusted whenever new information was gained about the environment or the road itself. The checklist for scoping is presented in Appendix 1.

For the Draft Final EIA Report the following sources of data has been utilized:

- Site visits to all parts of the proposed road
- Studies of topographical maps 1:250.000
- Studies of topographical maps 1:50.000
- Studies of aerial photos
- Studies of Satellite images and contours from Radar Satellite data covering the middle part of the project area for which both 1:50,000 maps and aerial photographs are lacking
- Reviews of previous studies including those given in the list of references
- Interviews with local and regional authorities
- Interview with the ERA Environmental Monitoring Branch (EMB)
- Interviews with the RRAs in Mekele and Asaita.

4.3. Human and Social Study

Data collected and analyzed so far for the assessment of the social impact is the secondary data from the governmental federal and regional sources, and primary data collected during the public consultation process at the federal, regional and zonal levels. Secondary data has been analyzed to provide a socio-economic profile of the study area. Since no specific alignment for the road construction has been selected yet, the study area is considered as two regions, and the zones and woredas within the regions affected by the alternative alignments. Analysis is undertaken at these levels, since at this stage the affected kebeles/farmers' associations have not been identified. However, within the woredas there are larger towns/settlements that are potential places where the alignment will be located. These settlements are included in the assessment as much as the information available permits.

Secondary data collected at the federal level includes mainly materials produced by the Central Statistics Authority. Regional secondary data collected includes region specific studies in various topics and other available data from the regional authorities. Secondary data analysis provides information mainly on the demography, forms of livelihood, access to social services (health centers, schools) and markets, employment opportunities, variation within production systems, education profile and infrastructure and health profile and infrastructure.

As the first step public consultations concentrated on the Government institutions (ministries, bureaux, departments, offices) at different levels and selected NGOs. Public consultations were undertaken at the federal level with EPA, ERA and Ministry of Economic Development and Cooperation (MEDAC), and at the regional level in both Afar and Tigray Regions and in Ab-Ala, Zone 2, in Afar Region. In addition, discussions with the Zone 4 representatives of the Afar Region were held together with the Afar Region regional authorities.

In Tigray Region the key authorities consulted were:

- Regional Administration;
- Bureau of Planning and Economic Development;
- Rural Roads Authority; and
- Bureau of Agriculture and Natural Resources

In Afar Region, the key authorities consulted were:

- Regional Administration;
- Bureau of Planning and Economic Development;
- Afar Rural Roads Authority;
- Bureau of Agriculture;
- Bureau of Health; and
- Executive Committee Members of Zone 2 and 4

Purpose of the discussions was to involve them in the decision-making on the proposed intervention. Main emphasis of the discussions was in identifying the relevant partners and assessing their commitment/interest in the consultation process and regarding the intervention. Possible conflicts between the needs and interests of the developer and the public were assessed.

5. DESCRIPTION OF EXISTING CONDITIONS

Note: The complete environmental descriptions of all the alternatives are included in the Report on Study Findings of EIA. In this report all the descriptions are not repeated, but rather concentrated on the recommended alternative B. However, the Comparison of the Alternatives (Chapter 8 in this report) includes, of course, the relevant summarised information of the impacts of all the alternatives, including the alternative zero.

5.1 Physical Environment

5.1.1 Topography and Relief

Topography

Ethiopia is a country of great geographical diversity with high and rugged mountains, flat-topped plateaus, deep gorges, incised river valleys and rolling plains. Over the ages, erosion, volcanic eruptions, tectonic movements and subsidence have occurred and continued through millennia to accentuate the unevenness of the surface.

Altitudes range from the highest peak at Ras Dejen, 4620 meter above sea level (masl), down to the Afar Depression, about 110 meter below sea level (mbsl). Most of the country consists of high plateau and mountain ranges with precipitous edges dissected by the numerous streams, which are the tributaries of the major rivers such as the Abay (Blue Nile), Tekeze, Awash, Omo, Wabe-Shebele, Baro-Akobo, etc. Since the country is located within the tropics, physical conditions and variations in altitude have resulted in a great diversity of climate, soil and vegetation.

The geomorphologic set up of the route corridor is quite complex. It generally passes through the foot of the western escarpment, which separates the rift valley and highlands. The proposed alignment initially runs through a flat plain in the south and traverses a mountain range in the middle and a rolling and flat terrain in the north.

The Route mostly passes through a fairly flat to undulating terrain, and crosses generally two mountainous and hilly areas. It goes through a flat and rolling terrain for about 40 km within altitude range of about 750 to 950 masl and climbs a mountainous terrain for some 25 km up to Leilé (Megale), rising to about 1600 masl altitude. From Leilé it passes through a rolling and flat landscape for about 63 km and crosses a mountainous/hilly area for some 8 km and finally follows a dominantly flat terrain up to Ab-Ala for about 12 km.

Relief

The Ethiopian relief includes a range of altitudes stretching from below sea level to nearly 4600m above sea level. Within these extremes, about 50% of the land surface is above the 1500m counter line. Traditional descriptions of the landscape (which are also associated with the broader classification into ecological zones) define as *Wurch* (the coldest highlands above 3500 meters), *Dega* (the cool highlands above 2500 meters), *Woyna-Dega* (warm lands between 1500 and 2500 meters), *Kolla* (the hot and relatively low lying lands below 1500 meters) and *Haroor* (the hottest lowlands below 500 meters) (Ethiopian Mapping Authority, 1988).

Most parts of the Route A and Route B lie in the *Kolla* zone, and some parts (particularly that of Route A) in the *Woyna-Dega* zone, while Route C totally lies in *Kolla* zone. The altitude of the Route A and Route B corridor range from about 900 masl (around Yalo) to about 1800 masl (around Weyra Wuha and Mehoni), while that of Route C is below 1000m except the northern section of the alignment, which has a maximum elevation upto 1600 masl.

5.1.2 Drainage and River Basins

Ethiopia is naturally endowed with rivers of considerable number and size. The major rivers flow beyond the boundaries of the country carrying not only water, but also valuable soil.

Most parts of Ethiopia are drained by major rivers flowing eventually into the ocean. Thus the western parts of the country are drained by major rivers like the Abay, Baro and Tekeze; and also the south-eastern region is drained by the Wabe-Shebele and the Genale. Endoreic drainage is characteristic of the rift valley region. Rivers draining these areas have no outlet to the sea. The major river in this area of internal drainage is the Awash, and there are also several smaller rivers (Meki, Catar, Bilate, etc.) discharging into the lakes (in the Lakes Basin).

The direction of flow of major rivers is guided by the general relief slope of the land. The north-western highlands and their associated lowlands are generally inclined westward and thus drain towards the Mediterranean. The south-eastern highlands and their associated lowlands drain towards the Indian Ocean. The Ethiopian rift valley forms a series of closed drainage basins.

Around the proposed project, due to the steep topography of the western escarpment, bordered by high altitude plateau, the terrain is extremely incised by many streams, which drain to the closed Danakil Depression drainage system. The drainage pattern is dendritic. The rivers disappear in the alluvial and lacustrine deposits of the vast plains of the Danakil Depression. Due to the high rainfall of the adjacent highlands, the streams are characterized by high discharges during rainy season. In the Raya valley and wide Afar plains they form exceptionally wide river channels, locally braided. Most of these wide river courses are characterized by shallow groundwater.

There are three major rivers draining the project area, namely Yalo/Agete, Ago and Deknigolo/Subala. Yalo is located in the south, Ago in the central part and Deknigolo in the northern part. As Yalo River is located to the south of Yalo town (but close to) and flows east, the alignment does not cross the river. The route crosses Ago River nearly in its central part, and intercepts Deknigolo near to Ab-Ala. There are also numerous seasonal and ephemeral streams, which are intercepted by the alignment. The alignment intercepts about six major seasonal streams between Yalo and Megale and about fifteen major streams between Megale and Ab-Ala.

5.1.3 Climate

Climatic conditions in Ethiopia are determined mostly by altitude. The highlands have a mean annual temperature of 16°C while the lowlands are usually around 31°C. There are two rainy seasons. The 'small rains' are in March-April while the main rainy season is from June to September. The highest mean annual rainfall (over 2700 mm) is in the southwestern highlands, and that it gradually decreases north to less than 200 mm, northeast to less than 100 mm and southeast to less than 200 mm.

Owing to large topographic differences, the climate of the region is highly variable, ranging from sub-humid to arid. As revealed from the Food and Agricultural Organizations of the United Nations (FAO, 1995) comprehensive agricultural and environmental data base for the member States of the Intergovernmental Authority on Drought and Development (IGADD), two representative administrative areas are chosen to show the climatic condition of the area: Rayana Azebo and West Shehetna Didigsala. The former may represent much of the route corridors of A and B. The later zone is similar to most of the area in route C. The long-term mean monthly rainfall and potential evapotranspiration (PET) of the two representative areas are represented in Table 5.1 and Chart 5.1.

Table 5.1: Mean Monthly Rainfall and Potential Evapotranspiration (PET) of the Rayana Azebo and West Shehetna Didigsala Areas

| Month | Rayana Azebo | | W-Shehetna Didigsala | |
|-----------|---------------|----------|----------------------|----------|
| | Rainfall (mm) | PET (mm) | Rainfall (mm) | PET (mm) |
| January | 18 | 106 | 4 | 128 |
| February | 26 | 114 | 6 | 140 |
| March | 112 | 146 | 30 | 178 |
| April | 68 | 150 | 20 | 188 |
| May | 30 | 164 | 8 | 210 |
| June | 10 | 156 | 4 | 206 |
| July | 134 | 132 | 30 | 168 |
| August | 130 | 124 | 22 | 156 |
| September | 30 | 130 | 16 | 166 |
| October | 12 | 136 | 2 | 168 |
| November | 14 | 108 | 2 | 130 |
| December | 18 | 100 | 4 | 118 |

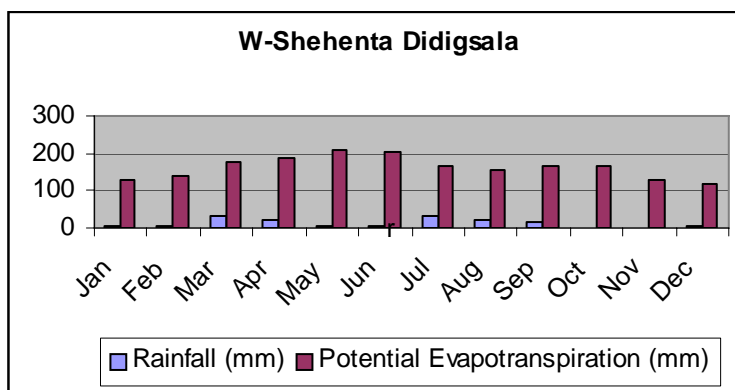
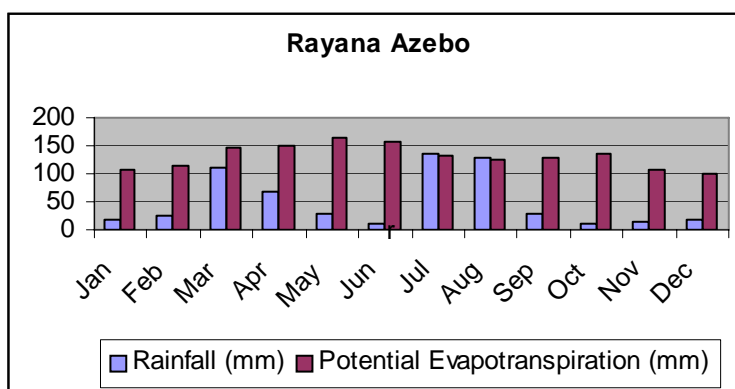


Chart 5.1 Mean Monthly Rainfall and Potential Evapotranspiration (PET) of the Rayana Azebo West Shehetna Didigsala Areas

For the eastern Rayana Azebo area the annual mean rainfall and potential evapotranspiration is 602 and 1,566 mm respectively. The mean annual, the highest mean and the lowest mean temperature is 24.1, 27.2 and 17 °C respectively. For the west Shehetna Didigsala area the annual mean rainfall and potential evapotranspiration is 148 and 1950 mm respectively. The mean annual, the highest mean and the lowest mean temperature is 27.2, 27.9 and 24.5 °C respectively.

On long-term basis, practically the region has rainfall in all the 12 months. It has bimodal rainfall pattern. The mean annual rainfall is by far lower than the potential evapotranspiration.

Much of the water resources of the region depend on the high rainfall in the adjacent northeastern highlands of northern Wollo and eastern Tigray.

The route corridor is generally a semi-arid environment characterized by a low rainfall and high temperatures. As a result drought tolerant vegetation, mostly shorter trees and shrubs, characterized by small deciduous leaves or leathery persistent ones are growing in the area. Mostly the size of the vegetation is shorter and its density is open, even scarce in some areas.

5.1.4 Geology

Regional Geology

The eruption of voluminous fissural and central type volcanics during the Cenozoic is the most important geological event in the plateau and the rift valley of Ethiopia. The Tertiary and Quaternary volcanic rocks cover very wide area. The volcanites of Tertiary, known as the *Trap Series*, overlie the Mesozoic sedimentary rocks in many places including the study area. They are highly weathered and form thick residual soils.

In Ethiopian volcanic terrain the stratigraphy of the Cenozoic from the oldest to the youngest forms the following rock units.

1. *Ashangi Group* - consists of basaltic lava flow with interbedded pyroclastics, ignimbrite and rhyolite. The top most part of the group is tuffaceous, contains lacustrine deposits in places including lignite seams and acidic volcanics. Differently oriented dolerite sills, acidic dikes and other intrusions are common.
2. *Shield Group* - consists mainly amigdaloidal basalts and rhyolites. They are exposed mainly in northern and western Ethiopia. Most of the big mountains of the country belong to this group.
3. *Maqdala Group* - They are abundant within the Ethiopian rift and on the adjoining plateaux. It consists of tuffs, ignimbrites, rhyolites and trachytes. They are interbedded with lavas and agglomerates of basaltic composition.
4. *Aden Volcanic Series* - They are the youngest Quaternary volcanics. The rocks of this series are obsidian flows, ignimbrite, pumice deposits associated with rhyolitic flows and domes, pyroclastic surge deposits, basaltic lava flows and spatter cones. This series is almost all exposed in parts of the Ethiopian Rift and is intensively affected by faulting.

Partially overlying the *Trap Series* of the Ethiopian plateau, located mainly along the central and southern margins of the rift, more acidic lavas, such as rhyolites, trachytes, trachybasalts, etc. are present together with tuffs, ignimbrites, agglomerates, interbedded basaltic flows and reworked paleosols. Fissural basaltic lava flows, silicic domes and lavas and thick pyroclastic deposits constitute the main petrographic units of the rift floor and the Afar lowlands.

Geology of the Project Area

The region along the four alternative routes has very complex geology both from lithological and structural point of view. As one goes from south to north the lithology changes from the complex basic and acidic volcanic rocks of the Tertiary Trap Series to the Mesozoic sedimentary sequences in Shehit areas with various types of granitic intrusions and recent sediments. From west to east the volcanics changes from the Trap series volcanics to the younger Aden volcanic series. These rocks are extremely faulted. These faults are even visible on Quaternary and recent alluvial deposits, signifying the active seismicity of the region.

The broad description of the stratigraphy of the region is given below (from the youngest to the oldest).

- I. *Quaternary and Pleistocene Deposits*: These are various generations of Quaternary and recent undifferentiated sediments, mostly covering the foot of major volcanic ranges, the Raya valley and most of the Afar Plains (especially along route C). Some of these major deposits are:
 - The Quaternary deposits include alluvial and lacustrine deposits (Q and Qh): sand silt, clay, diatomite, limestone and beach sand associated with various generations of volcanoclastic alluvial and colluvial deposits.
 - The Pleistocene deposits (Qp) are alluvial, lacustrine and marine sediments: conglomerate, sand clay, reef, limestone, marl and gypsum.
- II. *Quaternary volcanic centers (Qr)* - rhyolitic volcanic centers, obsidian pitchstone, pumice, ignimbrite, tuff and subordinate trachytic flows. These are patches existing in the northern end of the project area.
- III. *Dalaha Formation (Ndb, Late Miocene)*- fissural basalts with some intercalated detrital and lacustrine sediments, with rhyolitic flows and ignimbrites. These volcanic units cover the edges of routes B and C.
- IV. *Mabla and Arba Guracha Formation (Nmr, Middle Miocene)*: rhyolitic domes, flows and pyroclastic rocks of dominantly peralkaline composition with subordinate trachyte and basalt flows interstratified at the base. These are patches in the plains and highlands.
- V. *Mesozoic sedimentary rocks*: These are thick sequence of sedimentary rocks, which covers most of the Tigray Highlands and adjacent escarpment. In the project area they exist only around Shehit. These rocks include:
 - Agula Formation (Kimmeridgian) shale, marl and limestone
 - Antalo limestones
 - Adigrat Formation (Ja)- Triassic –Middle Jurassic sandstone
- VI. *Shiraro Formation (Pr_{2b}, Late Proterozoic)* - sandstone and conglomerate. They exist in limited area in the northern end of the project area.
- VII. *Post-tectonic granite and syenite (Gt₄)* Precambrian and Phanerozoic intrusive.

The geological structure of the region is associated with the rift tectonics and older pre-Tertiary tectonism. The most spectacular fault system is aligned along the major axis of the rift. The Afar Depression is a triple junction, where three rifts meet. This geological condition resulted in three different sets of faults trending NE-SW, N-S and NW-SE. The geomorphological setup of the region is strongly controlled by these structures and different generations of fissural and central type of eruptions. These structures also govern the flow directions and occurrence of groundwater.

5.1.5 Hydrogeology

As the region is rainfall deficit area (the annual rainfall is less than the evapotranspiration), the water supply for different purposes is dependent mainly on groundwater and seasonal ponds and running water in wadies and ephemeral streams. The groundwater comes mostly from shallow hand dug wells, dug along low-lying areas and the courses of seasonal rivers.

Along the western escarpment and the foots of major volcanic ranges, springs play very important role in the lives of millions of people. These springs originate from fractured volcanic rocks (fault-controlled) and from alluvial fans and local intercalations of alluvial-

colluvial deposits. Many of the productive wells abstract water from the thick alluvial and colluvial deposits in low-lying areas. A typical example of this is the many-drilled wells of the Raya valley, close to the southern end of the project area. Along the route corridors of A and B, such formations are expected to be the major groundwater sources.

Along the alternative route C, the possibility of getting sustainable groundwater resources is remote. Deep groundwater may exist in the alluvial and colluvial deposits. This requires detailed hydrogeological investigation, as the region is homogeneous in terms of hydrogeological regime. Structurally controlled groundwater from the highly fractured volcanics may be expected to exist from the Aden volcanic Series (route B) and the Trap Series (routes A and B).

According to the Hydrogeological map of Ethiopia (Tesfaye Chernet, 1988), at the scale of 1:2000000, the following hydrogeological description can be given.

The ultimate recharge to the groundwater of the region comes from the highland rainfall. The annual recharge in these areas may range from 50 to 150 mm. In the project area the direct annual recharge from rainfall is by far lower than 50 mm.

From groundwater productivity point of view the area can be categorized into two: Moderate productivity (routes A and B) and low productivity (route C). In the first case the specific capacity ranges from 0.02 to 13.2 liters per second and the range of optimum yield is 0.45 to 9.9 liters per second. In low productive areas the specific capacity and the optimum yield range is 0.001-3.4 and 0.05-4.5 liters per second respectively. The productivity of the wells is highly variable mainly owing to variations in the geologic structures.

Most of the springs and rivers are structurally controlled. In the volcanic terrain primary permeability is much less than secondary permeability due to extreme fracturing.

The chemical quality of the groundwater is highly variable. The Total Dissolved Solids (TDS) ranges from 500 to 1,500 mg in the moderate productive areas and 1,500 to 3,000 ppm in the low productive areas. The water is dominantly sodium bicarbonate type. It tends to be more rich in sulfate and chloride towards the Danakil Depression.

5.1.6 Soils and Erosion

The major soil types of Ethiopia are xerols, lithosols, cambisols, fluvisols, regosols and lithosols. The major characteristic of the country's soils are that with the exception of cambisols and lithosols, all the others are products of volcanic parent materials with good workability and drainage as well as adequate soil depth. Vertisols, though fertile, are difficult to handle as they harden out during dry periods and become sticky during wet periods.

The soils of the rift valley escarpment consist of leptosols, cambisols and light vertic soils. The soils are mostly deep but eroded with leached nutrients. Thus, soils in this area require annual amelioration and intensive soil and water conservation scheme.

The major soil types of the project area are eutric fluvisols, eutric cambisols and lithosols. Fluvisols are young soils developed in recent alluvial deposits of river plains that are generally good agricultural soils and often intensively used, while lithosols are shallow soils that are usually less than 10cm deep.

Soil erosion is prominent along some sections of the alignment. In particular it is significant in the Section Km about 80 to Km 100, i.e. at 25 to 35 km north of Megale where there are many gullies intercepting the existing truck. Most of the waterways are characterized by wider river courses formed by concentrated runoff draining from the western escarpment or mountain areas. The river abutments are eroded and silts, gravels and boulders deposited in the courses.

5.2. Natural Environment

5.2.1 Vegetation and Flora

The vegetation of Ethiopia is very heterogeneous mainly due to topographic and climatic diversity. The various vegetation types of the country have been grouped into nine major categories (see Figure 5.1). These include Desert and Semi-Desert Scrubland, Acacia-Commiphora Woodland, Lowland Semi-Evergreen Forest, Combretum-Terminalia Woodland, Moist Evergreen Forest, Evergreen Scrub, Dry Evergreen Montane Forest and Montane Grassland, Afroalpine and Sub-afroalpine Vegetation, and Riparian and Swamp Vegetation. The country's flora is estimated to contain between 6500 and 7000 species of higher plants, of which about 12 percent are believed to be endemic (T.B. Gebre Egziabher, 1991 cited in Ethiopia - UNCED National Report, 1992). The semi-arid and arid region of Ogaden (southeast Ethiopia) is the most species rich region characterized by a high diversity in Acacia, Commiphora and Boswellia species and contains about 25% of the country's flora (Vollesen, 1986 cited in Ethiopia-UNCED National Report, 1992). Endemism is particularly high in the mountains, the Ogaden and the forests of the southwest.

According to the above general classification, the vegetation of the project area is categorized as *Acacia-Commiphora* Woodland. It dominantly comprises small trees and shrubs that are adapted to tolerate droughts (moisture stress and high temperatures) by having either small deciduous leaves or leathery persistent ones. Its floristic composition is dominated by *Acacia* species, with two species - *Acacia mellifera* and *A. oerfota* - highly dominant in most part of the project area. Other characteristic species include *A. nilotica*, *A. tortilis*, *A. senegal*, *A. etbaica*, *Balanites* spp., *Salvadora persica*, *Commiphora* spp., *Sterculia rhynchocarpa*, *Grewia* spp., *Delonix elata*, *Dobera glabra* and *Ziziphus spina-christi*. The understorey is a combination of suffrutescents and grasses.

Relatively dense vegetation comprising larger trees and shrubs (mostly with evergreen leaves) are found along the waterways (seasonal rivers & streams), which is related to better availability of water (due to shallow groundwater in the river courses) and better soil (alluvial) that enhance vegetation growth. The characteristic species include *Acacia* spp. (mainly *A. nilotica* & *A. tortilis*), *Tamarindus indica*, *Balanites* spp., and *Ziziphus spina-christi*.

There is also a diverse grass species particularly on the slopes of hilly and mountainous areas. The major species identified from the area belong to the genera *Cenchrus*, *Danthoniopsis*, *Aristida*, *Digitaria*, *Dinebra*, *Eragrostis*, *Cynodon*, *Coelachyrum*, *Andropogon*, *Brachiaria*, *Chrysopogon*, *Cymbopogon*, *Panicum* and *Setaria*. The detail list of plant species identified from the project area is given in Table 5.2. Table 5.3 provides list of Some Threatened Endemic Plant Species of Ethiopia, particularly for the *Acacia-Commiphora* Woodland Vegetation Type.

The vegetation of the project area is heavily grazed or browsed by livestock, which is the backbone of livelihood for the pastoral people. The most utilized tree or shrub is *Acacia mellifera*, which is heavily browsed particularly by camels. The Afar people tend to conserve the natural vegetation because they understand that it is the only source of their animals feed and because of its essential role in maintaining the climate and ecology. However, the vegetation in the areas close to major settlement centers particularly Ab-Ala and boundary of Tigray is deforested mainly by non-Afar people for the supply of fuel wood and charcoal to Ab-Ala, Mekele and other settlement centers including the nearby rural villages.

More detail description of the vegetation of the project area (along Alternative B) is given by section as follows:

St. 0+000 (Yalo) - St. 24+000 (Bubuysu R.): The corridor of this section is mostly covered by dense Acacia bush and shrub on a flatter topography at the foot of a mountain range to the west (on left side) of the alignment. A single Acacia species, namely *Acacia oerfota*, is predominating the whole section. It is a shrub 1 to 5 meters high, which is branching from the base. In this section the alignment intercepts two major seasonal streams (wadis), named as Dibina (near Yalo) and Waley (at about St. 8+300). There are relatively larger trees and shrubs along the river courses (wadis) due to the availability of better moisture and soils that enhance vegetation growth. The dominant species in this habitat are *Ziziphus spina-christi*, *Balanites orbicularis* and *Acacia nilotica*. The understorey is mostly sparse mainly due to the heavy livestock grazing and trampling as well as dense growths of the Acacia shrub mainly *Acacia oerfota*. The Acacia trees and shrubs are heavily browsed by livestock particularly camels. Major grass species belong to the genera *Andropogon*, *Brachiaria*, *Chrysopogon*, *Cymbopogon*, and *Cynodon*.

St. 24+000 - St. 40+000: This section goes along the Bubuysi River, which runs through a narrow valley between mountains/hills. There is relatively dense vegetation along the river course, comprising larger trees including *Acacia*, *Ziziphus*, *Balanites*, and *Tamarindus* species. Other tree and shrub species in this habitat belong to the genera *Delonix*, *Cordia*, *Grewia* and *Salvadora*. The narrow valley along the river is dominantly covered by Acacia species mainly *Acacia oerfota*. Shorter trees and shrubs (mostly sparsely distributed) are covering the mountain/hill slopes on both sides of the Bubuysi River. Main species in this habitat belong to the genera *Acacia*, *Commiphora*, *Dobera*, etc. Nearly similar types of grass species (as that of the former section) are found in this part of the project area.

St. 40+000 - St. 65+000 (Bubuysi to Megale): This part of the alignment traverses mountain ranges where it intercepts a number of streams and rivers; the major ones being Gobera, Dabinbuyi and Dabhimbui rivers. The vegetation on the mountains and hills is dominantly Acacia bush and shrub. This part of the project area is dry and rocky where moisture stress and shallow soils are factors limiting vegetation growth. Major species on the hills and mountains include *Acacia mellifera*, *A. senegal*, *A. etbaica*, *Grewia ferruginea*, *Grewia arborea*, *Commiphora* spp., *Boscia coriacea*, *Salvadora persica*, etc. Dominant species along the waterways/wadis are *Ziziphus spina-christi*, *Balanites* spp., *Tamarindus indica*, *Acacia nilotica* and *Cordia sinensis*. Major grass species include *Cenchrus ciliaris*, *Danthoniopsis barbata*, *Digitaria diagonalis*, and *Eragrostis cylindriflora*.

St. 65+000 – St. 85+000: The alignment mostly runs along rolling terrain gently dropping to the flat plain at the foot of a mountain range/massif on left side. The vegetation is mostly open or scarce Acacia bush and shrub except the riverbanks, which have relatively dense vegetation with larger trees and shrubs. The route intercepts about six seasonal rivers and a number of streams/gullies that are all flowing east direction. Major species in the route corridor include *Acacia senegal*, *A. mellifera*, *A. oerfota*, *A. etbaica*, *Delonix elata*, *Tamarindus indica*, and *Salvadora persica*. Dominant species in the riverine habitat are *Ziziphus spina-christi*, *Balanites* spp., *Tamarindus indica*, *Acacia nilotica* and *A. tortilis*. Major grass species include *Cenchrus ciliaris*, *Cynodon dactylon*, *Danthoniopsis barbata*, *Aristida adscensionis*, and *Digitaria diagonalis*.

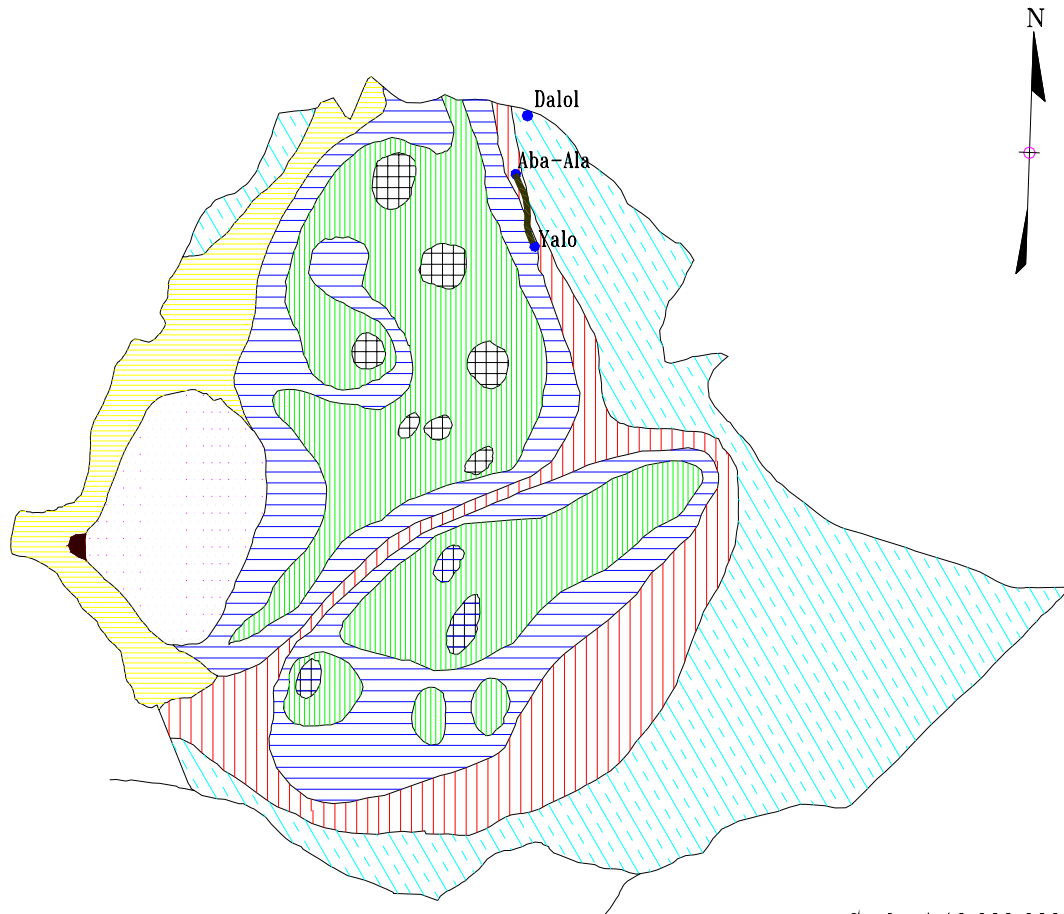
St. 85+000 – St. 128+000: This section of the proposed road is located on the western margin of the Kalah Plain or at the foot of a long mountain range on left side. Its corridor is characterized by a flat and rolling terrain. The alignment intercepts over ten rivers (seasonal) and many streams (seasonal) and gullies; all of them drain eastwards. Its vegetation cover is mostly open/scattered to dense Acacia bush and shrub while the riverine habitats are mostly covered by dense vegetation with relatively larger trees and shrubs. The flora of this area is

dominated by two Acacia species - *A. mellifera* and *A. oerfota*. Other major species include *Acacia senegal*, *A. etbaica*, *Salvadora persica*, *Cadaba rotundifolia*, *Ziziphus spina-christi*, *Balanites* sp., and *Acacia nilotica*; the latter three species are mostly riverine. Major grass species include *Cenchrus ciliaris*, *Cynodon dactylon*, etc.

St. 128+000 – St. 139+500: The first about 8Km stretch of this section crosses over a mountainous area, and the last 2.5km at the foot of the mountain through a rolling terrain. No stream intercepting the alignment. Its vegetation cover is open and mostly short Acacia bush and shrub with suffrutescents and grasses covering the understorey. *Acacia mellifera* is highly dominating the flora of the mountain area while *A. oerfota* is dominating that of the low-lying area. Other main species include *Acacia etbaica*, *A. senegal*, *Dobera glabra*, *Salvadora persica*, *Aloe camperi*, *Commiphora* spp., *Cordia sinensis*, *Grewia ferruginea*, *G. villosa*, *Boscia coriacea*, and *Cissus quadrangularis*. Major grass species are *Cenchrus ciliaris*, *Danthoniopsis barbata*, *Aristida adscensionis*, *Digitaria diagonalis*, *Dinebra retroflexa*, *Eragrostis cylindriflora*, and *Cynodon* sp.

St. 139+500 – St. 148+000 (Ab-Ala): This is the last section of the project (with about 8.5km length), which largely runs through a flat terrain. A perennial river, named Subala, is intercepting the road at about 3km from Ab-Ala. The corridor of this section has scarce vegetation. Only a few remnant trees and shrubs including *Acacia oerfota*, *A. nilotica*, *A. Senegal*, *Ficus sycomorus* and *Salvadora persica* are found in the area. However, there is a dense *Aloe camperi* particularly in the area between Ab-Ala and Subala River. Grass species include *Cenchrus ciliaris*, *Eragrostis cylindriflora*, *Cynodon dactylon*, *Cynodon plectostachyus*, *Aristida adscensionis*, *Digitaria diagonalis*, *Dinebra retroflexa*, *Coelachyrum poiflorum*, and *Sorghum arundinaceum*.

SIMPLIFIED VEGETATION MAP OF ETHIOPIA



Scale 1:10,000,000

LEGEND










| | | | |
|---|--|---|----------------------------------|
|  | Afroalpine and Sub-afroalpine Zone |  | Acacia-Commiphora Woodland |
|  | Dry Evergreen Montane Forest and Grassland |  | Lowland (Semi) Evergreen Forest |
|  | Moist Evergreen Forest |  | Desert and Semi-Desert Scrubland |
|  | Evergreen scrub |  | Proposed Road Project |
|  | Combretum-Terminalia Woodland and Savanna | | |

Fig. 5.1

Table 5.2: Major Plant Species identified from Yalo-Megale-Ab-Ala Road Project Area

| | Scientific Name | Vernacular Name (Afar) | Family Name | Remark |
|----|---|------------------------|-----------------------------|-------------------------------|
| 1 | <i>Acacia mellifera</i> (Vahl.) ^{a, b} | Merkhato | LEGUMINOSAE/ MIMOSOIDEAE | A, B (Dominant) |
| 2 | <i>Acacia etbaica</i> Schweinf. ^{a, b} | Segegto/ Sekekto | “ | A, B (Major) |
| 3 | <i>Acacia oerfota/nubica</i> Benth. | Germoita | “ | A, B (Dominant) |
| 4 | <i>Acacia nilotica</i> (L.) Del. ^{a, b} | Keselto | “ | A, B (Major) |
| 5 | <i>Acacia senegal</i> (L.) Willd. ^{a, b} | Addado/ Mek’ani | “ | A, B |
| 6 | <i>Acacia tortilis</i> (Forssk) Hayne ^{a, b} | Eieibto/ Behbey | “ | A, B |
| 7 | <i>Acacia horrida</i> (L.) Willd. ^b | Hahebto | “ | A, B |
| 8 | <i>Acacia asak</i> Hayne ^b | Eibeto | “ | A, B |
| 9 | <i>Acacia brevispica</i> ^a | | “ | B |
| 10 | <i>Lycium shawii</i> Roem & Scult. ^b | - | “ | B |
| 11 | <i>Prosopis juliflora</i> L. ^{a, b} | Weyane | “ | Yalo area-yet not very spread |
| 12 | <i>Aerva javanica</i> (Burm, fil.) ^b | Oila | AMARANTHACEAE | A |
| 13 | <i>Balanites aegyptiaca</i> (L.) Del. ^{a, b} | Uda/Udaito | BALANITACEAE | A, B |
| 14 | <i>Balanites orbicularis</i> Sprague ^{a, b} | Alaito | “ | |
| 15 | <i>Cordia sinensis</i> Lam. ^{a, b} | Medera/ Mederto | BORAGINACEAE | A, B |
| 16 | <i>Cordia</i> sp. ^a | Katoyta | BORAGINACEAE | A, B; Mostly Riverine |
| 17 | <i>Commiphora africana</i> (A. Rich.) Engl. ^a | Addo-Hadita | BURSERACEAE | A, B |
| 18 | <i>Commiphora</i> sp. ^a | Addo-Hadita | “ | A, B |
| 19 | <i>Sterculia rynchocarpa</i> ^a | Tararita/ Tarari | STERCULIACEAE | A, B |
| 20 | <i>Delonix elata</i> (L.) Gamble ^{a, b} | Hamai/ Hamaito | CAESALPINIOIDEAE | A, B |
| 21 | <i>Abutilon fruticosum</i> Guill. & Perr. ^b | Humbukto | MALVACEAE | A |
| 22 | <i>Ocimum americanum</i> Sims. ^b | Irgoity | LABIATA | A |
| 23 | <i>Dobera glabra</i> Forsk ^{a, b} | Gasra/ Gasraitto | SALVADORACEAE | A, B; Mostly on slopes |
| 24 | <i>Salvadora persica</i> (L.) ^{a, b} | Adaito | SALVADORACEAE | A, B |
| 25 | <i>Grewia ferruginea</i> Hochst. ^{a, b} | Hedaito | TILIACEAE | A, B |
| 26 | <i>Grewia villosa</i> Hochst. ^a | Hebelita | TILIACEAE | A, B |
| 27 | <i>Grewia arborea</i> (Forssk) Lam. ^a | Gindawai | TILIACEAE | A; By river courses |
| 28 | <i>Tamarindus indica</i> L. ^a | Homorto | FABACEAE | A, B; mostly riverine |
| 29 | <i>Ziziphus spina-christi</i> L. ^{a, b} | Kusura/Kusur aito | RHAMNACEAE | A, B, Mostly Riverine |
| 30 | <i>Sansiveira</i> sp. ^a | | AGAVACEAE | B; Succulent plant |

| | Scientific Name | Vernacular Name (Afar) | Family Name | Remark |
|----|---|------------------------|--------------------|---|
| 31 | <i>Osyris</i> sp. ^a | | SANTALACEAE | A |
| 32 | <i>Aloe camperi</i> Schweinf. ^a | Dhure | LILIACEAE | B; Succulent plant |
| 34 | <i>Terminalia</i> sp. (<i>T. ?brownii</i>) Fresen. ^a | Seriaybo | COMBRETACEAE | B; By river courses/wadis |
| 35 | <i>Cadaba rotundifolia</i> Forssk. ^a | Anagali | CAPPARIDACEAE | B; |
| 36 | <i>Boscia coriacea</i> Pax ^a | Danoneta | CAPPARIDACEAE | B; |
| 37 | <i>Sacrostema viminale</i> (L.) R. Br. ^a | Merka | ASCLEPIDACEAE | A |
| 38 | <i>Cissus quadrangularis</i> L. ^a | Mysaruga | VITACEAE | A, B; Scrambling vine, succulent |
| 39 | <i>Calotropis procera</i> ^a | | ASCLEPIDACEAE | In wadis |
| 40 | <i>Ficus sycomorus</i> ^a | | MORACEAE | A; a few trees along rivers |
| 41 | <i>Andropogon canaliculatus</i> Schumach ^{a, b} | Gorob | POACEAE (Grass F.) | B |
| 42 | <i>Andropogon</i> sp. ^b | Melif | “ | A |
| 43 | <i>Brachiaria eruciformis</i> (J.E. Sm) ^{a, b} | Mussa | “ | A |
| 44 | <i>Digitaria diagonalis</i> (Nees) Stapf ^a | | “ | B; |
| 45 | <i>Cenchrus ciliaris</i> (L.) ^{a, b} | Hantadi/Sakai | “ | B; Common/dominant |
| 46 | <i>Chrysopogon plumulosus</i> Hochst. ^b | Durfu | “ | A, B |
| 47 | <i>Cymbopogon pospischilli</i> (<i>K. Schum.</i>) ^b | Issusu | | A |
| 48 | <i>Cynodon dactylon</i> Trin. ^{a, b} | Irareyta | | A |
| 49 | <i>Cynodon plectostachyus</i> Pilgar ^{a, b} | Sardoita | “ | B |
| 50 | <i>Eragrostis cylindriflora</i> Hochst ^{a, b} | Donhito | “ | B |
| 51 | <i>Sorghum arundinaceum</i> (Desv.) Stapf ^a | Randa | “ | B; |
| 52 | <i>Danthoniopsis barbata</i> (Nees) C. E. Hubb. ^a | | “ | B; |
| 53 | <i>Coelachyrum poiflorum</i> Chiov. ^a | | “ | B; |
| 54 | <i>Dinebra retroflexa</i> (Vahl) Panzer ^a | | “ | B; |
| 55 | <i>Aristida adscensionis</i> L. ^a | Durfuta | “ | B; |
| 56 | <i>Setaria verticellata</i> ^b | Birro | “ | B |
| 57 | <i>Cyperus rotundus</i> (L.) ^b | Godeyta | CYPERACEAE | B |
| 58 | <i>Parthenium hysterophorus</i> ^a | | | B; Dominant weed on the plain around Ab-Ala |
| 59 | | Hayukaito ^a | ?SALVADORACEAE | A; Similar to <i>S. persica</i> |
| 60 | | Dokohoyta ^a | | B |
| 61 | | Kuribeta ^a | | |
| 62 | | Yolo'oto ^a | | Big tree, along Bubuysi R. |
| 63 | | Dumaito ^a | | B |
| 64 | | Dokohoyta ^a | | B |

Note:^a = Identified during Ecological Survey of this Project Study.^b = Identified/recorded during Afar Rangelands and Water Development Study, MCE, 1999.

A = Recorded from Yalo - Megale part of the Project Area.

B = Recorded from Ab-Ala - Megale part of the Project Area.

Table 5.3: List of Some Threatened Endemic Plant Species of Ethiopia in Acacia-Commiphora woodland.

Geographical Areas (based on former administrative regions): AR = Arsi; BA = Bale; GD = Gonder; GG = Gamo Gofa; GJ = Gojam; HA = Hararge; IL = Ilubabor; KF = Kefa; SD = Sidamo; SU = Shewa Upland; TU = Tigray Upland; WG = Welega; WU = Wello Upland.

Status: E = endangered; Ex = extinct; R = rare; V = vulnerable

| | Species | Family | Distribution | Status | Habit (Type) |
|----|--|---------------|----------------------|--------|------------------|
| 1 | <i>Acacia pseudonigriscens</i> Brenan and Ross | Fabaceae | BA; ca. 300 m | E | Small tree |
| 2 | <i>Aeschynomene ruspoliana</i> Taub. & Harms | Fabaceae | SD; not recorded | E | Shrub or herb |
| 3 | <i>Andrachne ephemera</i> M. Gilbert | Euphorbiaceae | HA BA SD; 1000-1600m | V | Herb |
| 4 | <i>Commiphora monoica</i> Vollesen | Burseraceae | BA; 1250-1400m | E | Small tree |
| 5 | <i>Crotalaria awasensis</i> Thulin | Fabaceae | SU SD; ca. 1700m | E | Herb |
| 6 | <i>C. boundettii</i> Polhill | Fabaceae | HA; 550m | E | Herb |
| 7 | <i>C. heterotricha</i> Polhill | Fabaceae | HA; ca. 500m | E | Herb |
| 8 | <i>C. hypargyria</i> Chiov. | Fabaceae | BA; not recorded | E | Herb |
| 9 | <i>C. jijigensis</i> Thulin | Fabaceae | HA; 1750-1850 m | E | Suffrutescent |
| 10 | <i>C. ruspoliana</i> Chiov. | Fabaceae | SD; not recorded | E | Herb |
| 11 | <i>C. trifoliolata</i> Bak. f. | Fabaceae | BA; ca. 1400m | E | Herb |
| 12 | <i>Cyphostemma burgeri</i> Vollesen | Vitaceae | HA; 1500-1800m | E | Herb |
| 13 | <i>Erythrococca uniflora</i> M. Gilbert | Euphorbiaceae | SD; 950-1325 m | E | Shrub |
| 14 | <i>Erythrophysa septentrionalis</i> Verdc. | Sapindaceae | HA; 600-800m | E | Shrub/small tree |
| 15 | <i>Euphorbia awashensis</i> M. Gilbert | Euphorbiaceae | SU; ca. 1000m | E | Pyrophyte |
| 16 | <i>E. baleënsis</i> M. Gilbert | Euphorbiaceae | BA; 1150-1450 m | E | Shrub |
| 17 | <i>E. betulicortex</i> M. Gilbert | Euphorbiaceae | SD; ca. 950 m | E | Small tree |
| 18 | <i>E. burgeri</i> M. Gilbert | Euphorbiaceae | HA; 1200-1550 m | E | Succulent shrub |
| 19 | <i>E. cryptocaulis</i> M. Gilbert | Euphorbiaceae | SD; 1350 – 1600m | E | Geophyte |
| 20 | <i>E. dalettiensis</i> M. Gilbert | Euphorbiaceae | HA; ca. 1200 m | E | Succulent shrub |
| 21 | <i>E. ellenbeckil</i> Pax | Euphorbiaceae | SD; 1000-1100 m | E | Succulent shrub |
| 22 | <i>E. fissispina</i> Bally & Carter | Euphorbiaceae | SD; ca. 750 m | E | Shrub |
| 23 | <i>E. Gymnocalycioides</i> M. Gilbert & Carter | Euphorbiaceae | SD; ca. 1350 m | E | Succulent |
| 24 | <i>E. monacantha</i> Pax | Euphorbiaceae | SD; BA; 1200-1800 m | V | Succulent |
| 25 | <i>E. nigrispinoides</i> M. Gilbert | Euphorbiaceae | SU; 1000-1700m | V | Shrub/small tree |
| 26 | <i>E. omariana</i> M. Gilbert | Euphorbiaceae | BA; 1350-1400 m | E | Herb |

| | Species | Family | Distribution | Status | Habit (Type) |
|----|---|---------------|----------------------|--------|------------------|
| 27 | <i>E. piscidermis</i> M. Gilbert | Euphorbiaceae | HA; 1000-1050 m | E | Succulent |
| 28 | <i>E. sebsebei</i> M. Gilbert | Euphorbiaceae | SD; 1300-1450 m | E | Succulent |
| 29 | <i>E. somalensis</i> Pax | Euphorbiaceae | HA; ca. 1100 m | E | Shrub/small tree |
| 30 | <i>E. tetracantha</i> Randle | Euphorbiaceae | BA; ca. 600 m | E | Suffrutescent |
| 31 | <i>E. uniglans</i> M. Gilbert | Euphorbiaceae | SD; ca. 1400 m | E | Small tree |
| 32 | <i>Galega somalensis</i> (Taub. ex Harms) Gillett | Fabaceae | SD; ca. 1600 m | E | Suffrutescent |
| 33 | <i>Indigofera cana</i> Thulin | Fabaceae | WU; 1200-1800 m | E | Suffrutescent |
| 34 | <i>I. curvirostrata</i> Thulin | Fabaceae | SD; ca. 900 m | E | Shrub |
| 35 | <i>I. ellenbeckil</i> Bak. f. | Fabaceae | HA; not recorded | E | Suffrutescent |
| 36 | <i>Jatropha horizontalis</i> M. Gilbert | Euphorbiaceae | SD; 1250-1500m | E | Suffrutescent |
| 37 | <i>Lotus lalambensis</i> Schweinf. | Fabaceae | HA; 1200-200m | V | Herb |
| 38 | <i>Phragmanthera erythraea</i> (Sprague) M. Gilbert | Loranthaceae | TU SU; 1150-2200m | R | Semi-parasite |
| 39 | <i>Phyllanthus borenensis</i> M. Gilbert | Euphotbiaceae | SD; ca. 1100 m | E | Shrub |
| 40 | <i>Plicosepalus robustus</i> Wiens & Polhill | Loranthaceae | SD; ca. 1600m | E | Semi-parasite |
| 41 | <i>Rhynchosia erythraeae</i> Schweinf. | Fabaceae | SU; 1000 – 2000 m | E | Shrub |
| 42 | <i>R. malacotricha</i> Harms. | Fabaceae | SU HA BA; 1350-2000m | V | Shrub |
| 43 | <i>R. ramose</i> Verdc. | Fabaceae | HA; ca. 900 m | E | Herb |
| 44 | <i>Taverniera schimperi</i> Jaub. & Spach. | Fabaceae | TU SU; 1000 – 1300m | V | Herb |

Source: SOME THREATENED ENDEMIC PLANTS OF ETHIOPIA, Ensermu Kelbessa, Sebsebe Demissew, Zerihun Woldu and Sue Edwards. In: Botany 2000: East and Central Africa. NAPRECA Monograph 2: 35-52, 1992.

5.2.2 Fauna

The diversity of Ethiopian fauna is also high, reflecting the diversity in climate, vegetation and terrain. Some 242 terrestrial mammal species and 847 birds species are found in the country, of which 22 mammals and 27 birds are believed to be endemic (IUCN, 1984; 1989 cited in WCMC, 1989). This makes Ethiopia the richest in avifauna (bird-life) in mainland Africa. Although very little has been published on other groups of fauna, 6 reptile and 33 amphibian species are believed to be endemic. Ethiopia's protected areas (see Figure 5.2) consist of National Parks, Wildlife sanctuaries, Wildlife Reserves, and Controlled Hunting Areas. Of the national parks only two (Awash and Simen Mountains NPs) have been gazetted.

Previous studies indicate the presence of high diversity of wild fauna in the Afar Region in which the proposed road project is located. Over 82 mammal species and 528 bird species are believed to exist in the region (CEDEP, 1998). Two endemic mammals (Wild Ass and Swayne's Hartebeest) and five endemic birds are reported for the region. The most threatened larger mammals of the region are Beira Antelope, Dorcas Gazelle, Specke's Gazelle, Soemmering's Gazelle, Gerenuk, Grevy's Zebra and Wild Ass (CEDEP, 1998). The Afar

region being in the northern part of the rift valley is important for paliarctic migratory birds. A few of the lakes, swamps and marshy areas in the region particularly in the administrative zones of 1, 2 and 3 are important habitats both for residents and migratory birds. With regard to protected areas, the Afar Region has two National Parks, four Wildlife Reserves and two Controlled Hunting Areas. None of the wildlife conservation areas are located in or in the vicinity of the proposed road corridor. The list of these conservation areas, with their surface areas, is given in Table 5.4.

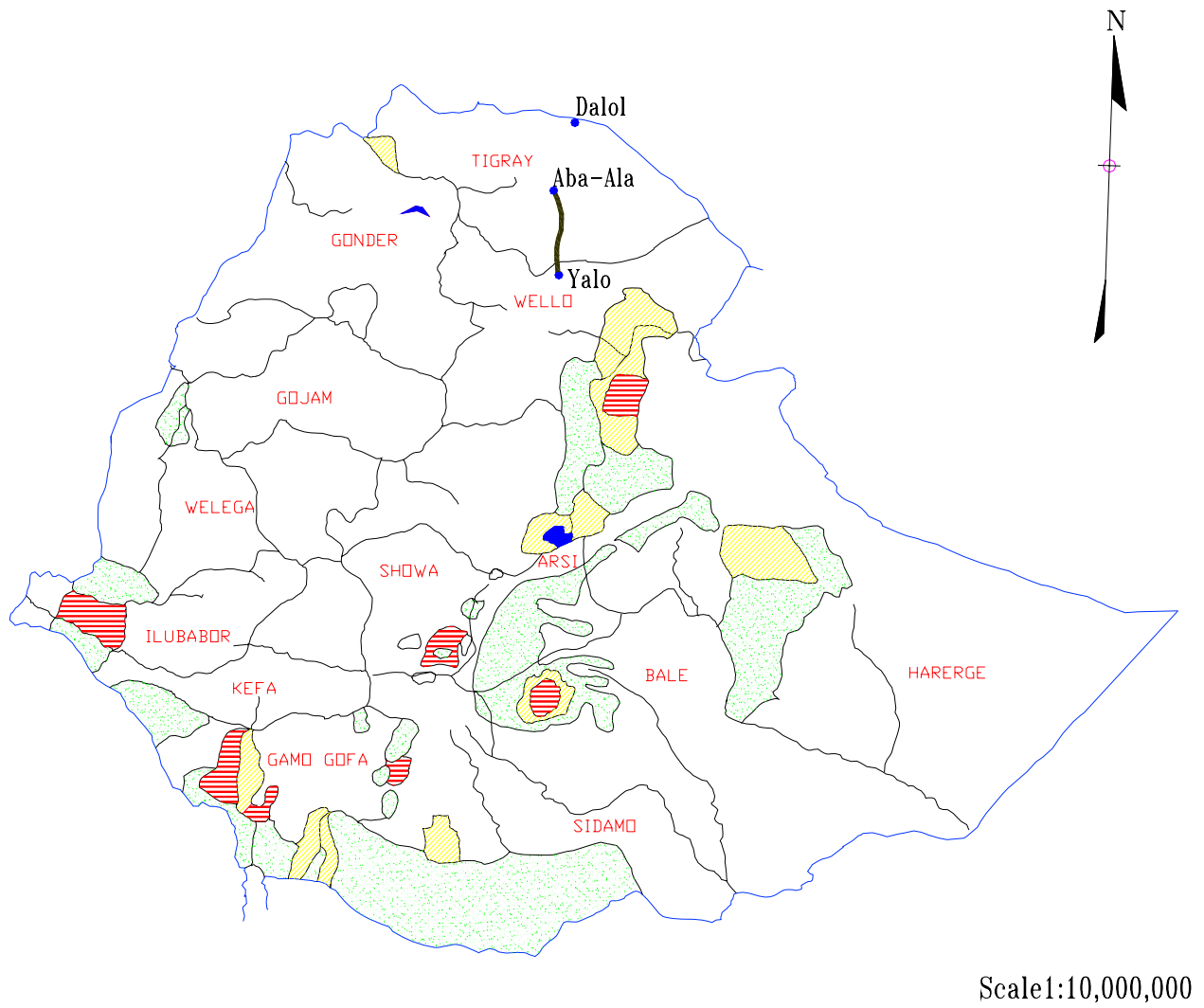
Table 5.4: Wildlife Conservation Areas in the Afar Region

| | Name of Conservation Area | Area in Km² |
|---|--------------------------------------|-------------------------------|
| 1 | Awash National Park (NP)* | 756 |
| 2 | Yangudi-Rassa NP | 4,731 |
| 3 | Alledeghi Wildlife Reserve (WR) | 1,832 |
| 4 | Awash West WR | 1,781 |
| 5 | Gewane WR | 2,439 |
| 6 | Mille-Serdo WR | 8,766 |
| 7 | Gewane Controlled Hunting Area (CHA) | 5,932 |
| 8 | Awash West CHA | 9,136 |

Based on the information obtained from various documents of previous studies, interviews of key informants at regional, zonal and woreda offices as well as local people, and observations made during field survey, the project area has a variety of wildlife species. The major larger mammal species present in the route corridor and its vicinity include warthog, monkeys, baboons, Oryx, dikdik, bush-duiker, hare, fox, jackal, spotted hyena, aardvark and porcupine. Of these species monkeys, baboons, spotted hyena and dikdik are relatively abundant. Of bird species Ostrich, Francolin and 'Kukaye' (Afarigna); 'Jigira' (Amharic) are found in the area. However, there is no any designated protected area to conserve the wild animals. The list of main mammal species present in the project area is given in Table 5.5. Table 5.6 presents the list of some rare or threatened mammal species that are believed to be found in the route corridor or in its vicinity.

As to the information obtained from the local informants the project area was endowed with relatively abundant and diverse wildlife particularly larger mammals. However, their abundance and diversity have critically diminished since the 1980s primarily due to the effects of the civil war between the Tigray People Liberation Front (TPLF) and the Former Government of Ethiopia ('Derg' Regime). The project area was a military base for the TPLF, and during that period wild animals were either heavily exploited for meat by the fighters/soldiers or migrated to other places due to the disturbance by military operations. Some of the wild animals such as Soemmering's gazelle and different antelopes, which were used to be abundant, are now rarely seen in the area.

WILDLIFE PROTECTED AREAS OF ETHIOPIA



LEGEND






-  National Parks Gazetted
-  National Parks not Gazetted
-  Wildlife Sanctuaries and Reserves
-  Controlled Hunting Areas
-  Proposed Road Project

Fig. 5.2

Table 5.5: Larger Mammals Recorded from the Project Area

| No. | Common Name | Local Name (Afarigna) | Remark |
|-----|-------------------------|-----------------------|---------------------|
| 1 | Ground Squirrel | | |
| 2 | Naked Mole-rat | | |
| 3 | Crested Porcupine | | |
| 4 | Grivet (Vervet) Monkey | Wegai | Relatively abundant |
| 5 | Anubis Baboon | Dema'e | “ “ |
| 6 | Hamadryas Baboon | | |
| 7 | Bat-eared Fox | Wakeri | |
| 8 | Jackal | Asalita | |
| 9 | Genet Cat | | |
| 10 | Mongoose | | |
| 11 | Aardvark | | |
| 12 | Striped Hyena (R) | | |
| 13 | Spotted Hyena | Yangula | Relatively abundant |
| 14 | Warthog | Hereya | |
| 15 | Cheetah (R) | | |
| 16 | Wildcat | | |
| 17 | Serval | | |
| 18 | Caracal (R) | | |
| 19 | Leopard (R) | Kabi'e | |
| 20 | Lion | | |
| 21 | Hippopotamus | | |
| 22 | Bush Duiker | Wadeda | |
| 23 | Klipspringer | | |
| 24 | Dikdik | Sejeri | |
| 25 | Mountain Reedbuck | | |
| 26 | Soemmering's Gazelle | Saraytu/Sara | |
| 27 | Dorcas Gazelle (R) | | |
| 28 | Oryx | Biyda | Hunted for Meat |
| 29 | Lesser Kudu | | |
| 30 | Greater Kudu | | |
| 31 | Bushbuck | Argudo | |
| 32 | | Weydeda | |
| 33 | Rock Hyrax | | |
| 34 | Abyssinian Hare | | |
| 35 | African Wild Ass (*, R) | | |
| 36 | Grevy's Zebra (R) | | |
| 37 | Ostrich | Goroya | |
| 38 | | Kukaye | Jigira |
| 39 | Francolin | | Qoq |
| 40 | Python | Argufti | |
| 41 | | Heberi | |

Note: * = Endemic species
R = Rare species

Table 5.6. Some Rare/Threatened Mammals in or in the Vicinity of the Project Area

| | Scientific Name | Common Name | Remark |
|---|--|-----------------------|--------|
| 1 | <i>Gazella soemmerringii</i> (Cretzschmar 1828) ^a | Soemmerring's Gazelle | |
| 2 | <i>Gazella dorcas</i> (Linn. 1758) ^a | Dorcas Gazelle | |
| 3 | <i>Equus africanus</i> (Fitzinger 1857) ^{a, b} | African Wild Ass | |
| 4 | <i>Equus grevyi</i> Oustalet 1882 ^{a, b} | Grevy's Zebra | |
| 5 | <i>Panmthera pardus</i> (Linn. 1758) ^a | Leopard | |
| 6 | <i>Acinonyx jubatus</i> (Schreber 1775) ^a | Cheetah | |
| 7 | <i>Felis caracal</i> Schreber 1776 ^a | Caracal | |
| 8 | <i>Hyaena hyaena</i> (Linn. 1758) ^a | Stripped Hyena | |

Source: ^a = CEDEP, 1998

^b = WCMC, 1989.

5.3 Archaeological, Cultural and Historical Sites

Discoveries of fossils made in the 1970's brought the paleoanthropological significance of the Afar region to the world's attention. The various researches conducted in the region have so far identified nine paleoanthropological sites. These are the Hadar, Gona, Middle Awash, Melka Werer, Kesem-Kebena, Mmeschelle, Ledi, Waranso and Dara Laka sites. The studies conducted in the Hadar area resulted in the discovery of many important ancient fossils, the most famous of which was a partial skeletal fossil remain nicknamed "Lucy". This place was known to be one of the world's most famous paleoanthropological sites. All the known paleoanthropological sites are generally located along the Awash River, which is far the proposed road project.

The Afar region has also important cultural features. For many economic, social, political, judicial and defensive purposes, the social organization of the Afar, which is based on kinship is highly cohesive (IPS, 1998). The social structure of the Afar functions as mechanism of reciprocal obligation between kinsmen. As a result it is used as a means of spreading the resources of livestock and labour optimally over the available pasture. The social system also maintains or facilitates social change and development of the pastoralists.

Among the historical sites in the region, the most important one is located in the Afambo area, east of Assaita, near to Awash River. This is a place where Afar formed its own Sultanate known as Awsa Sultanate in the sixteenth century. This site has important historical properties such as palaces, mosques and shrines. This is a potential site for tourist attraction provided that transportation facilities are improved (IPS, 1998).

Based on existing information, none of the known archaeological and historical sites are located in the project area. However, there are many graveyards located along the recommended alignment. These should be identified and located during the detailed engineering design surveys so that they will not be affected by the project.

5.4. Human and Social Environment

5.4.1. Demographic characteristics

The proposed three alternative road alignments affect both Afar and Tigray Regions. In ANRS, zones affected are Zones 2 and 4, and woredas Ab-Ala, Megale and Yalo. The TNRS zones affected by the proposed road alignments are Debubawi Zone and woredas Alamata, Rayaazebo and Hintalo Wajirat depending on the selection of the alignment.

The Afar National Regional State (ANRS) was formed at the early 1990s, retaining autonomy and self-administration of its own affairs within the FDRE. The ANRS consists of five

administrative zones, 29 woredas, 326 rural kebeles and 32 urban kebeles (CSA, 1996: 1). Total population of the Afar Region is 1 106 383 (56.93% male). The Afar used to be (and still are) fragmented among clans and still smaller divisions and are characterized by a distinction between noble and commoner groups. The government administrative structures have been recently established in most of the Afar area. Ab-Ala is the zonal capital for Zone 2 in ANRS and Kilewan is the zonal capital of Zone 4. Number of farmers associations by woredas is as follows: Megale 8, Berhale 9, Balul 12, Afdera 9, Erebt 13, Koneba 7, Ab-Ala 11 and Yalo 9. Total number of farmers associations in the affected woredas in Afar Region is 28.

Table 5.7: Population of zones and woredas by sex, urban and rural, in the affected zones and woredas in Afar Region (CSA, 1994) and Field Suvey Result

| Population of zones and woredas by sex, urban and rural (1996) | | | | | |
|---|---------------|---------------|---------------|---------------|--------------|
| Afar Region | Zone 2 | Ab Ala Woreda | Megale Woreda | Zone 4 | Yalo woreda |
| Centre | Ab Ala | Ab Ala | | Kelewina | |
| Total | 210522 | 24291 | 19664 | 126455 | 20436 |
| Male | 117522 | 13031 | 10719 | 70747 | 11685 |
| Female | 93501 | 11260 | 8945 | 55708 | 8751 |
| Urban | 4990 | 3300 | 300 | 1747 | 937 |
| Male | 2489 | 1613 | 167 | 908 | 459 |
| Female | 2501 | 1678 | 133 | 839 | 478 |
| Rural | 205532 | 20991 | 19664 | 124708 | 19499 |
| Male | 114532 | 11418 | 10719 | 69839 | 11266 |
| Female | 91000 | 9573 | 8945 | 54869 | 8273 |

The Tigray National Regional State consists of four administrative zones and one city administration (Mirabawi Zone 9; Mekakelegna Zone 10; Misrakawi Zone 7; Debubawi zone 9), 34 woredas, 1006 rural kebeles, 75 urban kefitignas and 141 urban kebeles (CSA, 1994: 1). From the total area of Tigray region Merabawi zone comprises 51%, Mehakelegnaw zone 19.3%, Debubawi including Mekelle 18.9%, Misrakawi 10.8% of the total area of the Region. Total population of the Tigray Region is 3 136 267 persons: 1 542 102 male and 1 594 102female. Number of farmers associations in the three affected woredas in TNRS is as follows: Alamata 19, Rayaazebo 22, Hintalo Wajirat 47, totaling in 88 farmers associations (kebeles).

Afar National Regional State is a newly established state in its present form. Its administrative structure is less developed and still in a process of being developed. Compared to the Tigray National Regional State its population is approximately one third and as a Region it is less developed and less urbanized. These two regions are at different levels of development and the development needs vary. In addition, the development needs of the country might differ from the development needs of the regions. Afar Region has been marginalized in development efforts of the country, thereby at present its status is high in the regional development efforts.

5.4.2 Population size, density and settlement patterns along the road alignments

There is a remarkable difference in the **size of the population** of the two Regions. The population size of the TNRS is close to almost three times the population size of the Afar Region. Despite their relatively small number in Ethiopia, Afars are of strategic importance because of their location between the highlands and the Red Sea. Located in a triangle of low land covering the Awash valley and the Danakil depression, the Afar's land has been divided by the Djibutian and Eritrean borders. Population size of the Afar Region is 1 106 383 persons: 626 839 male and only 479 544 female (sex ratio 131 is very high). Population size of the Tigray Region is 3 136 267 persons: 1 542 102 male and 1 594 102female (sex ratio 96.7).

Urban-rural distribution of the population shows that in both Regions the majority of population lives in the rural area. In ANRS, about 92.2% of the population reside in the rural area, and the remaining 7.8% in urban areas. In TNRS, about 85% of the population reside in the rural area, and the remaining 15% in urban areas.

There is a difference in **distribution of population over the zones**. In ANRS, population is evenly distributed over the five zones and in TNRS there are differences. Zone 1 in ANRS has 29.6% of the total population, followed by Zone 5 and Zone 2 with 25.6% and 19.8% respectively. Zone 4 has relatively less population (11.4%). In TNRS, population is not evenly distributed over the four zones. Mehakelegnaw Zone constitutes of 30% of the total population, followed by Debubawi 27.9%, Mirabawi 23.4% and Misrakawi 19.7% Zones respectively.

Table 5.8: Population of zones and woredas by sex, urban and rural, in the affected zones and woredas in Afar Region (CSA, 1999)

| AFAR REGION | ZONE 2 | AB-ALA WOREDA | MEGALE WOREDA | ZONE 4 | YALO WOREDA |
|--|-----------------|-----------------|----------------|-----------------|----------------|
| Center of zones and woredas by sex, urban and rural (1996) | Ab-Ala | Ab-Ala | | Kelewina | |
| Population of zones and woredas by sex, urban and rural (1996) | Total : 210 522 | Total : 24 291 | Total : 19 664 | Total : 126 455 | Total : 20 436 |
| | - 117 522 male | - 13 031 male | - 10 719 male | - 70 747 male | - 11 685 male |
| | - 93 501 female | - 11 260 female | - 8 945 female | - 55 708 female | - 8 751 female |
| | Urban: 4 990 | Urban: 3 300 | Urban: 300 | Urban: 1 747 | Urban: 937 |
| | - 2 4 89 male | - 1 613 male | - 167 male | - 908 male | - 459 male |
| | - 2 501 female | - 1 678 female | - 133 female | - 839 female | - 478 female |
| | Rural: 205 532 | Rural: 20 991 | Rural: 19 664 | Rural: 124 708 | Rural: 19 499 |
| | - 114 532 male | - 11 418 male | - 8 945 female | - 69 839 male | - 11 266 male |
| | - 91 000 female | - 9 573 female | | - 54 869 female | - 8 273 female |

(The 1994 Population and Housing Census of Ethiopia. Results for Affar Region, May 1999, Addis Ababa) and Field Survey Result

The average population density of ANRS is 12.5 and in TNRS 61 persons per square kilometer. Average zonal population density varies in ANRS.

Table 5.9: Average population density in the zones (The 1994 Population and Housing Census of Ethiopia.)

| AFAR REGION | Population Density | TIGRAY REGION | Population density |
|-------------|--------------------|-------------------|--------------------|
| Zone 1 | 12.1 | Misrakawi Zone | 106 |
| Zone 2 | 7.7 | Mehakelegnaw Zone | 97 |
| Zone 3 | 9.4 | Debubawi | 80 |
| Zone 4 | 8.6 | Mirabawi | 25 |
| Zone 5 | 94 | | |

Zone 2 is the least densely populated area as opposed to Zone 5. In Zone 5 there is a large number of population and it is the smallest Zone in size. The least densely populated woreda

in Zone 2 is Megale and in Zone 4 Yalo. In TNRS, average zonal population density varies between 25 and 106.

There are differences in the **number of the municipal centers** between the Regions. In ANRS, In Zone 2 there are three towns and one woreda center: Koneba, Ab-Ala and Berahile towns and Nehile woreda center. Ab-Ala is the only town in Ab-Ala woreda. In Ab-Ala woreda the most populous PAs are Wesema (4561), Adihara Meli (2460) and Inda Asen Gola (2335). In Megale woreda there is only one small woreda center Nehile. The largest PAs are Hida (3479), Limo (3271) and Gimrida (2610). In Zone 4 there are four towns: Derayitu, Alele Subula, Dibina and Kelewina. However, their population is very limited (between 123 - 937). Dibina town (937) is located in Yalo woreda. The largest PAs in Yalo woreda are Gidela (4527), Wale'e (3478) and Kuwilina Galule (2704). In rural areas of the Afar Region, the population of the farmers' associations is in most cases much larger than in towns. The population density of the project area is shown in Figure 5.3.

According to the Bureau of Public Works and Urban Development of TNRS, there are 38 municipal urban centers with combined population of 485,625 or 14.5% of the total population of the TNRS. This shows that the overall degree of urbanization in both regions is very low.

Table 5.10: Total population of towns in the affected zones and woredas in Afar Region (The 1994 Population and Housing Census of Ethiopia. Results for Affar Region. May 1999, Addis Ababa.)

| AFAR REGION | ZONE 2 | AB-ALA WOREDA | MEGALE WOREDA | ZONE 4 | YALO WOREDA |
|----------------------------------|-----------------------------|--|--|---|---|
| Center | Ab-Ala | Ab-Ala | Leilé | Kelewina | |
| Total population of towns (1996) | Koneba town 819 (Koneba) | Ab-Ala town 3 300 - 1 613 male - 1687 female | Leilé town 300 - 167 male - 133 female | Derayitu town 154 (Aura) Alele Subula town 123 (Ewa) Dibina town 937 (Yalo) Kelewina town 533 (Gulina) | Dibina town 937 - 459 male - 478 female |

Figure

5.3

There is a high **concentration of municipal urban centers** on the main road in TNRS starting from Wajja in the south via Adigrat to May Tsebri in the west. The distribution of municipal urban centers show that 31.6% of the towns are concentrated in Debubawi Zone, 23.7%, 21.1%, and 18.4% is Mirabawi, Misrakawi and Mehakelegnaw zones respectively. In other words, 23.8, 22.5, 19.0, 18.0 and 16.6% of the total municipal urban population live in Debubawi, Mekele, Misrakawi, Mehakelegnaw and Merabawi Zones of TNRS, respectively. Mekele is the single municipal urban center (city) with a population greater than 100,000 inhabitants. There are no medium sized municipal urban centers with population of 50,001-100,000 inhabitants. Adigrat has a population of between 40,001 and 50,000. The town of Axum falls under the category of inhabitants between 30,001 to 40,000. There are 5 towns in each category with inhabitants of between 20,001-30,000 and 10,001-20,000. About 26 of the municipal urban centers have a population of between 2,000 and 10,000. Thus, Tigray Regions municipal urban centers are also characterized by both regional and zonal urban primacy.

Table 5.11: Total population of farmers' associations in rural areas in the affected zones and woredas in Afar Region (The 1994 Population and Housing Census of Ethiopia. Results for Affar Region. May 1999, Addis Ababa.)

| AFAR REGION: | ZONE 2 | | ZONE 2 | | ZONE 4 | |
|--------------------------|----------------|------|----------------|------|------------------|------|
| | AB-ALA WOREDA | | MEGALE WOREDA | | YALO WOREDA | |
| Total population of | Idimo | 723 | Korayitu/Tonsa | 2440 | Rekrek | 1821 |
| farmers' associations in | Wesema | 4561 | Bubush | 2088 | Dermamudelelina | |
| rural areas (1996) | Goben | 1723 | Adu | 2489 | Gidela | |
| | Dergamo | 1687 | Hida | 3479 | | 4527 |
| | Wahargubi | 1601 | Arado | 1165 | Uda'ile | 2593 |
| | Asen Gola | 2140 | Limo | 3271 | Kuweilina Galule | |
| | Inda Asen Gola | 2335 | Faro | 2122 | 2704 | |
| | Haridan | 1844 | Gimrida | 2610 | Wale'e | 3478 |
| | Galayiso | 1917 | | | Mesgid | 1604 |
| | Adihara Meli | 2460 | | | Harmomelina | |
| | | | | | Rakubidera | 2732 |

As regards the population size, the number of population is much higher in the affected zones and woredas in Tigray Region. Any development intervention in those areas would directly affect more people than in Afar Region. In the affected woredas in Tigray Region there are altogether residing 292 223 people versus only 64 391 in the Afar Region.

In both regions most of the population reside in rural areas in the affected woredas. However, there are significant differences in the number of urban centers. In the affected woredas in Tigray Region there are seven urban towns with the population of 50 179. Most of the towns are in the affected Debubawi Zone. Alignment passing through one of the larger towns would increase the number of people served. More resettlement efforts can be expected in more populous areas. There are only two towns in Afar Region with the population of 4 237. However, particularly in the Afar Region, the size of the towns is in most cases smaller than the size of farmers associations.

Woredas play the central role in the Decentralization Policy of the Government. Its implementation is also part of the Interim Poverty Strategy of the Government. Woredas will become administratively increasingly independent. This implies, that despite of the size of population, the woreda administrative centers become increasingly important and need to be operational and able to provide the requested services to their population. This requires large

investments in the woreda administrative centers. Access to the woreda center and linkages with other administrative centers at the zonal and regional levels are essential for effective administration.

5.4.3 Ethnic composition

Affar ethnic group constitutes an overwhelming majority (91.8%) of the population of the Afar Region and Tigraway ethnic group (94.8%) of the population of the Tigray Region. In ANRS, out of the other ethnic groups Amhara comprised 4.5% followed by Argoba with 0.9%, and Oromo and Tigraway with 0.8% each. Affar, Amhara, Tigraway, Oromo and Argoba ethnic groups form the five largest ethnic groups in size in urban areas, while Affar, Amhara and Argoba were the largest three in rural areas. Consistent with that of the total population, females dominate males in number among the Amhara and Argoba, while the opposite is true for Affars. Other ethnic groups in the Afar Region are the Guragies, Hadiyas, Kembatas and Welaitas, however, they are not residing in the Zones 2 and 4. In TNRS, out of the other ethnic groups except Tigraway, Amhara comprised 2.6%, followed by Saho 0.7%, Agew/Kamyr 0.4%, Eritreans constitute 0.9% and other foreigners constitute only 0.03% of the total population of the TNRS. The same ethnic groups form the five largest ethnic groups in size in urban areas. The proportion of the Amharas in urban areas is, however, twice as large as that in the rural area areas.

In the affected woredas ethnic groups are very harmonious within their respective regions. This implies that no major ethnic minorities exist in the affected woredas within the respective regions. Part of the project area is a regional border area between Tigray and Afar Regions. In Tigray Region Tigraways and in Afar Region Afars dominate in the project area. There is lively co-operation between these two regions along the border.

5.4.4 Language

Overwhelming majority uses Affar language as a mother tongue (90.8%) in Afar Region and *Tigrigna* (95.4%) in Tigray Region. In ANRS, Amharic is used by 6.7% is the second largest language, followed by *Tigrigna* with 0.7%. Considering the second language spoken, 90.8% and 90% did not have a second language in ANRS and TNRS, respectively. In ANRS, Amharic is spoken by the highest proportion (4.4%) of the population as a second language. About 92.2% speak Affar language either as a mother tongue or as a second language. All major ethnic groups use the language of their own ethnic group dominantly. The proportion of using the language of own ethnic group varies from 99.7% among Affars to 69.7% among Amharas. In TNRS, Amharic is used by 3% and it is the second largest language as a mother tongue, followed by *Sahogna* with 0.7%. Amharic is spoken by the highest proportion (7.1%) of the population as a second language followed by *Tigri*. In ANRS, about 92.2% speak Affar language either as a mother tongue or as a second language. All major ethnic groups use the language of their own ethnic group dominantly. The proportion of using the language of own ethnic group varies from 99.7% among Affars to 69.7% among Amharas.

Language structure fully reflects the harmonious ethnic structure within the regions. *Tigrigna* and Affar language are spoken in Tigray and Afar Regions, respectively, but not understood by each other. Amharic is a language spoken in both regions but in a very limited scale. Amharic is more spoken in the Afar Region, however, mainly in the areas bordering Amhara Region. Lack of common language might affect the collaboration between the two regions. Low education level in Afar Region does not significantly contribute to the increased language capacity in the region.

5.4.5 Religion

Overwhelming majority (95.6%) of the population of the Afar Region are Muslim and 95.4% of the population of the Tigray Region are Orthodox Christians. In ANRS, next to Muslim are Orthodox Christian with 3.9%. Protestant comprise 0.4% of the population. In urban areas the proportion of Muslims decreases to 63.3% while the proportion of Orthodox increases to 32.8%. Majority of Tigraway, Welayita, Ertireans and Guragie ethnic groups are Orthodox Christians. All Affars are affiliated with Muslim religion. 97.5% of Argobas were also Muslims. In TNRS, next to Orthodox Christians are Muslim with 4.1%. Protestant and Catholics comprise insignificant proportion of population of the region. Proportion of followers of traditional and other religions are also negligible. The religious composition of population in rural area resembles that of the region. In urban areas the proportion of Orthodox Christian decreases to 87.4% while the proportion of Muslim has increased to 12%. Majority (80%) of Agew-Awingi, Agew-Kamyr, Amhara, Kunama and Tigraway ethnic groups are Orthodox Christians. The Affar and Oromo are dominantly affiliated with Muslim religion. The Saho are divided into Orthodox (41.5%), Catholic (43%) and Muslim (15%).

Religion also reflects ethnicity being harmonious within the regions. Within the regions no conflicts are expected but in occurrence of conflicts e.g. border conflicts religious aspects can further aggravate the problem.

5.4.6 Household size

There are differences considering the average household size and the total number single headed households accommodate population. In the ANRS average household size is 5.7 persons per household, in urban and rural parts 3.7 and 6 respectively. Average household size in the TNRS is 4.3 persons per household, in urban and rural parts 3.8 and 4.5 respectively. In ANRS, single person households comprise 4.21% of the total households and accommodate 30.4% of the population. Distribution of persons per household exhibit different picture in urban and rural areas. In TNRS, single person households comprise 9.9% of the total households and accommodate 2.3% of the total population. Households with five or fewer members constituted 70.4% of the total households and accommodate 51.% of the population. Distribution of persons per household exhibit different picture in urban and rural areas. Proportion of small size households is higher in urban areas in both Regions.

Even though in Afar Region the percentage of single-headed households is low, those households accommodate almost one third of population. Single headed households are often the most vulnerable households.

5.4.7 Heads of households

Male headship rates are higher than those of females in both regions and at all ages reflecting the fact that men assume the role of the chief bread winner in the household and bear the main responsibility for family affairs, apart from domestic chores, child bearing and child rearing. In ANRS, the rate among females is significantly lower than males in both urban and rural areas. In TNRS, the rate among females is significantly higher in urban areas than in rural areas while the opposite is true among females. In ANRS, for females in rural areas the peak is at the age group 65+. In urban areas out of the total number of heads of households 22,214 with population of 63,822 people, there are 16,548 male headed households (74.5%) accommodating 32, 734 person and 5, 666 female headed households (25.5%) accommodating 31, 088 persons. In rural areas there are out of the total number of heads of households 168,479 with population of 709, 906 people, there are 147, 632 male headed households (87.6%) accommodating 404, 893 persons and 20,847 female headed households (12.4%) accommodating 305, 013 persons.

It is worth noticing that the population accommodated by female and male headed households is almost similar despite of the fact that the percentage of male headed households is

significantly higher. This implies, that female-headed households are larger size, taking care of a number of family members. Female-headed households are in most cases more vulnerable than male-headed households. Female-headed households are in most cases single-headed households which increases their vulnerability.

5.4.8 Type of residence

99.6% of population of both regions reside in conventional households, while only 0.3 live in non-conventional houses and the proportion of homeless is very insignificant. In ANRS, this is reflected also in Zones 2 and 4. Majority of the homeless is adolescents or adult males and concentrated in the group 15-64 years in both regions. There are more homeless people in Zones with urban centers (Zones 1, 3).

Most of the houses in both regions are conventional houses. In case resettlement/displacement occurs, conventional houses are expected to be displaced. Even though houses are conventional, their standard is quite poor. Most of the houses built in rural Afar is makeshift type. Conventional houses are found in urban area. The conventional houses found in rural Tigray lack corrugated iron roof, water and electricity. In the affected woredas in Afar Region, this applies also in urban areas. In affected woredas in Tigray Region, the standard of houses is much higher in urban areas. More compensation costs are expected there in case resettlement/displacement occurs.

5.4.9 Age distribution

In both regions, the age structure is characterized by much higher proportion of young and low proportion of old age, reflecting the prevailing higher fertility rate. Population at young age group (below 15 years) makes up 51.1% and 44% of the total and those at old age group (above 64) constitute 3.1% and 5% in ANRS and TNRS, respectively. The proportion of population aged 15-64 in ANRS is 45.8%. The age-sex composition of the population by functional age groups showed modest variation by zones in both regions. Among persons in the age group 15-64 females outnumber males in all Zones.

In both regions large proportion of young working age population places a lot of pressure on the economic development of the regions. New employment opportunities are required to decrease the vulnerability. On the other hand large working age population is a potential labor force that could be utilized. During road construction employment opportunities should be given to local communities to promote local economy. Out of the working age population women are larger in number.

Large proportion of young population implies that many people are sexually active and prone to sexually transmitted diseases.

5.4.10 Dependency ratio

The age structure of the population in both regions is characterized by a large proportion of younger age groups which shows the high level of dependency. Overall dependency ratio for Afar Region is 91.7 and 95.1 for Tigray Region with dependency ratio of 88.3 /87.3 for the young and 3.4/7.8 for the old, respectively. Dependency burden in rural areas is higher than that of the urban areas.

Higher dependency in most cases means increased vulnerability when available household resources need to be shared amongst larger number of family (and or extended family) members.

5.4.11 Sex composition

Sex ratio at birth in ANRS is around 105. Since mortality rates are higher among males this ratio tends to reduce as age advances. However, overall sex ratio is 130.7 males per 100 females. Sex ratio for rural areas is particularly very high with around 132.8 males per 100 females. Sex ratio for children under 1 (122) falls outside an acceptable range and remains stable up to age group 1-4. For the 15-19 age group the sex ratio rises to 159 males per 100 females. Thereafter, it fluctuates up to the last age group (75+). In urban areas, at age group 15-19 years there are 92.7 males per 100 females and at age group 70-74 years 159.5 males per 100 females. It is surprising to observe a very high sex ratio in the older age groups for rural areas. For example, in age group 65-69 years, there are 248.8 males per 100 females. Sex ratio in TNRS for children under 1 (around 103.1) falls in an acceptable range and remains stable up to the next two age groups (i.e., 1-4 and 5-9). For the 10-14 age group the ratio rises to 110.7 thereafter falling down up to age group 30-34. Beyond this age group the sex ratio fluctuates from one age group to the other.

Sex ratio for children below one year falls outside acceptable range in both regions. This implies, that preference is given to boys after birth. Available family resources are used to ensure, that boys survive the first vulnerable years of childhood. This attitude is also reflected in later years. In rural areas sex ratio is in most age groups high i.e. there are more men than women. This is particularly evident in the Afar Region, where access to health care is limited or non-existent in some areas. Preference is given to the health care of men and boys, and e.g. maternal mortality rates remain high. In Tigray Region the situation is more balanced which implies that access to health care is easier. In urban areas in both regions the situation is reversed which shows that with improved access to health care the preference given both sexes is more balanced.

5.4.12 Marital status

The highest proportion of the Afar and Tigray Regions' population (43.1%/61.2%) aged 10 years and over have been engaged in marriage. In ANRS about 5.6%, and in TNRS 13.1% have dissolved their marriages by either divorce or widowhood. The proportion in dissolved marriages is significantly higher among females than males in both regions, indicating remarriage to be higher among males than females. Marriage among females starts early in the Region. Compared to females, males enter into marriage late (SMAM 27.9 in ANRS/24.9 years in TNRS).

There are more dissolved marriages for women than men placing them in a more vulnerable situation. Largely in the project area the traditional marriage law is followed which in most cases leaves women with limited resources, if nothing at all. Divorced women do not re-marry as often as men implying that they need to survive with their own means.

5.5 Economic activities and development needs

5.5.1 Afar National Regional State

Primary occupation is livestock rearing or pastoralism (92%). Crop production, trade and mixed agriculture are the other occupations. Regarding secondary employment of pastoralists, it is almost non-existent. Therefore about 91% are without secondary occupation except for a very small proportion of pastoral community. Low level of secondary occupation has reduced the capacity of generating additional income for the pastoral community economy and, thereby, has not improved the food security status of the household economy.

Among the population aged ten years and over 626 041 or 80.6% were reported to be economically active and 149 663 or 19.3% economically inactive. Among the male population

92.4% were economically active and 65.2% of female population. In urban areas women are almost equally active than men and in rural areas men are significantly more active which reflects the fact that women's work as housewives is not considered as being economically active. This is also reflected in Zones 2 and 4:

In Zone 2: Economically active male 93.3% (72 266); female 51.1% (30 893). In Zone 4: Economically active male 94.7 (45 101); female 68.0% (24 980)

Livestock rearing/pastoralism

The Afar are specialized in the production of livestock. They herd cattle and camels as primary livestock; goats and sheep as secondary livestock, and donkeys as means of transportation. The importance of animals in the socio-economic life of the Afar can be seen by looking at the relative size of each herd, which may run in hundreds and thousands, depending on the human population that is dependent on the herd. Livestock and livestock by-products provide the main proportion of household food and cash income. Dry range lands, characterized by sandy soils and long-lasting dry season, constitute the environmental setting. Maintenance of animals is based on feeding grass and plants, which become scarce during the dry season. Livestock mortality is very high due to the environment. In addition, animal disease is frequent and reduces productivity. Livestock production is based on grazing resources and availability of water. Provision of veterinary services is scanty in the region. Livestock rearing is therefore dependent upon climatic changes. The survival rate of camels is relatively high during drought, and the households that own camel also cope up consuming camel milk. Small stocks particularly goats exist with camels despite of drought conditions.

Most Afar are pastoralists but are restricted in their movements by harsh arid climatic conditions. A number of them in Awsa's territory have long been settled cultivators in the lower Awash River valley around irrigated agriculture schemes along the middle Awash. However, Afar pastoralists remain vulnerable for various reasons. They are essentially trekkers, bringing animals and caravans of goods to traders. Trading lines controlled by Highlanders or Issa Somali and price mechanisms are not in the hands of the Afar (except ghee butter, dum palms and up to now the Dalol salt). Consequently, Afar traditional economy appears to be particularly vulnerable for lack of cash and income generating alternatives. As far as resource management is concerned, pastoralists are facing wayane bush encroachment (*prosopis juliflora*) infesting grazing areas.

Livestock are private property, individually owned by both male and female members of the family. Rangelands and water resources are managed as a common property and usually controlled by each clan or sub-clan units. Each clan or sub-clan apply rules of traditional and social control, which regulate the access and coordinate the actions of individual managers in the utilization of natural resources. The socio-economic survey conducted in Afar region has indicated that there are a total of 11 932 450 livestock present in Afar region. Out of these cattle comprise 43%, followed by goats 5 717 641 (47.9%), and camels 1 078 495 (9.1%). (Rangeland and Water Development Study. Vol IV: Socio-Economics and Environment. Draft Final Report. December 2000. Metaferia Consulting Engineers/ANRS).

Livestock rearing is almost the only means of survival for the Afar population. This implies, that any development intervention should take into consideration the specific requirements of the livestock economy. In addition, development interventions should support development of secondary means of income to reduce vulnerability caused by single product based economy. Road to be constructed should improve access to and for veterinary services, markets and grazing areas. In addition, it should provide access to other extension services available within the government structure. In this respect, development of woreda centers as service providers is crucial and it cannot be done without proper road network. Meanwhile, road should provide access to any available and affordable veterinary services to reach the livestock. In addition, the movements of the livestock during the year, and to and from market places where livestock

are sold and goods purchased, are important in order to provide access to veterinary services to the areas where the majority of the livestock resides at certain times.

Livestock marketing in Zone 2 and 4

The major markets for Zone 2 livestock grazers are Ab-Ala, Mehoni (in Tigray Region) and Kuneba. Ab-Ala is the major trading centre of goats. Market takes place on Thursdays. There are also few sheep, cattle and camels for sale. The supply of the market comes from distant places like Afdera, Erebt, and Teru woredas. Traders take the livestock they bought in Ab-Ala to markets in Mekelle, Woukro and Adigrat in Tigray Region. The supply of livestock market day is 2625 heads.

Mehoni is a town located in Tigray Region and is not the most important livestock market for Afars but rather is reported to be a place where Afars buy grain. However, also livestock marketing takes place at Mehoni market.

Zone 4 is adjacent to the highlands of Tigray and Amhara regions. Most of the markets for the population of Zone 4 are located in Amhara region. Most important markets are Yalo, Hara, Alamata and Alellesuba. Although the Yalo market occurs on Tuesdays most the traders come to the market once a month. There is a trend for the price of livestock to fall down. The only time price of livestock increases is when there is good harvest in the neighbouring highland areas which leads to increase in livestock demand in these areas. Alamata is a market located in Tigray region. Only few Afars come to Alamata market, and they do not come to sell livestock but buy grain.

Location of the market centres within and outside of the Afar region are far. It takes 2-3 days to trek marketable livestock. Loss of weight of animals is inevitable, which means low price. Limited number of buyers is also a critical problem in determining livestock price. During draught time as the amount of milk obtained from the community's livestock is not enough and families are forced to sell their livestock with low price. Price of grain coming from the highland areas in contrast is very high. Supply of cereals in the market is very low as a result price for cereals very high.

The main reason for Afar population to cross the regional border to Tigray Region is for livestock marketing and purchasing of grain. There is very limited movement from Tigray Region to Afar Region across the border area. Markets in Afar Region are less developed and no such goods are available there that are not available in Tigray Region markets. Markets in Tigray Region are at long distance for Afar population and herding the livestock to these areas leads inevitably to the loss of weight of the livestock to be sold and, accordingly, lesser price. It can be argued, that if the internal Afar markets were more developed and the goods (grain) available in the Afar markets, the traveling needs of Afar population would decrease in Tigray Region and be more targeted towards the developing Afar markets (MCE, 2000). They would still sell livestock in Tigray Region when there is a real need, but the main markets would be within the Afar Region. Development of the Afar Region markets in the areas where the livestock resides most of the time would ensure, that livestock does not lose its value when traveling long distances.

Agropastoralism

In Afar region land is communally owned property. It is owned and utilized by the Afar clan. Each clan has a territorial unit for exclusive use of the respective clan. Recently, however, the clans have reached consensus that each and every clan will have the right to graze their livestock in any clan territory provided it respects the territorial supremacy of the other clan.

Forced by the recurrent drought and the continuously increasing price of cereals there are indications that the Afar community is taking up non-pastoralist activities such as agro-

pastoralism as secondary occupation. Households that are engaged in agro-pastoralism comprise 32.7% of the total number of households in the Region. Out of the total number of kebeles in Zone 2, Ab-Ala woreda, residents of 8 kebeles are producing rainfed agricultural crops including maize, sorghum, barely and teff. Kebeles are: Dergamo, Adi Harmeli, Worker Gubi, Asengalo, Hidmo, Whedet(ketea), Hirdan and Wesema. Majority of the people have permanently settled in the area. Their livestock is herded during the dry period to the grazing area by young people. Remaining members of the family remain in their respective location producing crops.

In Megale woreda in Zone 2 there are about 82 pastoralists who are practicing rainfed crop production including sorghum, maize, teff, chick pea and barley in six kebeles. Kebeles are Afdar (51 persons), Aradu (7 persons), Keritu (10 persons), Gubdaba (6 persons) and Faro (4 persons). In Ewa woreda in Zone 4 about 120 households are growing maize in three kebeles. In Aura woreda about 39 persons cultivate crops including maize, sorghum and teff on a small plot of land in 6 kebeles. The yield level from these small plots of land is very low.

Agropastoralism is practiced particularly in Ab-Ala and Megale woredas. In case of road construction access to extension services available within the government is a key for improved productivity. Road alignment to be selected should provide access to the areas where agropastoralism is practiced. This would improve vulnerable economy by providing an alternative source of livelihood. (MCE, 2000)

Conflict over resources

The most serious conflict in the Afar Region is the conflict between Afar and Issa who control and claim a large area of land within the Afar territory. Conflict is over the natural resources, but has changed its nature to a more political conflict. There are also conflicts between Afar and Oromo, and Afar and Amhara over the utilization of the grazing areas and water points. In Zone 2, Ab-Ala woreda there is internal conflict over grazing land and water points with people from Tigray Region. Conflict areas include Arado kebele and Raya Azebo woreda in Tigray Region, Gelaiso and Hintalo Wajerat kebeles in Tigray Region, and Kuneba woreda, Wesama kebele and Deragaina in Tigray Region. In Megale woreda there is a conflict over grazing and water points within and out of the woreda demarcation. Conflict areas are located between the following locations: between Aredu and Adaldera; Kenito and Raya Azebo and partially Wajerat, Gubidaha and Adiwajrat (Mehoni). In Zone 4, there are conflict areas between the Ewa woreda in Afar and Amhara Region caused again by grazing land and water points. Conflict areas include Gubena Mormor (Ewa), Harara and Filwoha (Habru), Mersa and Sirinka areas in Amhara Region. People of Aura woreda have a conflict area between people of Kobo woreda.

External conflict areas include conflict between Afar and Issa, and Afar and neighboring escarpment areas of Amhara, Oromia and Tigray Regions. Confrontation with neighbouring escarpment areas of Amhara, Oromia and Tigray Regions is solely a result of vested interest in resource use. Confrontation is sporadic and related to availability of grazing areas and the need to use the escarpment areas for grazing. Highland farmers also trek their livestock into the territory of Afar Region in time of shortage of water and feed.

Project affected woredas are main conflict areas being the bordering woredas between Tigray and Afar Regions. Confrontation is sporadic and is not expected to cause major difficulties for the road use. However, the conflict exists and needs to be considered particularly in cross-border cases.

Development needs and priorities

According to the socio-economic study undertaken in the Afar Region, the needs expressed by local authorities, pastoralists and various agency representatives (mainly men) include: water;

health (human and animal); and education (Socio-Economic Rural Household Survey - Afar National Regional State, FDRE. Vol. I., November 1997). In addition to these priorities, various problems have been identified for specific areas such as poor animal marketing, flooding and Awash river bed diversion, grazing land rehabilitation and security for "border areas" with the Issa, Tigray and potentially with the Oromo. Recommendations as stated in the study:

- Training and capacity building in marketing through pastoral market associations in order to infect the terms of trade;
- Market associations to adopt a broader perspective like pastoral associations using a holistic approach that would take into account water and grazing management as well as marketing;
- Explore all possibilities for economic activity diversification;
- Water interventions;
- Peace building;
- Ecological questioning of grazing rehabilitation through measures to control wayane proliferation;
- Use of media, particularly the radio, for information dissemination campaigns (HIV prevention, animal diseases, animal marketing etc.).

Identified development needs provide the basis for understanding what kind of needs the road to be constructed should serve in the Afar Region. For most of the needs access is a crucial factor. Training and capacity building at the level of kebeles (pastoralist associations) does not succeed without improved access. Woreda Councils need to be in a position to provide the required assistance together with the support of zonal and regional administration. Peace building requirements between Afar and Tigray Regions need to be taken into consideration when deciding on the road alignment.

According to the study, development priorities of Afar women are related to lack of basic social and other services and harmful socio-cultural practices. Following problems of women were repeatedly cited, and they also reflect the general problems in the Afar Region as such: drought; lack of water; lack of access to health services and mills; lack of accessible roads; lack of market services; low price for livestock and lack of access to schools. In few cases crop growing activities were mentioned e.g. lack of agricultural implements. New development trends are, however, coming to the Afar society as well. Need for accepting other means of income than livestock rearing has become evident due to decrease of reliance in rain resulting in prevalence of a series of drought seasons. Some women have started vegetable growing in Ab-Ala woreda, in Ewa women are engaged as daily labourers in road construction and in Dulecha woreda some women are engaged in saving and credit programme. This indicates that there is room to involve women to broaden the income generating base.

Needs of Afar women reflect the development needs identified by men. However, there are few additional aspects that can be specifically mentioned, particularly strong resistance to traditional harmful practices. Afar society is a very traditional society where change is expected to take time. However, traditional harmful practices constantly degrade women and place them in an unequal position with men. Some of the practices are even dangerous to the health of women e.g. female circumcision. Without access to assistance (awareness raising, health centers and improved education) the situation will not change. Road to be constructed should be in the areas where maximum benefit of eradication of harmful traditional practices can be achieved.

5.5.2 Tigray National Regional State

Three fourth of the economically active population are skilled agricultural and fishery workers. This differs between rural and urban areas. In urban areas significant number of the economically active persons are reported to be service workers: shop and market sales workers group (26.8%), crafts and related trade workers group (18.3%) and those engaged in elementary occupations (18.3%). The pattern observed above is also true for males and females in both urban and rural areas.

Among the population aged ten years and over 69.5% were reported to be economically active and 30% economically inactive. Among the male population aged ten and over 76.4% were economically active and 63.1% of female population. Women residing in urban areas are almost equally active as men. More inactive female are reported than active females (34.7% active against 64.8% in active). The imbalance is caused due to the under reported contribution of housewives in urban areas. In Debubawi Zone: economically active male 82.13% (180 588); female 56% (127 822)

The economy of the Tigray Region is more diversified than the Afar Region economy having thereby more development potential that can be speeded up by road construction. Road alignment in Tigray Region might have more impact in the national economy of the country, as the alignment in Afar Region has clearly significant impact on the regional development and its economy.

Livestock rearing

According to the regional income accounting estimation 21.32% of the total regional GDP emanates from the livestock sub-sector. The official estimate of animal population is 8,100,743 of which cattle account for 2,149,400 sheep 2,526,020 goats 3,035,140 camels 23,740 and equine 366,443. Sheep account for 31% of the total animal population. Goats hold the highest number (3,035,140) accounting for about 37.5 percent of the animal population. Mehakelegnaw and Merabawi Zones have relatively larger goats concentrations 1,153,600 and 945,620 respectively. In general, goats are kept everywhere in the region, either with sheep or, in some places as separate flocks. Most of the goats population is believed to be of indigenous breed.

Pack animals include horses, mules, donkeys and camels and account for 4.8% of the total animal population. Equines are kept mainly for transport, for draft work in some areas, as well as for riding. Camels are important in the low lands for transport and riding. The over all distribution pattern shows that the region possesses a limited number of equine and pack animal population relative to others.

In Tigray Region livestock rearing is also an important source of living and its requirements need to be taken into consideration in development interventions. Livestock rearing is not as vulnerable in Tigray Region as it is in Afar Region. Because of urbanization and more developed administrative zonal and woreda centers, it is possible to have easier access to services required. Bordering area between the regions is draught stricken on both sides of the border, thereby adding vulnerability factors to livestock rearing. However, distances to centers are shorter and availability of services and goods broader.

Domestic trade

Up to June 1994 a total of 3,272 whole sales, 10,767 retail and 3,954 service licenses were issued by Tigray Trade Bureau. In the given year the total number of domestic private traders in the region are distributed by zone as follows:- Mekelle 2,412, Debubawi 4,098, Misrakawi 3,670, Mehakelegnaw 3,617 and Misrakawi 4,205. The highest number of wholesalers are in Misrakawi (1,074 of the total) and the lowest in Debubawi (405). The highest number of retail

traders are in Merabawi (3124 of the total) and the lowest in Easter (1,801). And for the service giving establishment size the highest number are in Debubawi (1,341 of the total) while the lowest in Merabawi zone (542).

In the project affected Debubawi Zone there are a large number of domestic private traders and service giving establishments. It is expected that some resettlement/displacement cases will occur also to the service establishments. Traders in the Debubawi Zone are potential traders also in the Afar Region given access to the Afar markets. Most of the traders in developed Afar markets (Ab-Ala, Megale and Yalo) are expected to come at least initially from the Tigray Region. Their willingness and interest need to be taken into consideration when designing the alignment.

Hides and skins

The volume of production of hides and skins is directly proportional to the number of livestock slaughtered. In 1993 a total of 830,443 in 1994 1,101,326 and in 1995 1,258,643 hides and skins were delivered from Tigray region to Mehakelegnaw market. In 1995 out of the total regional production delivered to Mehakelegnaw market there were 14,878 hides, 663,886 sheep skins and 609,879 goat skins. In the same year regional share of hides 1.2%, sheep skins 50.4% and goat skins 48.4%. The zonal share is as follows: Debubawi 39.4%, Misrakawi 29.7%, Mehakelegnaw 14.8% and 16.1% Merabawi Zone.

5.6 Access to services

In Afar Region all access indicators are very low also in the country context. Most indicators are the lowest in the country. This implies the low level of general development of the region, and the urgent need to develop it in view of a balanced development within the country. Unbalanced regional development might have implications in the stability of the country.

5.6.1 Access to education

School attendance and enrollment

School attendance in both Afar and Tigray Regions in the past and at present is very low. However, it is still remarkably lower in Afar Region. In Afar Region 92.4% and in Tigray Region 78.4% of the population have not received formal education. The current and past school attendance are relatively higher in the urban areas in both regions. In Afar Region 24.3% and 41.1% in Tigray Region have been attending school. In the Afar rural area, majority (96.3%) and in Tigray 85.2% never attended any formal education. School attendance for is higher for boys than for girls in all zones in both Regions. Availability of schools is better in urban than in rural areas. This creates better opportunity for schooling of children of urban dwellers than in rural areas.

As far as net enrolment ratios for Afar Region zones are concerned the highest rate for all levels is recorded in Zone 3. Also the proportion between female and male is more balanced. The ratios were 10.5% for primary, 5.2% for junior secondary, and 3.8 for senior secondary levels. In Zone 2 no pupil whose age is either between 13 to 8 is found in junior and senior secondary levels, respectively. Zone 4 and Zone 5 do not have pupils in neither junior secondary nor senior secondary levels. The net enrolment ratios for urban areas are observed to be very high compared to rural areas. No significant difference between the two sexes exists in each level in urban areas. 9.9% of the total enrolment takes place in non-regular institutions. In Debubawi Zone in Tigray Region urban+rural combined attendance for male is 18.95% and for female 12.6% so no major difference for attendance between sexes exists. (CSA 1996)

Table 5.12: School enrollment in the affected zones woredas in Afar Region (The 1994 Population and Housing Census of Ethiopia. Results for Afar Region. May 1999, Addis Ababa.)

| AFAR REGION | Zone 2 | Zone 4 |
|---|-------------------|------------------|
| Total primary school enrolled by sex | Urban male 79.7 | Urban male 28.6 |
| | Urban female 43.6 | Urban female 0 |
| | Rural male 6.1 | Rural male - |
| | Rural female 1.7 | Rural female 1.0 |
| Total junior secondary school enrolled by sex | Urban male 46.7 | - |
| | Urban female - | - |
| | Rural male 0.4 | - |
| Total senior secondary school enrolled | Rural female 0.6 | - |
| | Urban male - | - |
| | Urban female - | - |
| | Rural male 0.8 | - |
| | Rural female 0.6 | |

Education is the key to the development of the entire region. Low school enrollment rates in Afar Region indicate that it still lacks sufficient school and teacher network, and that future human resources for development are limited. In addition, there are big discrepancies in education of boys and girls. This continues the existing situation where unequal opportunities between sexes prevail. Reasons for limited number of schools in Afar Region are also related to accessibility. Schools cannot be constructed where there is limited access. In addition, even if schools exist, it is difficult to get teachers to areas without access to towns and centers. Quality of education suffers.

Enrollment is low in both regions, but alarming in the Afar Region. Afar Region has cooperation agreement with Tigray and Amhara Regions for expert support. However, there is a tendency in the Afar Region to become dependent on other Regions and the number of experts in the Afar Administration has decreased. In order to ensure that Afar population has an opportunity to administer its regional development independently, investment in education is crucial. Improving the access in the previously non-accessible areas will facilitate in this process. Improved and faster access might also improve the possibilities of girls to attend school. They are not expected to travel long distances to school. High illiteracy rate and lack of educational institutions are a reflection of the same situation. Conditions for development in Tigray Region are at much higher level than in Afar Region.

Literacy rates

There is a significant difference in the literacy rates in the two regions. Only 7.4% of the population are literate in the Afar Region as compared to 20% of the Tigray population. The main difference exists in rural areas. Among the urban dwellers the literacy rates are almost similar 57.2% (Tigray) and 53.8% (Afar). The corresponding figure in rural areas is only 3.1% in Afar Region but in Tigray 13.7%. Literacy rate and school attendance in Afar are one of the lowest in the country even if compared to Somali and Benishangul-Gumuz Regional States.

Table 5.13: Literacy rates in the affected zones in Afar Region (The 1994 Population and Housing Census of Ethiopia. Results for Affar Region. May 1999, Addis Ababa.)

| | Zone 2 | Zone 4 |
|----------|--------------------|-------------------|
| Literacy | Urban male 43.35 | Urban male 27.56 |
| | Urban female 23.11 | Urban female 9.53 |
| | Rural male 5.51 | Rural male 3.16 |
| | Rural female 0.92 | Rural female 0.41 |

In Afar illiteracy is relatively more among Afars (97%) followed by Argobas (73.9%) out of the respective population. Literacy rate also varies by religion. In Tigray illiteracy is relatively more among Amharas and Tigraways about (79%) followed by Sahos (73.8%) out of the respective population. On the other hand, most of Tigraways (70.3%), Sahos (68.2%) and Amharas (53.2%) have completed primary grades. Relatively significant proportion of population in urban areas are literate. This can be attributed to the higher number of schools and relatively better school facilities that are available in urban areas, the influx of literate population from rural to urban areas searching for jobs and other better opportunity. Relatively more males than females are literate in both urban and rural areas.

Literacy rate among zones in Afar region ranged from 19.8% in Zone 3 to 0.9% in Zone 5. Literacy rate is higher in urban than in rural areas in all zones (except zone 5) and for males than females in all zones. Zones 1 and 3 rate better and Zone 5 worse. In Tigray Region also relatively more males than females are literate in both urban and rural areas. In all zones, except in Debubawi, the majority of literate population, about 3/4, have completed primary grades. In Debubawi zone 58% of the literates completed primary grades.

According to the socio-economic survey in Afar Region, majority of population lack access to educational institutions. Only 9.7% have access to modern school and 14.8% to religious school. (Socio-Economic Rural Household Survey - Afar National Regional State, FDRE. Vol. I. November 1997)

Number of schools and other educational institutions in TNRS

In Tigray the number of schools in 1996 was 703. Teacher/student ratio was 1:45. There is less provision of the service in Merabawi Zone and relatively better in the Misrakawi Zone. Higher Education and other training institutes are new features for Tigray since 1992. Today, there are a several training centers in the region owned by government and non-governmental organizations. Government institutes are e.g. Mekele Business Collage, Adwa Teachers Training Institute (TTI), Mekele Nursing School and Axum technicians school. Other institutions are Mekele University College, Maichew Technical School (college), Abi-Adi Teachers of 1998. There are also Technical Vocational Training centers in Mekele, Korem, Adigrat and Axum expected to start giving training in 1998 by Tigray Labour and Social Affairs Bureau. The Ainalem Management institute. Non-Governmental institutes: There are also technical training centers run by non-governmental organizations. The Tigray Development Association has two skill training center in Kalamino near Mekele and Selekhelekh (Merabawi zone). Trainees from these centers are working in the on-going construction activities in the Region. Don Bosco has established technical school in Mekele, Wukiro and Adwa to train medium level technicians in building and mechanical fields in Mekele and Adwa and in Business and Agriculture in Wukiro.

Access to water sources

In Afar Region, population has very limited access to potable water supply. The total number of households (housing units) is estimated as 188 860 (CSA, 1996) out of which 167 182 are in rural areas (88.5%). Rural households that have access to tap water is very limited, 3.2%.

Housing units that use protected well/spring are 2%, and unprotected well/spring 27.2% , river/lake/pond 67.4 %. Access to unprotected water supply sources is also difficult and the water sources differ significantly by season. During the rainy period they have relatively easy access to water sources both for human and livestock consumption. During rainy season almost half of the population (49.6%) has access to water points within 30 minutes walking distance, and 22.6 between 1/2 - 1 hours. During the dry season only 14% have access to water point within 30 minutes. Zone 2 and 4 from well 54.8% and 66.8% respectively during dry season; during rainy season 49% river and 57.6% river .

In 1995 in Tigray there were 481 wells fitted with pumps and 81 springs were developed, and installed one wind and one solar pumps. The distribution of hand pumps is not even. 41.4% are located in Mehakelegnaw Zone, 24.1% in Misrakawi zone, 19.1% in Merabawi and 15.4% in Debubawi Zone. The location of spring development: 51.8% are in Mehakelegnaw, 32.2% in the Misrakawi and 16% in Debubawi Zone. There is one wind pump and one solar pump in the Misrakawi zone. There are a total of 52 motorized water supply points in the whole region of which 16, 14, 12 and 10 are found in Debubawi, Merabawi, Mehakelegnaw and Misrakawi zones respectively. The total water generating capacity of all the water points is estimated to be 2,928 m³ (excluding the water points in Mekele) of which 31.8, 23.0, 22.9 and 22.2 percent of the water available is located in Misrakawi, Mehakelegnaw and Merabawi zones respectively.

Access to health services

Availability of health services in Afar Region is one of the lowest in the country. Percentage of households having access to: health post (0.37%), health center (16.32%), clinic (77.81%) and hospital (5.5%). Health services are situated in relatively distant places if the settlement pattern is taken into consideration. Proportion of households having access to health services within an hour is only 8.36%, 16.20% between 1-2 hours, 10.83% between 3-4 hours, 13.18% between 4-5 hours, 36.99% more than 5 hours. Generally, more than 75% of the households should at least travel 2-3 hours to have access to health services from the nearest health institution. Capacity to give services is very low: 1 health post/1 150 890 persons; 1 health center/287 722 persons; 1 clinic/31 105 persons and 1 hospital bed/17 706 persons.

In 1995 in Tigray there were 143 clinics (excluding Mekelle), 16 health centers, 6 rural hospitals, 4 zonal hospitals and 2 referral hospitals. In 1994 there were 1,180 hospital beds to serve 3,136,267 people in the region. The health personnel/population ratio seems insufficient. However, there is a great expectation that the situation will improve significantly when the Regional Referral Hospital at Mekele and Zonal Hospitals at Indaslassie, Maichew, Abyi Addi and health centers in different towns are completed.

The zonal distribution of health institutions in the region more or less correlates with population distribution. Mehakelegnaw Zone with one referral hospitals, one zonal hospital, one rural hospital, 4 health center and 44 clinics and a population size of 943,850. Merabawi Zone with a population of 733,962 has one zonal hospital, 2 rural hospital, 4 health centers and 38 clinics. Debubawi zone with a population of 970,447 has one zonal hospital, 2 rural hospital, 5 health center and 33 clinics while the Misrakawi zone with a population of 584,946 has one zonal hospital, one rural hospital, 2 health centers and 28 clinics.

Access to agricultural extension service

Provision of agricultural extension services play an important role in attaining high agricultural productivity. About 80.7% of the households in the socio-economic survey carried out in the Afar Region did not get any type of extension services and 19.3% only had obtained at least one type of service (Socio-Economic Rural Household Survey - Afar National Regional State, FDRE. Vol. I. November 1997).

Except for the veterinary service, provision of other extension services are non-existent (soil and water, credit, home economics etc.). Only 48% of households had received veterinary services. In a region where households depend almost solely from animal husbandry, this is not encouraging. In areas where awareness of the residents about the causes for degradation of environmental conditions is low and provision of appropriate agricultural development programmes are lacking, the environmental conditions will go down from bad to worse. Over 90% of the household heads had experienced a recent drought where the magnitude of losses of animals and agricultural products ranges from very high (58%) to medium (35.6%). Unexpectedly, about 82.6% of the drought affected households did not receive any assistance (food aid). In Tigray Region 28.8% of the veterinary centers are located in both Mehakelegnaw and Merabawi Zones, 22.4% in the Misrakawi Zone and 20% in Debubawi Zone.

5.7 Transport system and travel patterns

5.7.1 Mobility and settlement pattern of Afar pastoralists

Mobility and settlement pattern can be divided into permanent and temporary camps. Each clan has its own territorial unit but temporary migration is a common practice within and/or out of the regional boundary in search for grazing land and water for their livestock. Relatively permanent movement pattern of each clan is limited to territorial units. Even though, the territorial limitation of clans for grazing land and water points is generally abandoned, there are still conflicts between clans over grazing areas. Migration status of the nomadic pastoralists indicates that approx. 54% of the population stay in the same place throughout the year implying that majority of the livestock is herded to seasonal grazing areas by relatives and together with the herds of relatives. Migration areas of the pastoralists who limit themselves within Afar Region comprise approx. 44% of pastoralists, and those who move out most of the time out of the Region approx. 2.7%, and pastoralists who wander to various migration places in and out of the Region is only approx. 0.2%.

In Ab-Ala woreda, Zone 2, the movement of pastoralists for grazing land and watering points is synchronized with seasonal changes. During the winter season they stay around Ab-Ala and Kala areas. During summer time they move to Bahri, Gelaisso, Haridan (Asha and Wegeri), Asengola (Adu and Mebha), Wesema (Gubal and Alitro) and Adi Harmeli (Ali and Subli) kebeles of the woreda.

Pastoralists of the Megale woreda, Zone 2, stay in Hafalafa, Faro, Ganduli, Sahli, Adu, Derima, Limo and Alobis areas of the woreda during the winter season. There is sufficient amount of range and water resources. They also dig wells for their use in these areas. During the dry season they go to Bekaru, Dima, Tonsa, Deraitu, Deringha Berah, Harinekli, Mantblu, Giminda and Daligna which provide relatively good water sources. During the dry season they travel 7-8 hours to find water sources for livestock and for the household needs. During drought they move to Bahri located between Ab-Ala and Erebti, to Zone 4 (Yalo woreda), and to Tigray Region (Rayana Azebo and Dedebe woredas). In time of drought periods they also move to mountainous areas including Wageria which is located between Ab-Ala and Megale woredas (also Haflu, Subula, Gimimda, Dande, Serid and Skel in Megale).

In general, pastoralists in Ewa and Aura woredas stay most of the time in their localities since there exists enough grazing land and water. Chifera and Mille in Zone 1 are main grazing areas during the dry seasons. Also they go as far as Bati, Asayita, Haik and Woldyia during the draught periods. There are two potential grazing sites between the boundaries of Aura and Kobo woredas. These areas are also causes of conflict between the two woredas. They also go as far as Yalo, Teru, Chifera, Asayita, Ewa and Mille woredas during the drought period.

Mobility and settlement patterns indicate in which areas the services are needed to ensure support to the livestock and agropastoralist economy of the Afar Region. There is already a tendency for the pastoralists to settle down and the whole family migration is reducing. Thereby, the areas where families stay during the winter with sufficient grazing area and water are becoming more important in the Afar society. Still there is a need to migrate during the summer time and particularly during drought for search of water and fodder.

5.7.2 Availability, type and conditions of social services in Afar National Regional State

According to a socio-economic study conducted in the Afar Region (Socio-Economic Rural Household Survey - Afar National Regional State, FDRE. Vol. I. November 1997), the following characteristics notes can be made (sample area included e.g. Ab-Ala woreda):

- Distribution of households by **type of main road available** nearby: 44.2% in the sample area had access to dry weather gravel road; 33.9 percent had access to gravel all weather road, however, it is only 7.7% of total sample households who had access to asphalt roads.
- Distribution of households by range of **time needed to reach the nearest main road**: 51% in the sample area are more than 15 km far from the main road. 68.7% have to walk over 5 km to reach the nearest main road.
- Distribution of household heads by **means of transportation to market** place for household members and goods: 88.1% walk to the market while 4.7 use vehicle; 72.3% take the goods to market places by pack animals, human shoulder 18.1% and vehicles 4.4%.
- Range of **time needed to reach to the nearest market place**: 4.9% walk half an hour or less, 27.8% walk over two days, on the average close to 60% walk almost a day to reach the nearest market place.
- Range of **time needed to reach to nearest mill**: About 40% of the households need to walk over 1/2 day, 15.1% need 1/2 day or less, 29.4% need to walk a day or more.
- Access to **health services**: 18.2% have access to basic health services while 81% do not; 91.3% of households heads reported no health personnel available in kebele/locality; 87.9% reported that there are no trained midwives in kebele; 53.7% carry emergency health care cases to the health institution on their shoulders, vehicles are used in 3.3% of the cases; 53.4% rely on traditional healers/medicine; 31.3% travel long distance to get modern medicine; malaria is the most common disease (69.5%) requiring quick access to modern medicine.
- In Zones 2 and 4 the distance to the health facilities is longest (majority 32.3% between 1/day and 1 day).
- Access to **education**: 30% of households who have access to educational institution get services in a walking distance, about 34.2% have to travel from 1/2 an hour and 15.1% an hour to two hours. In Zone 2 majority walk between 1/2 day and over two days; in Zone 4 it is the same but a little easier access since some reside within two hours from the school. Zone 1 has the easiest access to schools.

5.7.3 Road Network in TNRS and ANRS

Road construction is one of the most important components of development. It is through access that all development endeavours can effectively be implemented. The TNRS has around 1261 km stretch of all weather road. Accordingly, the calculated road density in the region is 15.7km/1000sq. (the national coverage is above 25km/1000 Sq.Km). The distribution of roads by zone: 32.8% in the Mehakelegnaw Zone, 28.8% in Debubawi Zone, 20.8% in Misrakawi Zone and 17.6% in Merabawi Zone. Merabawi Zone is the least accessible when

compared to the other zones. Transport in many parts of the region is done on foot and by pack animals.

The road network and motorized traffic in the Tigray Region is at much higher level than in Afar Region in the project areas. Dehubawi Zone in Tigray Region has the second highest length of road network in Tigray. This indicates, that the basic road infrastructure for induced development exists. In the project area in Afar Region there is a limited road network (RR 10 cleared between Ab-Ala and Megale) without motorized traffic. Between Megale and Yalo there is a track used during the military operations, but it does not provide service for connecting between Megale and Yalo. Some access roads exist between the regions, but no proper road connecting Yalo and Ab-ala within the Afar Region exists.

5.8. Afar Society

5.8.1 Social Organization of the Afar

Social organization of the Afar is made up of vast territorial units, each consisting of human and livestock population. These units provide the largest permanent groups in the community and give individual members their social identity and their principal claim on natural resources. Usually, the livestock population is superior in number to that of the human population, and therefore the ultimate objective of pastoral production system is to match large herd size with the available water and grazing resources.

The main unit of social organization is the kinship group made of different herding families that are affiliated to each other through consanguine and marriage ties. Kinship group controls the property rights and succession in the local community. Other important elements include family units formed through polygamous marriage and other territorially organized herding groups. Kinship, descent and marriage are essential in organizing economic and property relations e.g. management and use of rangelands and water resources. Marriage practices are based on Islam law (polygamous marriage). The structure of Afar family is patriarchal.

The two main traditional institutions are called *Idola* and *Fiema*. There are strict by-laws that govern the institution to trial various social and economic cases among the existing clans. By-laws are transferred from one generation to another and the content is improved/modified according to the social and economic conditions of the respective clans. As a result certain rules and regulations of the traditional institutions vary from one clan to another. Most of the time these institutions deal with a number of civil and criminal trials that are the responsibility of the *woreda* and/or higher level courts.

Fiema is a youth association having a legislative, executive and judiciary bodies comprising a chair, vice chair and judges (3). *Fiema* is established in all clans. When the case goes beyond its judicial responsibilities it is transferred to sub-clan leader and finally to clan leader. **Idola** is elders association. It is formed at sub-clan and clan levels, and has also its legislative, executive and judiciary bodies. Chairpersonship is always held by sub-clan and clan leaders. Ambiguous cases beyond the responsibility of the *Idola* are transferred to jury of other clan leaders. Cases investigated by traditional institutions are e.g. adultery, rape and murder. In handling of the cases, usually persons from *woreda* government (*woreda* council and/or police) attend the trial. They can comment on the verdict for further rectification or adapt it as it is. Generally, traditional institutions have an important role in investigating civil and criminal cases in Afar society.

In each of the clan/sub-clan there are chiefs/leaders/representatives responsible for any social, economical and political matters. In earlier times the persons were recognized on hereditary basis. Now, position is gained either through election or inherit and depending on the persons strength in decision-making. Prominent elders in each of the clan/sub-clan with clan leaders

also play great role in decision making on matters like dispute settlement, usage and management of range lands, water and other natural resource, conflict resolution etc.

Mabilo is a loose, non-hierarchical socio-political structure, which exists at different levels of family structure. Members of Ganda budda and Iniki budda mabilo are mostly middle aged married women. Mabilo established at this level is mainly women's organization (men can also participate). Mabilo is established to settle disputes, solve conflicts between husbands and wives and advice in case of problems.

Grazer (Pastoralist Association) has been established based on the organization model of the Peasant Association in the highlands, and were formed during the previous regime. Grazers are currently restructured and reorganized to carry out administrative function within the government system. They are recognized mainly on the basis of clans rather than on geographical area. Grazer would not function without the support of traditional institutions. Traditional clan leaders play the most active role in decision making on social and political affairs including resource use and management that Grazer/Kebele Administration. Cooperative societies and farmers groups have been organized in some parts of the Region, which indicates that they can be established and promoted on the basis of clan/sub-clan as appropriate.

In any development intervention, it is important to take into consideration the traditional decision-making structures of the Afar society. Despite of the newly established decentralized government structure, the traditional bodies still hold important position amongst the population. Constant communication with these bodies will increase social acceptability of the intervention. In addition, if conflicts occur between construction workers and local population, traditional decision-making bodies will be aware of the purpose of the road construction. With their support conflicts can be solved in a peaceful manner.

5.8.2 Role of Women and Men in Afar society

Given the aridity of the physical environment and widely dispersed nature of the natural resources, the Afar are likely to increase their chances of survival by moving from place to another in search of pasture and water. Efficiency of the system depends on the collaborative efforts of different members. Animals usually graze some distance away from the camp and are cared for by young people. Men are responsible for mapping out the places where animals with the human population will migrate. As members of patrolling scouts young men are sent to search for water, browse and availability of salt. Men make decisions on when and where to move, and this has to be co-ordinated with other herding groups so that the whole process is a collective task involving the consensus of a number of herding families.

Women are active participants in the process of moving and locating human and animal herd in a new settlement site. They pack all household and other movable items and load them on a camel or donkey. In situations where only big animals move women usually stay behind and look after small stocks. Most of the activities Afar women have responsibility of are associated with getting and processing food, managing food rationing, fetching wood and firewood. Husband takes actively part in purchasing grain from the market and marketing, thereby, is done jointly. While women take sheep and goat to the market, men sell cattle and camels. Long distance marketing is usually done by men.

As regard decision making at the household level, most decisions are taken jointly by women and men. However, in most matters that affect the community decisions are done by men. When conflicts over the use of range resources arise, it is men who get together, discuss and resolve the conflict. Women are largely left out from making decisions concerning community wide concerns. Their routine role does not extend beyond domestic issues. There appears to exist no activity that falls outside Afar woman's domain except that men are exclusively

responsible for defence and ensuring security in the community. Despite of this, the society adores masculine characters and tends to downgrade woman's role.

Afar women are heavily overburdened with their productive and reproductive roles and are principal actors in the family. However, they are not given position and they do not usually hold leadership position in the traditional power structure. Pastoralist women are more than 80% responsible for fuel wood collection, in most cases on daily basis. They are responsible for child rearing. Children are considered as assets, accordingly, traditional or modern family planning practices are non-existing in the rural society. Immunization programmes for mothers are practically non-existing (in the study 93% of respondents lacked access).

Women's productive roles start with (makeshift) house construction, herding and watering livestock (usually small ruminants), milking, etc. It is the sole responsibility of women to build huts for the family. In the absence of their husbands, they undertake hoe cultivation, sowing, weeding, harvesting and transporting. As income-generating activities they produce a mat used for sleeping, other mats, sacks made of goat skin, butter and water containers and ropes. Particularly mat making creates additional income for the household. Both productive and reproductive roles become harder during the dry season and in general when there is shortage of water in the vicinity. As their livestock produce very little milk (main source of food), women are obliged to search for other sources and prepare e.g. porridge more frequently than during wet season. Such food preparation entails additional grain milling time. Water fetching becomes also more burdensome. Food scarcity has more impact on women and children than men (male adults) due to traditional eating habits where men always eat first.

Apart from some informal traditional support mechanisms in times of e.g. death, Afar women do not involve themselves in other formal associations. For example, the usually practised form of revolving fund or idir (association during mourning) is not known amongst Afar women.

According to the socio-economic study (Rangeland and Water Development Study. Vol IV: Socio-Economics and Environment. December 2000) Afar women harshly complain about a number of harmful traditional practices that challenge their welfare. Female circumcision, mutilation during child birth, polygamy and gubna (marriage agreement to marry relatives of the deceased husband) were the most often mentioned harmful practices. Injustice in case of divorce was also strongly disagreed by women. The level of consciousness of women in explaining that harmful traditional practices were done against their will and that they are blocking increase of women's status in the society is surprisingly high.

Travel needs of women and men differ in the Afar society. Women's travel needs are related to the household chores.

5.8.3. Attitudes Towards Certain Selected Variables

- Most unwanted type of work is money lending, which has religious and cultural background. Blacksmith, pottery and leather work also not preferred. This implies that local population does not have negative attitude towards working in the road construction. It can be expected that labor force is available in the area.
- Household heads attitude towards modern schooling is mainly positive. 12.2%, however, thought that modern schooling make children uncultured, and 6% were of the opinion that it hampers activities to be carried out in the family. Only 2.6% had the opinion that modern schools spoil the religion of their children. Quite a remarkable proportion (88%) responded that they were not willing to send their daughters to modern schools (uncultured, need to work in the household, against religion). This implies that access to schools and non-availability of teachers are not the only reasons for low education. Attitudes towards school, particularly for girls, are negative. Awareness raising is required

amongst the population. In urban areas the balance of sexes in enrollment are more balanced implying that increased awareness and access increase enrollment. Awareness raising also requires improved access to population.

- Existence of problems with other ethnic groups: yes 40.9% (resource use, disputed territories, cultural/religious), no 59.1%. Solutions to the problems have been sought from the Council (46.3%), regional/zonal/woreda council (26.7%) and traditional leaders (19.1%). This implies that the conflicts between ethnic groups are also over disputed territories and cultural/religious, not only on the resource use.

5.8.4 Participation in development programmes

There are very few, if any, donors operating in the Afar Region. ACF is involved in animal health and marketing, MSF France human health and particularly TB treatment, Farm Africa also in animal marketing, Early Warning Systems and resource management and Afar Pastoral Development Association in water and health education. However, these organizations do not operate in Zones 2 and 4. According to the socio-economic study (Rangeland and Water Development Study. Vol IV: Socio-Economics and Environment. December 2000), in all development programmes such as terracing, planting trees etc. the participation of households has been very low. Most of those households that participated in development programmes had the opinion that they are useful. However, opinion of the households e.g. to overcome drought/famine are pray to God (76.8%), diversify working practices (12.7%), and environmental protection (4.4%). This shows that majority does not believe that development programmes as such can contribute to their situation.

Some of the sample population have participated in road construction (49.2%) which was the main activity where people had participated. Other programmes included terracing, tree planting, development of ditches/springs and construction of dams. Household opinion of those who participated in the road construction work was 41.4% useful and 20% not useful.

Limited development efforts have taken place in the project area in Afar Region. There is some but limited experience in project work.

5.9 Tourist sites

Hot springs

In zone 2 and 4 of Afar Region there are a total of 47 hot springs. Concentration of the springs is in Megale woreda (16). Hot springs in other woredas are as follows: Erebti (6), Berhale (6), Ab Ala (8), Kuneba (4), Dalol (6), Teru (3), Awra (9), Uwa (2). The list of the total number of hot springs by woreda and their location has been attached to this report (Annex). At present most of the hot springs are inaccessible to people residing outside the region. Yet, some of them are visited by the local people, and people coming from surrounding woredas in Tigray Region who would be walking on foot. Water is believed to have special power of healing various disease.

The Leilé hot spring in Megale woreda is visited by, not only local and Tigray population, but also by people coming from Amhara Region on foot.

One of the hot springs in Berhale which is 135 km from Mekele, and accessible by road, used to be a recreation area for foreign and local tourists during the Emperor era. At present it is used only by local people. Debeha hot stream in Teru woreda which is accessible up to Teru town, and at the distance of 3 hours on foot from Teru, is said to have high potential for geothermal power generation.

Lakes as attractions

There are fresh and salt water lakes in the Afar Region. Twelve relatively large lakes are identified in the region out of which three are located in Zone 2 and five in Zone 3. Their surface area varies from 350 to 11 300 hectares. There are also smaller lakes with area varying between 31 to 125 hectares. There are no lakes in Zones 4 and 5.

Lake Hashenge is the sole lake reported in the Atlas map of Tigray. The lake is located in Debubawi zone in Olfa woreda north of Korem town.

During the detailed design of the alignment it is important that these attractions are taken into consideration, particularly the hot springs. Some of them are already visited also by the population of Tigray Region (Megale hot springs) and if accessible, have further development potential.

Salt route

The Yalo-Ab Ala road is part of the route that connects the only local salt production zone in the country with the rest of the country. Presently traditional salt production takes place in Dalol and its neighbourhood. It is mainly transported by camel to market places. Completion of a road would increase the possibilities to transport to the market salt production and facilitate its distribution.

5.10 Land Use and Land Cover in Tigray Region

According to the 1:1,000,000 scale map of land use cover of Ethiopia prepared for the Ministry of Agriculture shows the following categories of land use/cover in Debubawi Zone:

- **Moderately cultivated land** is found mostly in Debubawi Zone (Raya Azebo, part of Enda Mehoni, Emba Alaje and Wajirat weredas). It is an area of mixed agriculture where farmers practice rain fed agriculture and cultivate grains, as well as sedentary peasant livestock grazing and browsing on improved or fallow land. In contrast to the intensively cultivated land, patches of forest or bushes and large areas under natural vegetation exist.
- **Bush land and shrub land.** The high forest region is found mostly in Debubawi zone, particularly in common boundary of Raya Azebo and Enda Mehoni woredas. This is a disturbed type of high forest. Part of the high forest are cleared for settlement and cultivation of perennial and annual crops. Open bushland exists in Alamata woreda. In Debubawi and Misrakawi Zone the shrub lands are inter mixed with cultivated land.

6. PUBLIC CONSULTATIONS

Expectations/attitudes and benefits as explained by various authorities in relation to the road alignment to be selected are summarized below:

| AUTHORITY | COMMENT |
|--|---|
| Rural Roads Authority, Tigray National Regional State. (Opinion expressed during meeting with the Head of the Authority and experts) | <ul style="list-style-type: none"> ▪ B with modification is the most feasible connection. Afar Region needs to be connected to Ab-Ala Zone vertically. RR 10 access road exists from Ab-Ala to Megale woreda. Best is to connect Ab-Ala - Megale - Yalo. Alternative A is duplication with the already existing roads on the Tigray side. Good access exists in crossing Afar and Tigray Regions but no vertical accessibility in the Afar Region. |
| Regional Administration, Tigray National Regional State (Meeting with the delegate of the regional administration head) | <ul style="list-style-type: none"> ▪ Correct approach is to discuss with the regional authorities. Since this is (and always when it is) the case all the support will be provided. |
| Bureau of Planning and Economic Development, Tigray National Regional State (Meeting with delegate of the bureau head and department heads) | <ul style="list-style-type: none"> ▪ Environmental Group exists in the Production Department of BoPED ▪ Five year plan in a process of being revised: more emphasis on RR10 level of roads based on labour based technology - RR50 roads are too expensive ▪ Livestock problems in Tigray and Afar Regions: animal diseases exist and a road could facilitate access to livestock services; crop production also suffers from infestation on both sides of the regional border. Costs high to provide veterinary services if no access via road to infected areas. ▪ Development cooperation between two Regions in 7 woredas in Zone 2: Afdera is not included; instead collaboration includes Yalo in Zone 4. Collaboration includes construction of health centers, schools and access road RR10 construction. ▪ Mahoni - Chercer - Balla -link important and exists: from Balla to Yalo a RR30 road approx. 15 km ▪ Ab-Ala - Megale access road exists: stretch is good. In Yalo biggest market in Afar and high interaction with Raya Azebo woreda in Tigray Region. ▪ Connect Yalo - Megale - Ab-Ala (primary need): during national struggle military connection route between Megale and Yalo. Already existing stretch - no environmental problems. Would facilitate salt flow to Yalo from North. Road can be constructed using valleys in Megale. ▪ No population centers deep in Afar area (Alternative C). ▪ Megale population (Afar) provides oxen to Tigray and they buy grain in Mahoni (Tigray) . Lively economic and social interaction. Also they provide oxen for ploughing. ▪ Local conflicts in grazing. Important to administer the Afar border area to solve the conflicts. ▪ Regional Government plan is to connect each tabia with RR10 road. Thereby, no need for connecting roads. |
| Zone 2 Council Members, Zone 2, Ab-Ala, Afar National Regional State (Meeting at Ab Ala zone administration office) | <ul style="list-style-type: none"> ▪ Appropriate channels need to be used to approach zones i.e. via the Region ▪ Accessibility the main problem: only Mekele-Ab-Ala road constructed. None of the other woredas accessible. ▪ Yalo - Megale - Ab-Ala: connecting these three woredas is the most feasible in the opinion of the Zonal Council. ▪ Ab-Ala - Megale (capital is Nehile) is cleared and is about 90 km. |

| AUTHORITY | COMMENT |
|--|--|
| | <ul style="list-style-type: none"> ▪ Cover: scattered distribution of trees. Gibba in Tigrigna. So scattered that might not be found during road construction. Scattered shrub. ▪ During rainy season nomads in Megale area. ▪ Productive activities: very few - only attempts. During good pasture time butter is sold; during dry season selling of animals. ▪ Regulation to control hunting exists. Families take care of wildlife. ▪ In Zone 2 no trust on clan leaders since Government structure already exists and can be mobilized for further action. In some cases clan leaders may have impact on the people e.g. in Zone 4. ▪ Zone 2 provides all possible support for road construction. Woredas are going to contribute even more. ▪ Access to medicine; market and other town services; transport will be available; Government can provide services easier; during drought relief can be provided early; land potential can be materialized when services available; administration can be contacted quickly if problems exist; nobody will further neglect, migration can be reduced if services are available; access to fertilizer; white and read salt can be easier distributed to other woredas (Afdera and Dalol salt), community to benefit from this potential. ▪ Flooding during rains; no maintenance facilities for vehicles |
| Disaster Prevention Bureau, Tigray National Regional State (Meeting with bureau head) | <ul style="list-style-type: none"> ▪ Mostly whole regional boarder area is drought affected and food deficit. Food reserve is in Mekele and other in Kombolcha. Tigray assists Zones 1 and 2 in Afar. |
| Ethiopian Roads Authority (meeting held at ERA) | <ul style="list-style-type: none"> ▪ As an analytical model RED cannot stand alone - short comings need to be taken into consideration and carefully looked into ▪ Road to be constructed is an Afar Region road and needs to benefit the Afar Region ▪ Corridor development is a priority; no need for RR 10 access roads within this intervention - they are financed from other sources ▪ Alternatives might be close to Rift Valley which is culturally sensitive area; ensure that authorities responsible for cultural heritage are involved ▪ Include all alternative road alignments in the Preliminary Findings ▪ Presentation in the presence of two affected Regions and EPA |
| Regional Administration, Afar National Regional State (Meeting with the Regional Adminstration Economic Sector Head) | <ul style="list-style-type: none"> ▪ Road connecting three woredas Ab-Ala-Megale-Yalo in the 5-year Regional Development Plan ▪ Justification: connect two zones (zonal capitals): zones 2 (Ab-Ala) and 4 (Kilewan); connect three woredas without existing link; easier access to Samara (new regional capital) ▪ This road has economic value ▪ Military tracks exist between Yalo and Megale |
| Afar Rural Roads Authority, Afar National Regional State (Meeting with the deligate of the bureau head and experts) | <ul style="list-style-type: none"> ▪ Connect Ab-Ala - Megale - Yalo ▪ RR 10 exists between Ab-Ala - Megale: possibility to use existing road |
| Bureau of Education, Afar National Regional State (Meeting with the bureau head) | <ul style="list-style-type: none"> ▪ In Zone 4 accessibility is a problem; in Zone 4 and 5 no school facilities ▪ In Megale/Erebt teachers go to school five days on foot - no transportation - difficult to get teachers to stay there |

| AUTHORITY | COMMENT |
|---|--|
| | <ul style="list-style-type: none"> ▪ Rural Afar school enrollment rate very low ▪ Not possible for girls to walk long distances to school |
| Bureau of Health, Afar National Regional State (Meeting with experts) | <ul style="list-style-type: none"> ▪ 4-5 days to supply medicine ▪ veterinary services difficult to supply and can take 3 months |
| Bureau of Agriculture, Policy Advisor in Reg. Administration, Central Committee Member in Zone 4 and Administrator Zone 1 and ARRA (Meeting held in Afar National Regional State) | <ul style="list-style-type: none"> ▪ Recommended route: Gubidora (capital of Yalo) - Bubuisi approx. 35 km (2nd kebele): Bubuisi - Nehile - Ab-Ala ▪ Area mainly flat ▪ Not recommendable to cross Regions ▪ Area is permanent grazing area and area for agriculture development ▪ Yalo cattle market the largest market in the area: access needs to be provided also from Megale ▪ C: no population density in that area ▪ Area would most benefit of the modified A connecting Ab-Ala - Megale - Yalo |
| Ab ala woreda and Zone 2 administration, clan leaders, government employees and private sector (meetings held in government offices and private places) | All Recommended Alternative B <ul style="list-style-type: none"> • Administration : experience sharing with Megale woreda increases. Social and economic services can expand due to better acces to region. Letter report to/from reach Megale takes 2-3 days that will improve. Better adminstartion in Megale. Aid support comes from Afar region. • Commerce : link to Yalo big livestock market created. Market in Megale town initiated. Better price for livestock , grain and other products increases. Grain supply to Megale and Yalo woredas with better price as price for grain in those woredas is hogher than Ab ala. Loss of livestock weight and value decreased due to transportation by car. Price of some grain is lower in Ab ala than Mekele because production is higher. • Community : value system about wealth increases among rural population that they start buying cars rather than keep large stock of animals. Increased socio-economic services. Towns develop along the route. • Women’s participation in government institutions increases. School attendance increases. |
| Megale woreda administration, clan leaders, government employees and private sector (meetings held in government offices and private places) | All Recommended Alternative B <ul style="list-style-type: none"> • Market established at Nehile and the town will develop. • Potable water supply will be constructed, irrigation and farming technology introduced. The nomadic way of life will give way to permanent settlement. • What is spent in other region (our money) will be spent in our region. • Link with zone and region speeds up development, aid comes to Nehile, socio-economic infrastructure expands with better service level. • Access to Ab ala and Yalo markets • Willingness of contractors to come to Megale increases • Better woreda and kebele administration |
| Yalo woreda administration, clan leaders, government employees and private sector (meetings held in government offices and private places) | All Recommended Alternative B <ul style="list-style-type: none"> • Access open to Ab ala and Megale people. The link with Asayita improves the development of Yalo. Kebele and woreda administration strengthened. • aid comes to Leile, socio-economic infrastructure expands with better service level. • Access to Ab ala and Yalo markets • Willingness of contractors to come to Yalo increases |

7. ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

7.1 General

The detailed types of construction works to be executed as well as quantities for the project roads are not known in detail at present. However in order to assess the potential environmental impacts caused by the construction of the road, the Consultant has assumed a preliminary construction scenario based on general and past experiences, and the preliminary findings of the study.

It should be stressed that the conceptual design for the road will be determined based on the outcome of the feasibility study and that the exact and detailed design will be elaborated during Phase 2 of the project. In general, it is anticipated that the applicable standard will be that of an all-weather gravel road.

When discussing impacts and mitigation measures, a clear distinction should be made between the rehabilitation/upgrading of existing roads and the construction of a new road since the latter is likely to produce more critical impacts. The different activities anticipated to take place are presented in Section 3.3 of this Report.

A preliminary checklist for scoping with all possible environmental components, and type, duration and significance of impacts, etc. was prepared for the road project in general. In the beginning, the list was not comprehensive nor very specific in terms of alternative routes, only the distinctive properties of each alternative were presented as comments and as evaluation base. The table has been used as a checklist for defining the possible impacts in later stages of this EIA.

The assessment concerning natural and physical environment are based on the following sources:

- Site visits to all existing parts of the road
- Studies of topographical maps 1:250.000
- Studies of topographical maps 1:50.000
- Studies of aerial photos
- Studies of Satellite images and contours from Radar Satellite data
- Reviews of previous studies including those given in the list of references
- Interviews with local and regional authorities
- Interview with the ERA Environmental Management Branch (EMB)
- Interviews with the RRAs in Mekele and Asaita
- Interview with EPA

Results of the analysis of the available secondary data, public consultations, the collected primary data and poverty assessment provide the general framework for the preliminary assessment of potential social and human impact.

In the preliminary poverty assessment, indicators proposed in the Interim Poverty Eradication Strategy were used. Potentially affected environmental components and/or values were identified in the tentative scoping table and further developed based on the on-going secondary data analysis. Analysis in this report is based on defining the potential SIA components and/or values, their characterization, and categories of evaluation. Potential impact, its character and evaluation need to be verified based on primary data to be collected for the selected route.

Tentative list of factors/indicators used in this report is presented below. Direct and indirect; positive and negative; immediate and long-term; and unavoidable or irreversible social impacts will be analyzed, as well.

| | |
|---|--|
| Social acceptability | <ul style="list-style-type: none"> - Expectations and attitudes - Benefits/adverse effects - Level of conflict of interest - Priority of services - Degree of poverty - Preferred route amongst the population; travel needs |
| Resettlement/displacement | <ul style="list-style-type: none"> - Number of population/potential to be resettled - Loss of homes - Loss of buildings - Loss of businesses |
| Demographic changes | <ul style="list-style-type: none"> - Population - Settlement patterns - Housing |
| Change in a way of life | <ul style="list-style-type: none"> - Availability of transport - Availability of goods - Cultural practises - Living habits |
| Impacts of gender, mainly women | <ul style="list-style-type: none"> - Role of women and men - Work burden - Traditional harmful practices - Access to social and other services - Travel needs - Modes of travel - Income generation - Health |
| Impact on indigenous people | <ul style="list-style-type: none"> - Marginalization of ethnic minority groups - Marginalization of other vulnerable groups |
| Induced development | <ul style="list-style-type: none"> - Agriculture - Livestock - Other economic interventions - Tourism - Access to social and other services - NGOs and other donors |
| Conflicts between local population and immigrants | <ul style="list-style-type: none"> - Attitudes and expectations - Availability of water - Availability of grazing land |

In the following Sections 7.2, 7.3 and 7.4, the impacts of the alternatives are summarized and compared. The environmental concerns and the evaluation base are more widely presented in the Section 7.2 dealing with alternative A. In Section 7.3 dealing with alternative B and in Section 7.4 dealing with alternative C, the concerns and evaluation base are not repeated, if not necessary in terms of understanding the assessment. Furthermore, if the impacts are similar/common to all of the alternatives it is mentioned only once. Finally, the impacts of the alternatives and the comparison are briefly summarized in the Impacts Summary Table in Appendix 3.

7.2. Impacts of Alternative A

7.2.1. Physical Environment

Soil and bedrock

During construction works some detours and site roads will be built. For the time being it is impossible to identify the amount or places for these, and therefore the impacts can be evaluated mainly on the basis of the length of the route alignments, which is not accurate enough to make any difference between the alternatives. The detours and site roads might have significant local impacts on areas under cultivation or pasture in two ways: the land would be out of use during construction works, and after construction the land would be unusable for some time if not restored to the original condition. The restoration is often quicker for cultivation purposes than for pasture purposes.

In terms of physical and natural environment in general, the advantage for alternative A is that for most of the route the opening in the terrain already exists, and thus the damage caused by the mere existence of the road has already taken place.

Alternative A is exploiting the most of the existing road network in the project area. Thus, new erosion exposure will not be as extensive than with totally new construction. However, the soils in the area are for the most part highly erodible. It has to be emphasized that road construction as well as upgrading a road is one of the most evident activity creating and enhancing erosion. Yet, erosion preventive measures are still not applied enough in road projects. The problem seems to lie on supervision of road works, and not so much in inadequate knowledge or requirements.

The alternative A passes a mountainous and hilly terrain, resulting quite extensive earthworks at places, and thus putting a strain on the use of non-renewable aggregate resources. Also spoil disposal problem is evident in places where the haulage distances for proper spoil disposal areas is long enough to induce environmentally unsustainable solutions.

Extensive earthworks inevitably mean also growing risk to landscape instability in major cuttings and borrow pits.

Water resources, water quality and drainage systems

In the project area there are numerous rivers, and the roadworks comprise a potential risk to the quality of the river waters. However, all the rivers are seasonal and most of the works are expected to take place during dry season. Therefore, the inconvenience will probably be small, and at least temporary. Yet, the problem may prove locally considerable, if it is a question of the only source of water in the neighbourhood and the conflict rises between the locals and immigrants.

If sand and gravel is excavated from river bottoms, it might have local impacts on river courses and river bottom ecology. In this respect alternative A forms a potential risk having many rivers in the area.

It is likely that Alternative A interferes with the local drainage systems least and splits more territories with agricultural potential, and probably also disturbs the drainage patterns there.

In settlements the road drainage system improves the present situation significantly. Alternative A is introducing the most settlements, and thus have a reasonably big positive impact.

Construction camps provide a risk for surface water quality, if the sewage and the hazardous liquids are not treated properly. At this stage it is not possible to make any difference between the alternatives.

Air quality

The traffic volume on the existing roads at present is comparatively low. However, due to the bad condition of the vehicles and the scarcities in road geometry as well as maintenance problems, the air quality may in places be very poor occasionally. New roads will undoubtedly increase the traffic, but the change is expected to be small – keeping in mind that new road will be in better condition and have better geometry. Alternatives with more mountainous and hilly sections, like A and B, have clearly more harmful effects than alternatives passing through a flat or rolling terrain. Nevertheless, the actual impact on peoples health or more widely on their environment is considered insignificant.

7.2.2. Natural Environment

Biological and ecological changes

At this stage there is no evidence that any sensitive habitats, rare or endangered species would be found close to any of the road alternatives. Nevertheless, it is fairly possible that some rare or endangered species live on or migrate the project area. Though, the environmental survey carried out for the recommended alternative gave no suggestion that this would be the case.

The new road giving better access to previously non-accessible territories is increasing the risk of influencing these species in a way or another. The first risk is to get wiped off by the road, the other is getting disturbed (e.g. during nesting) by construction works. During operation phase some sensitive habitats or species get disturbed by traffic, and traffic is killing animals on the road, too. Some of these impacts can be avoided through good engineering (alignment design, quarry location, etc.), some cannot.

Impacts on flora and fauna will be mainly related to the consumption of land for the road development and operation of borrow and quarry sites. Implementation of the project will affect the flora due to clearing for site preparation, extraction of materials from borrow and quarry sites, and establishment of base camps. During the operation period the vegetation along the road could be affected related to improved access resulting in increased human activities such as cultivation, collection of wood for fuel and construction, making of charcoal, etc.

Activities for constructing the new section of the road and upgrading the existing road particularly in mountainous area will cause damage on the flora available in the right of way, at borrow pits and quarries, and access roads to those sites. It will be the site clearance to prepare the road alignment, operation of borrow pits and quarry sites and establishment of base camps that will affect the flora at those sites and in nearby areas. The section between Yalo and Addis Ketema, which has mostly dense bush, was already disturbed by the existing road. The possible impact of this project on the flora of this area will be related to widening of the road width and probably due to alignment modification, and operation of borrow and quarry sites in the area. Primarily Acacia bushes and other associated plant communities will be affected.

In terms of new space required for the road, alternative A may be considered as environmentally sustainable, due to utilizing the existing roads to some extent. Seeing the context and the magnitude of the road project, the mere destruction of the bushes, grass and even some trees under the road alignment would not be considered as a significant impact. However, the activity might have some, more or less local significance, when connected to several other negative impacts or conditions (e.g. scarcity of grazing land, the splitting and

border impact of the road, etc.). This kind of local impacts are best identified and prevented by consulting the public during detailed engineering phase.

7.2.3. Archaeological, Cultural and Historical Sites

Based on existing information, none of the known archaeological and historical sites are located in the project area. However, the existence of any sites of archaeological, historical, cultural or religious value should be assessed in the future. In particular some sites of cultural and religious importance including burial places could exist along the road. These should be checked and located, if existing, during the detailed engineering design surveys so that they will not be affected by the project. During the environmental survey of this feasibility study, no such sites were located in the vicinity of the alignments surveyed.

7.2.4. Human and Social Environment

Social acceptability

Alternative A was not supported in public consultations. Afar National Regional State as a newly established state and its development to the level of the other regions is a regional development priority. Both alternatives are partly located in Tigray Region and not seen to sufficiently contribute to the development of the Afar Region. These two regions are at different levels of development and their development needs vary. In addition, development needs of the country might differ from the development needs of the regions.

Afar Region has been marginalized in development efforts of the country, thereby at present its development is high in the regional development agenda. In Afar Region all access indicators are very low also in the country context. Most indicators are the lowest in the country. This implies the low level of general development of the region, and urgent need to develop it in view of a balanced development within the country. Unbalanced regional development might have implications in the stability of the country. In this case some other aspects of development, e.g. economic benefits related to the development of the whole country might become secondary, and the potential economic benefits are not fully utilized. Political development priorities affect the social acceptability of the development interventions and, thereby, their implementation.

Alternative A is partly located in Tigray Region, thereby it does not sufficiently respond to the travel needs of the ANRS or significantly improve the ANRS road network. However, half of the alignment is on the ANRS side i.e. route from Megale to Ab-Ala. Both alternatives do not improve significantly "corridor" access of Afar population between Yalo and Dalol.

Their population would not be keen on crossing the regional borders even if access is provided within Tigray Region. However, it at least in theory improves the accessibility of the population of the Megale woreda to both directions, to Yalo and Dalol, even though the Megale-Yalo connection is located in Tigray Region. Being within Tigray Region, construction of this alignment does not contribute to improving administrative system in ANRS or solving grazing problems along the regional border.

Alternative A is expected to have minor impact in development of market areas in both regions. Movement would mainly increase from Afar Region to Tigray Region for Afar population to continue purchasing grain from Tigray markets. Required goods would be purchased at the same time and availability of goods would increase in Megale woreda. There is very limited movement from Tigray Region to Afar Region across the border area. Markets in Afar Region are less developed and no such goods are available there that are not available in Tigray Region markets. Markets in Tigray Region are at long distance for Afar population

and herding the livestock to these areas leads inevitably to the loss of weight of the livestock to be sold and, accordingly, lesser price. It can be argued, that if the internal Afar markets were more developed and the goods (grain) available in the Afar markets, the traveling needs of Afar population would decrease in Tigray Region and be more targeted towards the developing Afar markets. They would still sell livestock in Tigray Region when there is a real need, but the main markets would be within the Afar Region. Development of the Afar Region markets in the areas where the livestock resides most of the time would ensure, that livestock does not lose its value when traveling long distances. A alternative will mainly increase communication and linkages between Megale and Ab-ala woredas.

In the affected woredas ethnic groups are very harmonious within their respective regions. This is also reflected in the language used and religion. In Tigray Region Tigrayans and in Afar Region Afars dominate in the project area. There is lively co-operation between these two regions along the border but due to ethnic reasons border problems occur if e.g. available resources are not sufficient to cater for the needs of population on both sides. In these cases utilization of the road to be constructed might be affected, and access denied for one (some) ethnic group (s). Project affected woredas are main conflict areas being the bordering woredas between Tigray and Afar Regions. Confrontation is sporadic and is not expected to cause major difficulties for the road use.

During the detailed planning and design of the road alignment, as well as during construction, it is important to take into consideration the traditional decision-making structures of the Afar society. Despite of the newly established decentralized government structure, the traditional bodies still hold important position amongst the population. Constant communication with these bodies will increase social acceptability of the intervention. In addition, if conflicts occur between construction workers and local population, traditional decision-making bodies will be aware of the purpose of the road construction. With their support conflicts can be solved in a peaceful manner.

Limited development efforts have taken place in the project area in Afar Region and this might affect the social acceptability. However, alternative A passes in Afar Region only in Zone 2 where the government structure is fully operational. Constant consultation with population needs to be undertaken to clarify the purpose of the project and the operating mechanisms. In Tigray Region experience exists in various development interventions. It is expected that social acceptability is high amongst the population towards development projects. Alternative A passes quite long distances in Tigray Region where because of previous experience working conditions are expected to be easier than in the Afar Region.

Alignment A provides access to drought stricken areas and enable access to relatively poor and vulnerable areas in both regions. Areas are poor, having low income level of the population and low access figures to social and other services. Intervention would improve situation of the vulnerable population in both regions.

Both alignments would have positive impact on the collaboration program between the two regions. Afar Region would benefit through increased support from Tigray Region. Benefits of the road could be maximized by connecting Yalo and Megale woredas with feeder road located within ANRS. However, it is expected that it is in the interest of the Afar Region as a federal state to independently manage the affairs within its mandate. This implies that with time the technical assistance co-operation agreements between the Afar and Tigray Regions will change their nature.

Low acceptance amongst regional and zonal authorities might have at least moderate impact during the operation and maintenance phase. Alternative A was not also accepted by the consulted groups, and the local people in Ab ala, Megale, and Yalo Woredas. Low acceptance requires mitigation measures, but it is expected to be mitigated using continued consultations with authorities.

Resettlement/displacement

Alternative A entails also construction of new road, even though they also use the existing access roads as basis. Along the alignments there are not very densely populated towns/settlements. In Tigray Region, main sources of living in the concerned areas are both livestock rearing and agriculture. Population is settled. In the concerned areas in Afar Region, population is mainly pastoralists. However, the settlement pattern has a tendency of becoming less mobile than before. There will presumably be some people who will be displaced from their homes. In alternative A, particular emphasis needs to be placed in cases where the property of female-headed households is lost. They are in many cases very vulnerable in case of negative changes. It is expected that some minor agricultural land and/or livestock grazing area might be endangered.

Along the alternative A, in both regions, most of the population reside in rural areas in the affected woredas. However, there are significant differences in the number of urban centers. In the affected woredas in Tigray Region there are seven urban towns with the population of 50 179. Most of the towns are in the affected Debubawi Zone. Alignment passing through one of the larger towns would increase the number of people served. More resettlement efforts can be expected in more populous areas. There are only two towns in Afar Region with the population of 4 237. However, particularly in the Afar Region, the size of the towns is in most cases smaller than the size of farmers associations. This needs to be taken into consideration when choosing the route of the alignment.

Most of the houses in Tigray region are conventional houses and that of rural Afar are makeshift types. In Afar conventional houses are found mainly in urban areas. In case resettlement/displacement occurs, conventional houses are the ones expected to be displaced. In some cases mobile houses are also expected to be affected. Most of the conventional houses lack corrugated iron roof, water and electricity. In the affected woredas in Afar Region, this applies also in urban areas. In affected woredas in Tigray Region, the standard of houses is much higher in urban areas. More compensation costs are expected there in case resettlement/displacement occurs.

Even though along the alternative A, in the Afar Region the percentage of single-headed households is low, those households accommodate almost one third of population. Single headed households are often the most vulnerable households. Particularly in Afar Region, special emphasis needs to be placed on ensuring appropriate resettlement terms and compensation for these households. Along the route on the side of Tigray Region the same phenomena exists, however, in a limited scale. It can be expected that the vulnerability of the single-headed households is less along the alignment A on the side of Tigray Region.

Along the alignment A, there are more dissolved marriages for women than men in both regions, particularly in Afar Region, placing them in a more vulnerable situation. Largely in the project area the traditional marriage law is followed which in most cases leaves women with limited resources, if nothing at all. Divorced women do not re-marry as often as men implying that they need to survive with their own means. In cases of resettlement/displacement, special emphasis needs to be placed on ensuring that the compensation provided is improving the situation of these women.

Demographic changes

As regards the population size along the alignment A, the number of population is much higher in the affected zones and woredas in Tigray Region. Any development intervention in those areas would directly affect more people than in Afar Region. In the affected woredas in Tigray Region there are altogether residing 292 223 people versus only 64 391 in the Afar Region.

Along the alignment A, in both regions most of the population reside in rural areas in the affected woredas. However, there are significant differences in the number of urban centers. In the affected woredas in Tigray Region there are seven urban towns with the population of 50 179. Most of the towns are in the affected Debubawi Zone. Alignment passing through one of the larger towns would increase the number of people served. More resettlement efforts can be expected in more populous areas. There are only two towns in Afar Region with the population of 4,237. However, particularly in the Afar Region, the size of the towns is in most cases smaller than the size of farmers associations. This needs to be taken into consideration when choosing the route of the alignment.

Along the alignments sex ratio for children below one year falls outside acceptable range in both regions, however it is less acceptable in the Afar Region. This implies, that preference is given to boys after birth. Available family resources are used to ensure, that boys survive the first vulnerable years of childhood. This attitude is also reflected in later years. In rural areas sex ratio is in most age groups high i.e. there are more men than women. This is particularly evident in the Afar Region, where access to health care is limited or non-existent in some areas. Preference is given to the health care of men and boys, and e.g. maternal mortality rates remain high. In Tigray Region the situation is more balanced which implies that access to health care is easier. In urban areas in both regions the situation is reversed which shows that with improved access to health care the preference given both sexes is more balanced.

Road is expected to cause only minor demographic changes because of improved access to goods and services. There seems not to be movement of population between regions to permanently settle in the area of other region. It is not expected that TNRS population will increasingly settle in the towns of ANRS and vice versa.

Population growth will continue and more people will move to towns along the road side within both regions. Improved access to Leile town or its vicinity is expected to increase the number of population. Particularly in Megale and Ab-Ala woredas, it is expected that population will settle more along the road side because of improved access to, and possibly for services. There is a tendency amongst pastoralists to increasingly settle down, and in addition to livestock rearing practise agro-pastoralism. This is caused by harsh conditions and food insecurity.

Change in a way of life

In a medium-term, particularly in Megale and Ab-Ala woredas quite significant change could take place for the nomads to increasingly settle down. Improved access to and for services would encourage people to reside close to them. Access to services is very low particularly in Megale, but also in Ab-Ala woreda. Changes are expected to be quite significant both for both male and female population Afar Region where the road is passing, because of increased access to services. It is not expected that the change towards urbanization will be rapid and the level of urbanization will drastically increase.

Most of the nomadic houses are of poor quality. It is expected that because of upgrading/constructing of road the accessibility as well as the mobility of the people in the area will increase. As a result the movement of goods to the rural areas will be enhanced. Therefore, rural dwellers who can afford will have access to purchase building materials to improve the quality of their houses. In general, access to goods that were not earlier available will improve.

The consulted groups in Megale and Ab ala woredas do not think that this alignment maximizes their interest. No significant change of life is expected in TNRS. Alternative A serves the highest number of population along the road side who travel e.g. to important market places like Mehoni within Tigray Region. Improvement of this alternative would

improve access to Mehoni from both Ab-Ala and Yalo woredas. With the better road public transportation possibilities might increase. Increased mobility using motorized transportation might change the way of life in a limited scale.

Impacts on gender, mainly women

Along the alignment A travel needs of women and men differ in both societies. Women's travel needs are related to the household chores. In Afar society the burden is heavier for women since the distances to services, water, fuel wood etc. are longer than in Tigray Region. In detailed design of the road alignment it is necessary that the opinions and views of women are addressed to reduce their work burden.

Along the alignment A attitudes towards school, particularly for girls, are negative in Afar Region. Awareness raising is required amongst the population. In urban areas the balance of sexes in enrollment are more balanced implying that increased awareness and access increase enrollment. Awareness raising also requires improved access to population.

Some significant positive changes can be expected particularly in the life of women in Ab-Ala and Megale woredas in a medium-term. Changes in the roles of women and men are expected with the settling down of nomads. Improved access to education for girls will bring significant changes in women's job opportunities. In addition, improved services and information on eradication of harmful traditional traveling will be available. With improved quality of the road, access to goods improves, which might change the travel needs of women. For example, it might reduce the travel needs to far-away markets which is one of the main travel needs for women.

Road would also provide an improved access to Yalo market, however, willingness to travel long distances within Tigray Region is not supported because of sporadic conflict around the border of Yalo woreda and Raya Azebo woreda in Tigray. It is expected, that particularly for Afar women, because of cultural reasons extensive traveling in any other region would not be recommended.

With a better quality road services like grinding mills might become closer reducing the work burden of women. With the change of the diet of nomads towards cereals, the work burden of women has increased. Small busses might appear on the road providing an alternative for traveling on foot. It is expected, though, that majority of women might still continue traveling on foot because of limited cash resources. Motorized transport might give an alternative in case of emergencies, e.g. faster access to health centers, thereby reducing health status of women in case of pregnancies. Both women and men would benefit of faster access to medicine in case of malaria. With a better road educational facilities can be reached quicker and safer which might increasingly encourage girls to go to school. Enrolment rate of girls is very low in ANRS.

Since there has been an existing road network for years, and relatively easy access to bigger places like Mehoni and Mekele, the road will not have any major impact on women particularly in the areas of Alternative A in TNRS. Improved quality will make it more comfortable for women to use the road as pedestrians. This is also reflected in the situation of men, since most of the local traveling is done on foot. Main reason for traveling longer distances is marketing and buying of products, which is jointly done by women and men in both regions.

In TNRS, along the alignment A, there might be shops and bars along the road run by women. With improved motorized traffic, their income might increase with the increased number of customers. Income generating activities will also increase during the construction work with a quite large number of construction workers residing in the area.

Women along the alignments might be posed to increased risk of sexually transmitted diseases and unwanted pregnancies due to the construction camps. Equally, construction workers will be posed for the risk. This can be mitigated to some extent with appropriate IEC-interventions, however, not completely. This might be less of a risk in ANRS, because of less densely populated areas. No major health risk is expected in the local areas of Afar region because of sparse population density and the traditional bye-laws that restrict Afar women from contacting outsiders.

Impact on indigenous people

Alignment A pass in both Tigray and Afar Regions. In the concerned Tigray area, majority of population are Tigray. In Ab-Ala, Megale and Yalo majority of population are Afar. There are small ethnic minorities on the side of Tigray residing in woredas along the road alignment. In ANRS, the smallest minorities do not reside in Zones 2 and 4. There is already an access road between Ab-Ala and Megale woredas. The road to be constructed is not expected to have any new or different impact on the ethnic groups already residing in the area.

Induced development

As regards alignment A, livestock rearing is almost the only means of survival for the Afar population. This implies, that any development intervention should take into consideration the specific requirements of the livestock economy. In addition, development interventions should support development of secondary means of income to reduce vulnerability caused by single product based economy. Road to be constructed should improve access to and for veterinary services, markets and grazing areas. In addition, it should provide access to other extension services available within the government structure. In this respect, development of woreda centers as service providers is crucial and it cannot be done without proper road network. Meanwhile, road should provide access to any available and affordable veterinary services to reach the livestock. In addition, the movements of the livestock during the year, and to and from market places where livestock are sold and goods purchased, are important in order to provide access to veterinary services to the areas where the majority of the livestock resides at certain times.

In the Afar Region there is a need to support the already started activities towards diversifying the economy. Implications of each development intervention towards this direction need to be investigated. Agropastoralism is practiced particularly in Ab-Ala and Megale woredas. In case of road construction access to extension services available within the government is a key for improved productivity. Road alignment to be selected should provide access to the areas where agropastoralism is practiced. This would improve vulnerable economy by providing an alternative source of livelihood.

The road network and motorized traffic in the Tigray Region is at much higher level than in Afar Region in the project areas. Dehubawi Zone in Tigray Region has the second highest length of road network in Tigray. This indicates, that the basic road infrastructure for induced development exists. In the project area in Afar Region there is a limited road network (RR 10 cleared between Ab-Ala and Megale) without motorized traffic. Between Megale and Yalo there is a track used during the military operations, but it does not provide service for connecting between Megale and Yalo. Some access roads exist between the regions, but no "corridor" connecting Yalo and Ab-ala in the Afar Region exists.

Along the alignments, in the Dehubawi Zone there are a large number of domestic private traders and service giving establishments. It is expected that some resettlement/displacement cases will occur also to the service establishments. Traders in the Dehubawi Zone are potential traders also in the Afar Region given access to the Afar markets. Most of the traders in developed Afar markets (Ab-Ala, Megale and Yalo) are expected to come at least initially

from the Tigray Region. Their willingness and interest need to be taken into consideration when designing the alignment.

Education is the key to the development of the entire region. Low school enrollment rates in Afar Region indicate that it still lacks sufficient school and teacher network, and that future human resources for development are limited. In addition, there are big discrepancies in education of boys and girls. This continues the existing situation where unequal opportunities between sexes prevail. Reasons for limited number of schools in Afar Region are also related to accessibility. Schools cannot be constructed where there is limited access. In addition, even if schools exist, it is difficult to get teachers to areas without access to towns and centers. Quality of education suffers.

Enrollment is low in both regions, but alarming in the Afar Region. Afar Region has cooperation agreement with Tigray and Amhara Regions for expert support. However, there is a tendency in the Afar Region to become dependent on other Regions and the number of experts in the Afar Administration has decreased. In order to ensure that Afar population has an opportunity to administer its regional development independently, investment in education is crucial. Improving the access in the previously non-accessible areas will facilitate in this process. Improved and faster access might also improve the possibilities of girls to attend school. They are not expected to travel long distances to school. High illiteracy rate and lack of educational institutions are a reflection of the same situation. Conditions for development in Tigray Region are at much higher level than in Afar Region.

Mobility and settlement patterns indicate in which areas the services are needed to ensure support to the livestock and agropastoralist economy of the Afar Region. There is already a tendency for the pastoralists to settle down and the whole family migration is reducing. Thereby, the areas where families stay during the winter with sufficient grazing area and water are becoming more important in the Afar society. Still there is a need to migrate during the summer time and particularly during drought for search of water and fodder. With improved services, better availability of water and fodder, it is expected that Afar migration within and outside the Region might reduce and pastoralists become more settled. Alternative A supports development of Afar economy mainly in Ab-Ala and Megale woredas. From Yalo woreda alignment passes to the Tigray Region.

Along the alignment A there are potential tourist attractions. During the detailed design of the alignment it is important that these attractions are taken into consideration, particularly the hot springs. Some of them are already visited also by the population of Tigray Region (Megale hot springs) and if accessible, have further development potential.

Positive impact on reducing vulnerability is expected, particularly in economic activities undertaken by local people residing within the road corridor. Major economic activity along the road alignment is livestock and animal husbandry and agriculture. Pastoralists have also started settling down in the area and to start agricultural activities. The advantage of having a road in the area would be improved transportation of livestock sector inputs and agricultural inputs. Megale is a major livestock grazing area because water and better pasture are available. Veterinary medicines can be supplied if and only if the area is accessible. With accessibility the cost of veterinary services is expected to drastically decrease. For example, the price of animal medicine is six times more in Tigray than in Asayita. Concerned woredas in ANRS purchase medicine from Tigray because of access problems.

Road is along the "salt route", thereby it provides improved access to salt between Yalo and Dalol. In addition, Ab-Ala town and Yalo towns might become increasing market places for salt. Alternatives improve distribution of salt (access) within both regions. Increased investment in salt production by local people can also be expected. In a medium-term, increased use of hot springs is expected.

With increased accessibility agricultural extension programmes can increase, particularly to develop pasture production in Megale using irrigation. Increased cereal production of agro-pastoralists and other diversification to improve food security can be expected with increased extension services. Road would also have positive impact on distributing cereals to Zone 2 and 4 markets with lower prices, thereby decreasing the need for selling animals with low price during the drought. As a result the marketing system within ANRS would improve.

People can also easily have access to markets to sell their products with better prices. With improved access, goods will become more accessible and the existing markets are developed. Improved markets increase income-generating activities to the local population through marketing of their products. Women would have a better potential to sell their products (e.g. mats) in local markets. In addition, new markets might develop along the roadside.

Construction will provide secondary employment opportunities for population. Population are mainly pastoralists and agro-pastoralists. In TNRS, population are mainly settled agriculturalists, and in need of, and expected to be interested in secondary employment opportunities. Population is familiar with various development interventions, and has experience in positive and negative impacts they might arise. In ANRS also, local people have insisted that they want to be employed in the project as laborers.

In both regions large proportion of young working age population places a lot of pressure on the economic development of the regions. New employment opportunities are required to decrease vulnerability. On the other hand large working age population is a potential labour force that could be utilized. During road construction employment opportunities should be given to local communities to promote local economy. Out of the working age population women are larger in number. Equal employment opportunities for men and women need to be promoted during construction. Along the alignment A, vulnerability is more prominent in the Afar Region.

Large proportion of young population implies that many people are sexually active and prone to sexually transmitted diseases. This needs to be taken into consideration during the road construction. Both construction workers immigrating from other areas and the local population needs to be sensitized in the prevalence of HIV/AIDS and other sexually transmitted diseases.

Conflicts between local population and immigrants

Limited development efforts have taken place in the project area in Afar Region and this might affect the social acceptability. However, local population in both regions is not expected to have negative attitude towards working in the road construction. It can be expected that labor force is available in the area. However, alternative A passes in Afar Region only in Zone 2 where the government structure is fully operational. Constant consultation with population needs to be undertaken to clarify the purpose of the project and the operating mechanisms. In Tigray Region experience exists in various development interventions. It is expected that social acceptability is high amongst the population towards development projects. Alternative A passes quite long distances in Tigray Region where because of previous experience working conditions are expected to be easier than in the Afar Region.

No significant conflicts are expected. In the discussions with the ANRS Zone 2 and 4 representatives, the full support of the affected woredas was guaranteed. All possible conflicts are expected to be solved with continuous public consultations between local population and other partners

7.3 Impacts of Alternative B

7.3.1 Physical Environment

Soil and bedrock

Alternative B is mainly a new alignment and about 20 km (15%) of its length passes over a mountain range south of Megale. As about 80% of the alignment runs through a flat and rolling terrain, generally it is a good opportunity for road construction in terms of impacts on soil and bedrock. The usage of aggregate material could be comparatively lower. With best engineering practices enhancement to erosion is likely minimal in the flat and rolling terrain.

However, this alternative also passes a difficult mountainous terrain (about 20-30 km length) where constructing a new road in this part of the project area will require quite extensive earthworks that could bring a significant impact in terms of erosion enhancement. In addition, spoil disposal problem could be evident in places where the haulage distances for proper spoil disposal areas is long enough to induce environmentally unsustainable solutions. In general a significant change to present situation in the impact zones is expected due to disturbance of the soil and rock bed, exposing these (particularly the top soil) to water and wind erosion.

Water resources, water quality and drainage systems

This alignment intercepts many rivers, all of which have seasonal flows. The road construction works will have potential adverse impacts to river water quality closely similar to the Alternative A.

Air quality

With the new road constructed in good condition (in terms of wearing course material and geometry) and presumably low traffic volume, the changes in air quality will likely be minor. In road construction and operation it is not uncommon to observe localized changes in the vicinity of the road that may have undesirable effects on the environment especially on settlements along the route. In fact there are few major settlements in the impact zone except the terminal towns and Megale. Nevertheless, the impacts on the environment including human health and plant physiology can be considered insignificant.

7.3.2 Natural Environment

Biological and ecological changes

The construction and operation of this road will mostly have more or less the same type of impacts discussed for the other alternatives. Nevertheless, the degree of the impacts on biological environment could be comparatively higher as the corridor of this alternative route is presumably richer than the other Alternatives. Its biological resources are less disturbed particularly compared to most part of the Alternative A, which is much influenced by human activities especially cultivation and settlement. Compared to Alternative C most part of the Route B is located at relatively higher altitude where there is better rainfall, and many streams traversing its corridor, which means its corridor is less arid than that of C. These conditions might have positively influenced vegetation growth that in turn provides better habitat for animal life.

In particular operation of the road may enhance some human activities such as fuel wood collection and making charcoal for market as a result of improved access and availability of modern transportation, a situation commonly observed in most parts of Ethiopia.

7.3.3 Archaeological, Cultural and Historical Sites

The discussion given for the other alternatives also applies for this alternative alignment.

7.3.4 Human and Social Environment

Social Acceptability

Alternative B was identified and fully supported in public consultations. Alignment B is fully situated in the Afar region connecting Yalo-Megale-and Ab Ala woredas. The route passes over the mountainous area in Yalo woreda and continues on the track upto Ab Ala town. The road is in the ANRS 5-year regional development plan and serves the priority need for regional road development, to serve improved connection between Zone 2 , Zone 4 and woredas population and administration set up with the ANRS regional capital and administration. Route B got highest acceptance amongst woreda administration, economic development offices, and local population, during fieldwork. The consulted groups and the local population insisted that they want to participate as labourer, during the road construction.. Leile, the center of Megale woreda, was established two years ago. In Leile there exists a woreda administration, one school, one newly constructed clinic. The construction of office for more government offices and residential area is on-going. The road will increase the possibility of development of the market, properly functioning woreda administration and offices at Leile..

Alternative B is expected to bring major impact in development of market areas in Afar region. Movement would mainly increase from within the Afar Region. The population of Megale woreda would have a chance to travel short distances to the Ab-ala and Yalo markets. There is already a shorter access track road between Megale and Ab-Ala, so the alignment B would be more important in providing access to Yalo, that did not earlier exist.

Location of markets in Tigray and Amhara Regions are at long distance for Afar population and herding the livestock to these areas leads inevitably to the loss of weight of the livestock to be sold and, accordingly, lesser price. Price of grain coming from the highland areas is in contrast is very high. Supply of cereals in markets located in Afar region is very low as a result price of cereals very high. It has been confirmed by the woreda administration, and local population that Alternative B would facilitate internal market development in Afar region by providing access to Tigray and Amhara region traders to the markets. Development of the Afar Region markets in the areas where the livestock resides most of the time would ensure, that livestock does not lose its value when traveling long distances implying better livestock price. Market development is also expected to increase supply of cereals and goods from Ab ala to Megale and Yalo markets with lower price. As a result positive impact on availability of goods and lower price of cereals.

Lively co-operation has been established between the two regions, however, conflict occurs due to ethnic reasons and times when available resources become insufficient due to natural calamities. Confrontation has been sporadic and is not expected to cause major difficulties for the road use. The road would facilitate increased co-operation between Tigray and Afar regions in reducing these conflicts through strengthened administration in the Afar woreda and kebele structure.

The newly established decentralized government structure is more or less operational in Ab Ala woreda but, is less operational in Megale and Yalo woredas. In these woredas the traditional bodies still hold important position amongst the population and are also members of executive committee members of the zone and woreda administration. Constant communication with these bodies will increase social acceptability of the intervention. In

addition, if conflicts occur between construction workers and local population, traditional decision-making bodies will be aware of the purpose of the road construction. With their support conflicts can be solved in a peaceful manner.

According to the data provided by the existing clinics malaria ranks between one to three top three diseases in the project area. Therefore, the in-coming project workers face high risk of contracting malaria. Moreover, the influx of huge number of project workers near local villages poses risk of expansion of malaria among the villagers.

According to the data provided by the existing clinics water borne diseases belong to the top three diseases in the project area. Lack of clean potable water and open defecation are attributed to be the major causes of water borne disease. Unless proper sanitation facilities and clean water is available, the situation will be highly exasperated with the introduction of camp. The risk of water borne disease is as much for the in-coming workers as to the local people.

Resettlement/displacement

Alignment entails mainly construction of new road, even though some tracks are expected to be used as basis. Despite of new construction low level of resettlement/displacement is expected because the area is very scarcely populated. Population comprise of mainly nomadic pastoralists communities and small portion communities practicing agro-pastoralist activities as secondary occupation. The settlement pattern has tendency of becoming less mobile than before. There will presumably be some people who will be displaced from there homes. It is expected that some farm plots and/or livestock grazing area might be endangered.

Along the Alternative B most of the population reside in rural areas in the affected woredas who live in make-shift housing. In case resettlement/displacement occurs, conventional houses are the ones expected to be displaced. There are three urban centers along the alignment where conventional houses are built Ab Ala, Leile and Gugubdi. Most of the houses in the towns, except for few cases in Ab ala, lack corrugated iron roof, water and electricity therefore less compensation costs are expected in case resettlement/displacement occurs.

In the Afar Region the percentage of single-headed households is low, those households accommodate almost one third of population. Single headed households are often the most vulnerable households. Special emphasis needs to be placed on ensuring appropriate resettlement terms and compensation for these households.

Demographic changes

Road might contribute to the increased population in the three. Significant increase of population is anticipated in Leile, the capital of Megale woreda because the permanent population is only 300, at present. In general it is expected that population will settle more in towns because of improved access to, and possibly for services.

Ethnic composition, language and religion may also become more diversified particularly in towns, if the service sector, which is expected to expand following the construction of the road, employs professionals from other parts of the country, particularly from Tigray and Afar regions. Employment of experts and professionals from other regions is the present strategy applied at all levels is going to continue in Afar government, due to insufficient educated and skilled human resource base. Private sector expansion has also to follow similar pattern of employees from other regions. Therefore, community with heterogynous ethnic origin and multi-religion and language background is likely to be the demographic change occurring in the project area, in the long run.

Along the alignment B sex ratio for children below one year falls outside acceptable range. This implies, that preference is given to boys after birth. Available family resources are used to ensure, that boys survive the first vulnerable years of childhood. This attitude is also reflected in later years. In rural areas sex ratio is in most age groups high i.e. there are more men than women. Preference is given to the health care of men and boys, and e.g. maternal mortality rates remain high. The public consultation process has shown that inaccessibility to be the main cause of low health service in the project area. The project area the project Alignment B may facilitate changing the imbalance between sexes in the long run.

Change in a way of life

In a medium-term, particularly in Yalo, Megale and Ab-Ala woredas quite significant change could take place for the nomads to increasingly settle down. Improved access to and for services, particularly those related to animal feed and health, would encourage people to reside close to them. Access to services is very low particularly in Yalo and Megale, but also in Ab-Ala woreda. Changes are expected to be quite significant both for both male and female population in the Afar Region because of increased access to services. It is not expected that the change towards urbanization will be rapid and the level of urbanization will drastically increase.

Most of the nomadic houses are of poor quality. It is expected that because of upgrading/constructing of road the accessibility as well as the mobility of the people in the area will increase. As a result the movement of goods to the rural areas will be enhanced. Therefore, rural dwellers who can afford will have access to purchase building materials to improve the quality of their houses. In general, access to goods that were not earlier available will improve.

High proportion of the road alignment is located closely to the human and livestock water supply sources. This may increase the number and frequency of crossing and traveling around the road in the short and medium term. This situation is likely to increase the risk of livestock accident along the road.

The Afar community residing in the rural areas seem to have the desire of settling along the new road in order to get better access to socio-economic services and to sell local products to passers by. This increases road side population, road side grazing thereby, increased frequency of the human and livestock crossing the new road. This situation is likely to increase the risk of human and livestock accident along the road in the long term. Usually it is the responsibility of small children, mainly that of girls, to look after small stock herd the risk of human accident becomes much more higher since these group are highly vulnerable.

Impact on gender, mainly women

Attitudes towards school, particularly for girls, are negative in Afar Region. Awareness raising is required amongst the population. In urban areas the balance of sexes in enrollment are more balanced implying that increased awareness and access increase enrollment. Awareness raising also requires improved access to population.

Changes in the roles of women and men are expected with the settling down of nomads. Improved access to education for girls will bring significant changes in women's job opportunities. In addition, improved services and information on eradication of harmful traditional traveling will be available. With improved quality of the road, access to goods improves, which might change the travel needs of women.

With a better quality road services like grinding mills might become closer reducing the work burden of women. With the change of the diet of nomads towards cereals, the work burden of women has increased. Small busses might appear on the road providing an alternative for traveling on foot. It is expected, though, that majority of women might still continue traveling on foot because of limited cash resources. Motorized transport might give an alternative in case of emergencies, e.g. faster access to health centers, thereby reducing health status of women in case of pregnancies. Both women and men would benefit of faster access to medicine in case of malaria. With a better road educational facilities can be reached quicker and safer which might increasingly encourage girls to go to school.

Women might be posed to increased risk of sexually transmitted diseases and unwanted pregnancies due to the construction camps. Equally, construction workers will be posed for the risk. This can be mitigated to some extent with appropriate IEC-interventions, however, not completely. No major health risk is expected in the local areas of Afar region because of sparse population density and the traditional bye-laws that restrict Afar women from contacting outsiders.

Along the alignment B travel needs of women and men differ. Women's travel needs are related to the household chores. Burden is heavy for women since the distances to services, water, fuel wood etc. are long. In detailed design of the road alignment it is necessary that the opinions and views of women are addressed to reduce their work burden.

Impact on indigenous people

Alignment B is expected to have significant impact on the Afar population residing in zone 2 and 4 because it opens new connection between Ab Ala and Yalo. The new connection is expected to bring the population of zone 2 and 4 closer and facilitate movement of the people along the route.

Induced development

In the project area in Afar Region there is a limited road network (RR 10 cleared between Ab-Ala and Megale) without motorized traffic. Between Megale and Yalo there is a track used during the military operations, but it does not provide service for connecting between Megale and Yalo. Some access roads exist between the regions, but no "corridor" connecting Yalo and Ab-ala in the Afar Region exists.

The advantage of having a road in the area would be improved transportation of livestock sector inputs and agricultural inputs. Yalo is major livestock market while Megale is a major livestock grazing area because water and better pasture are available. Alternative B creates accessibility between the livestock supply area and the major market and is expected to cause maximum impact on livestock marketing within Afar region.

With increased accessibility agricultural extension programmes can increase, particularly to develop pasture production in Megale using irrigation. Increased cereal production of agro-pastoralists and other diversification to improve food security can be expected with increased extension services. Road would also have positive impact on distributing cereals to Zone 2 and 4 markets with lower prices, thereby decreasing the need for selling animals with low price during the drought. As a result the marketing system within ANRS would improve.

Veterinary medicines can be supplied if and only if the area is accessible. With accessibility the cost of veterinary services is expected to drastically decrease. For example, the price of animal medicine is six times more in Tigray than in Asayita. Concerned woredas in ANRS purchase medicine from Tigray because of access problems.

Mobility and settlement patterns indicate in which areas the services are needed to ensure support to the livestock and agropastoralist economy of the Afar Region. There is already a tendency for the pastoralists to settle down and the whole family migration is reducing. Thereby, the areas where families stay during the winter with sufficient grazing area and water are becoming more important in the Afar society. Still there is a need to migrate during the summer time and particularly during drought for search of water and fodder. With improved services, better availability of water and fodder, it is expected that Afar migration within and outside the Region might reduce and pastoralists become more settled. Alternative B supports development of Afar economy mainly in Yalo, Megale and Ab ala woredas.

People can also easily have access to markets to sell their products with better prices. With improved access, goods will become more accessible and the existing markets are developed. Improved markets increase income generating activities to the local population through marketing of their products. Women would have a better potential to sell their products (e.g.mats) in local markets. In addition, new markets might develop along the road side.

Education is the key to the development of the entire region. Low school enrollment rates in Afar Region indicate that it still lacks sufficient school and teacher network, and that future human resources for development are limited. In addition, there are big discrepancies in education of boys and girls. This continues the existing situation where unequal opportunities between sexes prevail. Reasons for limited number of schools in Afar Region are also related to accessibility. Schools cannot be constructed where there is limited access. In addition, even if schools exist, it is difficult to get teachers to areas without access to towns and centers. Quality of education suffers.

In order to ensure that Afar population has an opportunity to administer its regional development independently, investment in education is crucial. Improving the access in the previously non-accessible areas will facilitate in this process. Improved and faster access might also improve the possibilities of girls to attend school. They are not expected to travel long distances to school. High illiteracy rate and lack of educational institutions are a reflection of the same situation.

Along the alignment B there are potential tourist attractions. During the detailed design of the alignment it is important that these attractions are taken into consideration, particularly the hot springs. Some of them are already visited also by the population of Tigray Region (Megale hot springs) and if accessible, have further development potential.

Road is along the "salt route", thereby it provides improved access to salt between Yalo and Dalol. In addition, Ab-Ala town and Yalo towns might become increasing market places for salt. Alternatives improve distribution of salt (access) within both regions. Increased investment in salt production by local people can also be expected. In a medium-term, increased use of hot springs is expected.

Road enables social services to access previously inaccessible areas. The network of government services has increased in the area during the last few years. However, it has been reported that it is difficult to get personnel or retain the existing personnel in their respective jobs. One reason is non-existing access to transportation. With motorized traffic and easier access to bigger towns in the area, availability of e.g. teachers, health workers etc. would increase and they would continue residing in the concerned areas. With increased accessibility number of NGOs and other donors is expected to increase in the area.

New employment opportunities are required to decrease vulnerability. On the other hand large working age population is a potential labour force that could be utilized. During road construction employment opportunities should be given to local communities to promote local economy. Out of the working age population women

are larger in number. Equal employment opportunities for men and women need to be promoted during construction.

The project area lacks services like fuel station and maintenance services which are essential for properly functioning transport system. This may limit transport operators from using the road in the desired level of service. Investors have to be sensitized about the up coming demand for such services during construction time so that the services are available when road starts service.

The other adverse effect of the new road may be the gradual declining of old social value systems, local customs and practices to be replaced by the new cultural and new value systems. This is attributed to the influx of new diverse inhabitants and new technology to the project area.

Large proportion of young population implies that many people are sexually active and prone to sexually transmitted diseases. This needs to be taken into consideration during the road construction. Both construction workers immigrating from other areas and the local population needs to be sensitized in the prevalence of HIV/AIDS and other sexually transmitted diseases. No major health risk is expected in the local areas of Afar region because of sparse population density and the traditional bye-laws that restrict Afar women from contacting outsiders.

Conflicts between local population and immigrants

The water needed for the road project is anticipated to be collected from the limited number of water sources already in use by the permanent and seasonal local users. The water needed for the road project is going to impose additional pressure over these sources and creates inconvenience on water fetching by the local people and animal

All the people and groups met in the public consultation process stressed that the local community should be given employment priority in positions not requiring skill. It has been made clear that depriving of this opportunity from the local people would be a cause of dispute for local people with the project. On the other hand, since the project area has hot climate the in-coming laborers are likely to cost more than local laborers, therefore, the probability of bringing laborers from other regions is limited.

Risk of conflict between project workers and residents may be caused if local customs are broken. Some of the local customs that have serious consequences are : trespassing Afar households and violating rules set to Afar women.

Since huge proportion of the project area has not been accessible for long time the majority of livestock in the rural area are not familiar to vehicle. Speeding car and noise of car can be causes for fatal accident to animal herd. Animal herds that travel parallel to the road are equally at risk as those crossing the road.

It was disclosed in the public consultation meeting that in-coming civilians are not allowed to carry armament without the authorization of Afar administration. Therefore, project workers coming from outside should follow this rule.

Livestock theft is a highly penalized crime. In case animal theft occurs and the perpetrator is apprehended the crime is settled by paying huge sum of compensation which is calculated following the local by-laws.

7.4. Impacts of Alternative C

7.4.1. Physical Environment

Soil and bedrock

Alternative C is mainly a new corridor in the eastern part of the project area. The flat terrain gives proportionally good circumstances for road construction in terms of impacts on soil and bedrock. The usage of aggregate material is comparatively insignificant. Due to flat terrain enhancement to erosion is fairly minimal (presuming good engineering).

However, opening an entirely new route in the area makes a big change to present situation. Taken into account the quantities of needed materials, the impact is not considered significant. The haulage distances for construction materials might be long, and thus produce lots of inconvenience during construction time and lots of extra energy consumption doing it. Yet again, not so many local people are there to suffer from it.

Water resources, water quality and drainage systems

Alternative C is passing a very dry area with not so many rivers to cross. In fact, lack of water might produce a problem to construction in many ways.

Air quality

Air quality will certainly not be affected seriously with this alternative. It is very probable that alternative C is tempting only a little traffic, and taking into account the good terrain (in terms of road geometry) and the few settlements along the route, there will not be a significant change in air quality.

7.4.2 Natural Environment

Biological and ecological changes

The route is a totally new alignment except for the stretch of about 45 kilometres running along existing track (in Ab-ala side). This route goes along arid environment, which has limited vegetation cover, and mostly through flat terrain. However, the first short part of the route (in Yalo area) goes through area covered by a bush/shrub vegetation. As this part of the project is completely new, the construction would very likely cause significant damage on the vegetation available on the alignment. Along the rest part of the route there is limited flora to be affected by the construction of the road. As a whole, the impacts on natural vegetation would not be significant with alternative C.

Impacts on Fauna

The proposed routes do not intersect areas of major or sensitive wildlife reserves or habitats. However, areas with a relatively dense and less disturbed bushland are important habitats for wildlife. Where the project intersects these habitats, it will fragment them affecting the flora and fauna in those areas. With implementation of the project, the area occupied by the road will be subtracted from the habitat's use, and living patterns of the wild animals are affected. It has to be taken into account that alternative C bears the biggest risks of having sensitive habitats or rare or endangered species close by, because at present the area is not disturbed by motorized vehicles at all.

The potential impacts would be related mainly to clearance of the natural vegetation and traffic during the construction and operation periods. In addition, the rate of poaching may increase with improved accessibility. Furthermore, mortality rate may increase because of collisions with vehicles. However, these impacts are not expected to be severe due to low traffic volume.

7.4.3 Human and Social Environment

Social acceptability

Alternative C was not supported in public consultations, however, its full existence in ANRS was considered positive. Alignment C would support the development of the Afar National Regional State to the level of the other regions, which is a regional development priority. Alternative C is fully situated in ANRS and thereby serves improvement of the ANRS road network and a secure connection between Yalo and Ab-Ala. It improves accessibility between Yalo and Ab-Ala fully within ANRS thereby supporting the fact that Yalo - Ab-Ala road is in the ANRS 5-year regional development plan. However, it does not serve the priority need for regional road development, which is to connect Yalo and Ab-Ala via Megale woreda.

Alignment is located in vulnerable areas of ANRS and thereby it would improve the situation of poor and vulnerable population even though the number of population in the area is limited. However, alignment would decrease vulnerability within ANRS.

Alternative C is expected to have minor impact in development of market areas in both regions. Movement would mainly increase from within the Afar Region to Ab-Ala and Yalo markets. Population of Megale woreda would have to travel again long distances to the Ab-ala and Yalo markets. There is already a shorter access road between Megale and Ab-Ala, so the alignment C would not serve connection between Megale and Ab-Ala. It would also provide access to Yalo for Megale population that did not earlier exist. Alignment C would provide a good linkage between Ab-ala and Yalo for motorized traffic.

Markets in Tigray Region are at long distance for Afar population and herding the livestock to these areas leads inevitably to the loss of weight of the livestock to be sold and, accordingly, lesser price. Alternative C would develop internal Afar markets, both Ab-ala and Yalo. More goods (grain) would be available in the Afar markets and the traveling needs of Afar population would decrease in Tigray Region and be more targeted towards the developing Afar markets. Alternative C would not facilitate selling of livestock, but the main markets would be within the Afar Region. Development of the Afar Region markets in the areas where the livestock resides most of the time would ensure, that livestock does not lose its value when traveling long distances.

Along the alignment C ethnic groups are harmonious which is also reflected in the language used and religion. Alignment C would not facilitate the lively co-operation between these two regions but would provide a secure access within the Afar Region between Yalo and Ab-Ala. Project affected woredas in the Afar Region are the main conflict areas being the bordering woredas with Tigray. Alignment C is further away from the border, and thereby does not directly affect solving of the border problems.

Despite of the newly established decentralized government structure along the alternative C, the traditional bodies still hold important position amongst the population. Constant communication with these bodies will increase social acceptability of the intervention. In addition, if conflicts occur between construction workers and local population, traditional decision-making bodies will be aware of the purpose of the road construction. With their support conflicts can be solved in a peaceful manner.

Limited development efforts have taken place in the project area in Afar Region and this might affect the social acceptability of the alignment C amongst the population. Constant consultation with population needs to be undertaken to clarify the purpose of the project and the operating mechanisms.

Low acceptance amongst regional and zonal authorities might have at least moderate impact during the operation and maintenance phase. During the field assessment the woreda administration, and local population, did not accept this alternative because it is the least inhabited area.

Resettlement/displacement

Alignment entails mainly construction of new road, even though some tracks are expected to be used as basis. Despite of new construction no resettlement/displacement is expected because the area is very scarcely populated. Population are nomadic pastoralists. Climate in the area is harsh and environment not suitable for grazing. It is expected that no grazing area would be endangered. This can be mitigated if cases appear.

In the concerned areas in Afar Region, population is mainly pastoralists. However, the settlement pattern has a tendency of becoming less mobile than before. There will presumably be some people who will be displaced from their homes. In both alternatives, particular emphasis needs to be placed in cases where the property of female-headed households is lost. They are in many cases very vulnerable in case of negative changes. It is expected that no agricultural land and/or livestock grazing area might be endangered.

Along the alternative C most of the population reside in rural areas in the affected woredas. There are no urban centers along the alignment. Alignment passing through this area would serve only a limited number of population. Resettlement efforts can be expected in Ab-Ala and Yalo woreda centers only.

Even though along the alternative C, in the Afar Region the percentage of single-headed households is low, those households accommodate almost one third of population. Single headed households are often the most vulnerable households. Special emphasis needs to be placed on ensuring appropriate resettlement terms and compensation for these households.

Demographic changes

Road is expected to cause very limited, if any, demographic changes. Even with improved access, it is not expected that the concerned area is a priority area for service development because of very limited population, who are nomadic, and environmental conditions are harsh. Road would not contribute to settlement of nomads along the road side. Road might contribute to the increased population in Ab-Ala and Yalo woredas. It is expected that population will settle more in towns because of improved access to, and possibly for services. Population particularly from Erebt and Teru woredas might use increased access provided by the road to settle around the Zone 2 capital and Yalo woreda centers. Any development intervention in those areas would have lesser development impact than in more populous areas. There are no urban centers along the alignment.

Along the alignment C sex ratio for children below one year falls outside acceptable range. This implies, that preference is given to boys after birth. Available family resources are used to ensure, that boys survive the first vulnerable years of childhood. This attitude is also reflected in later years. In rural areas sex ratio is in most age groups high i.e. there are more men than women. Preference is given to the health care of men and boys, and e.g. maternal mortality rates remain high. Alignment C would not significantly facilitate changing the imbalance between sexes.

Change in a way of life

Limited, if any, change in the lives of people is expected because population in these areas is nomadic, and no significant improvement in accessibility of and for social and other services is expected.

Impact on gender, mainly women

Limited change in the lives of women is expected. Road will improve accessibility to the Ab-Ala and Yalo markets. Road is fully in ANRS, thereby providing a secure and culturally suitable connection for women. Road would improve access to goods along the road side which might change the travel needs of women. It might reduce traveling to far-away markets. Motorized commercial traffic might not be available due to limited number of customers. It is expected that women continue traveling on foot.

Women might be posed to increased risk of sexually transmitted diseases and unwanted pregnancies due to the construction camps. Equally, construction workers will be posed for the risk. This can be mitigated to some extent with appropriate IEC-interventions, however, not completely. No major health risk is expected in the local areas of Afar region because of sparse population density and the traditional bye-laws that restrict Afar women from contacting outsiders.

Along the alignment C travel needs of women and men differ. Women's travel needs are related to the household chores. Burden is heavy for women since the distances to services, water, fuel wood etc. are long. In detailed design of the road alignment it is necessary that the opinions and views of women are addressed to reduce their work burden. Alternative C is not expected to reduce the burden of women significantly since the number of settlements is limited along the alignment.

Along the alignment C attitudes towards school, particularly for girls, are negative. Awareness raising is required amongst the population. In urban areas the balance of sexes in enrollment are more balanced implying that increased awareness and access increase enrollment. Awareness raising also requires improved access to population. Alternative C provides access in a scarcely populated area, thereby not improving significantly the situation.

Impact on indigenous people

In ANRS, the smallest minorities do not reside in Zones 2 and 4. The road is not expected to have any new or different impact on the ethnic groups already existing in the area.

Induced development

Alignment would enable, and facilitate, distribution of goods, mainly salt, within ANRS. It promotes access "corridor" development within ANRS. Despite of this, it is not expected to significantly improve access to and for social services. There is only limited population along the road side and population are pastoralists and not settled. Access to Yalo market from the North would improve but the number of users is limited along the road side.

Access to hot springs and lakes increases potential to improve the regional and local economy. Improved access in Tero woreda would enable utilization of a geo-thermal energy site for improving regional and local economy.

Conflicts between local population and immigrants

No major conflicts are expected.

8. COMPARISON of the Alternatives

8.1 Physical Environment

Soil and bedrock

Alternative A will likely have significant local impacts on areas under cultivation or pasture due to their location in areas of major agricultural activity. The other two alternatives (C & B) will have insignificant impacts on cultivation; nevertheless, they will certainly have impacts on the pasture available along the routes.

Based on the extent of their location in erosion prone areas such as mountainous and hilly areas (with steep slopes), erodibility of the soils and rainfall patterns, and extent of earthworks involved, alternatives A and B generally will have comparable erosion hazards. The alternatives A and B pass mountainous and hilly areas, resulting quite extensive earthworks at places, and thus putting a strain on the use of non-renewable aggregate resources. Also spoil disposal problem could be evident in certain sections of these routes. In particular the alternative B passing through a difficult mountainous area could induce more erosion hazards and spoil disposal problem; while the alternative C will likely have least erosion potential and spoil disposal problem.

Water resources, water quality and drainage systems

Routes A and B intercept numerous streams, and the roadworks comprise a potential risk to the quality of the river waters. However, as all the rivers are seasonal and most of the works are expected to take place during dry season, the problem is likely capable of being reduced to acceptable levels. As the route C crosses or goes along least number of streams, all of which are seasonal, its construction will likely bring minimal effects on the water quality of the water sources.

Air quality

New roads will increase the traffic, but the change is expected to be small for all the alternatives – keeping in mind that new road will be in better condition and have better geometry, and traffic volume on the roads would be comparatively low. However, comparatively alternatives with more mountainous and hilly sections, like A and B, might have more harmful effects than alternative C.

8.2 Natural Environment

Biological and ecological changes

In general significant variations are not expected among the alternatives in terms of changes in biological and ecological conditions. According to present findings there is no evidence that any sensitive habitats, rare or endangered species would be found close to any of the road alternatives. However, it has to be noted that the smallest changes in this respect would occur with alternative A, because the corridor already is bothered with traffic for most parts of it. Alternatives B and C are more or less new corridors with bigger biological and ecological changes if chosen to be implemented. Nevertheless, the changes with each alternative are expected to be minor.

8.3. Social and Human Environment

Social acceptability

Alternative B was identified during the public consultation process and was fully supported by all persons and institutions met.

Alternatives A and C were tentatively presented by the Consultant affect two regions. Despite of the possible conflict of interest, there was a unanimous agreement between the people and authorities of the TNRS and ANRS on where the priority need for road construction exists:

- Road should be an Afar National Regional State road
- It should link three woredas, namely, Ab-Ala - Megale - Yalo

The Consultant has included the preferred alignment as one of the alternatives to be studied. This is done after the missing information on land form in the area between Yalo and Megale woredas was prepared from satellite imagery. Alternative B was fully supported by all persons and institutions met.

Alternative A do not support the regional development priorities of the Government where major emphasis is given to the development of the Afar National Regional State. Alternative C is fully located in the Afar Region, but it is located in a scarcely populated area limiting the potential benefits.

Resettlement/displacement of people

No significant variation is expected between alternatives. No significant resettlement/displacement of people is expected in any of the alternatives.

Demographic changes

There is variation expected between alternatives. Alternative C is not expected to cause any significant demographic changes. C is located in sparsely populated area. Alternative B creates new access while Alternative A creates partially new access to previously not accessible areas and road construction would support development of the towns/settlements along the road and the vicinity. The settlement pattern of nomads is expected to change as a result of Alternatives A and B.

Change in a way of life

There is variation expected between alternatives. Because alternative B and alternative A provide access to previously not accessible areas, also the changes in a way of life can be expected to be biggest in alternative B. Alternative C is located in a sparsely populated the area where population is nomadic.

Impacts on gender, mainly women

There is variation expected between alternatives. Alternative C is expected to cause least positive impact because of its location in sparsely populated area. Alternative B is expected to cause the most positive impact on the lives of Afar women. Alternative A is expected to cause less level of impact on Afar women than B because it is partial located in Afar.

Impact on indigenous people

Alternative B is expected to cause the most positive impact because it creates new connection between zone 2 and zone 4 communities and facilitates movement along the route. There is no variation between alternative A and alternative C.

Induced development

There are significant variations between alternatives. Alternative B is expected to have significant positive impact on the development of the area. Alternative A is expected to cause less degree of impact because part of the area that this alignment pass is already accessible. Alternative C is expected to have least positive impact.

Conflicts between local population and immigrants

There are no significant variations between alternatives. No significant conflicts are expected in any of the alternatives.

9. IMPACT MITIGATION AND THE ENVIRONMENTAL MANAGEMENT PLAN

9.1 Tasks included in the mitigation measures

The Environmental Management Plan comprises mitigation, monitoring and the implementation in one comprehensive Environmental Management Plan, which includes all the relevant tasks in mitigation and monitoring and the responsibilities of different organizations during the Project proceeding until Operation Phase.

Mitigation measures concerning natural and physical environment are presented in the table below. Since the nature of the mitigation measures in this respect is quite normal – included in good engineering practices – the measures and tasks are not repeated in text.

Loss of productive land

Measures have to be taken to limit the disruption of grazing and agricultural by allowing construction to follow the existing right of way. In case productive land is likely to be lost due to the construction of the road then the information has to be provided to the sociologist two months before start up of construction. The sociologist will use W&ZPCUs to disseminate to the affected people and compensation is arranged. During construction the contractor has to ensure that adequate access to farming and grazing land is maintained. After construction is completed the land has to be reinstated to its original state and owner.

Lose of Property

Prevention of damage to any property that has not been agreed as part of a compensation plan in advance. (In the case of accidental damage ensure that this is added to the compensation plan.) Allowing removal of any property within or outside the right of way by giving prior notice in writing. Ensuring that adequate access to property is maintained during implementation via temporary structures if necessary

Malaria

Appropriate siting of camps away from towns and villages to minimise unnecessary contact between construction workers and local people. Ensuring cleanliness of sites and minimizing potential breeding sites for mosquitoes such as standing water. Provision of preventive and curative medication service.

Water borne disease

Task to be done by the contractor include, prevention of water contamination of water by project workers through practice of open defecation.
Provision of clean water supply and VIP latrines to project workers

Risk of accident caused by road side grazing

Task to be done by contractor and Z&WPCUs is to ensure adequate (2months) notice before the commencement of works to local people to minimize accident.

Risk of animal herd accident caused by speed of car

The following tasks are to be carried out to mitigate risk of animal accident. Organization of training to project drivers so that vehicle speed is dropped or stopped when animal herd is crossing or traveling along the road so as not to scare them. Awareness also to include actions to be taken by drivers in case accident occurs. Identification of regular livestock crossing points and places where big

herd travel along the road . Organization of road safety training to transport operators after road has been completed. Creation of awareness among herd owners about possible danger of vehicle.

Inconvenience of water fetching on local people

The first task is identification of water use needs of the local population and the road construction; Then agreement has to be reached with the community on water use through dialogue. To this end the sociologist has to inninte discussion with the zonal and the specific WPCU about the particular water source. Then organization of the meeting between the permanent and seasonal users of the water source and the project contractor that is facilitated so that the detailed schedule and volume of water to be consumed agreed by the project and the community is designed. Identification of an independent monitoring body with administrative authority to excute the plan and that monitors the strict adherence of the agreement.

Risk of conflict caused by breaking Afar customs

Tasks to be done by the contractor and the W&ZPCUs include :organizationof training to project workers about Afar customs which they should respect. Administration mechanism that enforce the respect of local customs introduced and monitored. Cemeteries which are considered to be sacred by Afar community are not disturbed

Risk of spread of sexually transmitted disease

Tasks to be done by ZPCU and the contractor comprise :provision of information on HIV/Aids to construction workers and local people particularly to local women through public meetings, religious institutions (where accommodating) and schools. Provision of means of protection at subsidized prices.

Lack of essential services

Tasks to be carried out by ZPCUs include sensitization of potential investors to initiate the services. Facilitation of incentives to encourage investment in the field.

9.2 Implementing Institutions

9.2.1 The present institutional set up

As part of the public consultations process at the woreda level information related to the grass root administrative structure was gathered. The administration structure at zone and woreda level, the authority , responsibility and present capacity, limitations, other social/power structures that influence the community, their link to the formal administrative set up, were also assessed.

Zone

The Zone 2 government organo-gram shows that the administration has 18 excutive committee members, 9 advisors (clan leaders) and 27 support giving employees. The executive committee members of zone 2 administration are representatives of the people and the 9 advisors are clan leaders. The inclusion of clan leaders in zone administration indicates that despite of the established formal administration set up the role of the traditional institutions is important.

Under the zone administration there are 8 sectoral offices namely Agriculture, Education, Health, Trade, Social affairs, finance, Economy Development. According to the information given during public consultation there is critical shortage of educated human resource in the

sectoral offices that only 50% of the positions have been filled. Poor logistics support and poor communication with the region also limit the capacity of the zone.

Woreda

At the woreda level there are 9 executive committee members and 7 support giving personnel. Clan leaders are members to the woreda executive committee. Sectoral office do not exist at the woreda level. At the woreda level the duties of sectoral office is undertaken by the Economic Development Office (EDO) which is accountable to the woreda administration. In the organo-gram it is indicated that the woreda EDO is supposed to have 12 experts. The actual number of experts in the three woredas varies between 5 in Megale, 6 in Yalo, and 7 in Ab ala. The capacity of the woredas is so low that even financial management of the three woredas is handled by the zone finance department. Apart from limited capacity the woredas do not have proper communication with the zone administration. Except Ab ala the other woredas do not have proper offices and logistics.

9.2.2 Restructuring

At present the administration set up of the region(the country) including the organization, role, authority, responsibility, accountability is in the process of drastic change. During the survey time the restructuring process was under study. The draft restructuring study is being prepared at the Federal level with the participation of the ANRS officials. Latter on when the draft is finalized it will be taken to the ANRS council for discussion and endorsement. Therefore, the role of the future institutions in the monitoring process is unknown.

At this stage some regions have completed preparing the new structure e.g. Amhara, and Oromia. From these it can be concluded that, the direction of change is geared towards enhancing the capacity of the woreda and kebele structures by skilled human resouce and logistics. Similar direction of change is expected in ANRS.

9.3. Coordinating mechanism

On account of the following reasons the consultants envisaged coordinating mechanism to assume the monitoring responsibility :

1. Assuming that the direction of change to be applied in ANRS is somehow similar to the other regions,
2. The public consultation has shown the authority of clan leaders is as important as the government administration structure
3. The new structure in ANRS is unknown therefore there is a need to devise a mechanism that accommodates the effects of the restructuring process
4. Low institutional capacity at woreda and zone level

Due to the listed reasons team/group coordinating mechanism has been recommended by the consultant.

The coordinating units are envisaged to be groups/teams at zone and woreda levels, They are envisaged to constitute persons coming from administration, clan leaders, women, and experts. The coordinating units will facilitate the project implementation during pre-construction, construction and Monitoring phases. Two levels of coordinating units are proposed to be established namely: one Zonal Project Coordinating Unit (ZPCU) and three Woreda Project Coordinating units (WPCUs) in each woreda.

The role of each WPCU is to take all responsibility in all stages of project implementation in the specific woreda. The role of the Zone PCU is to coordinate and follow up the activities in each woreda and provide all necessary backstopping support. The roles and responsibilities of this unit have been identified in the impact mitigation plan.

9.4. Members of the ZPCU

The on-going restructuring process is expected to change the role and responsibility of the zonal and woreda set up and the roles and responsibilities of the ZPCU and the WPCUs have to be adjusted accordingly. The recommended membership also is subject to be modified according to the result of on-going regional restructuring. After assessing the institutional set up at zonal administration and sectoral offices the consultant recommends the following to be members of the ZPCU:

1. Zone administration vice chairperson
2. Zone administration advisor (clan leader)
3. Zone administration women's affairs office
4. Agriculture Department
5. Department of Labor and Social Affairs
6. Department of Trade and Industry

9.5. Members of the WPCU

After assessing the institutional set up at woreda level the consultant recommends the following to be members of the WPCU:

1. Woreda administration vice chairperson
2. Woreda administration advisor (clan leader)
3. Woreda administration women's affairs office
4. The woreda Economic Development Department head and two experts

9.6. Other expertise needed

One sociologist and one ecologist/environmentalist is recommended to participate in all stages of the project implementation. The sociologist is recommended to be part of the consultant team, the ecologist/environmentalist will most probably be from ERA's staff (from EMB). As it is indicated in the Impact Mitigation Plan, the sociologist plays key role in initiating the establishment of the ZPCU and the WPCUs in zone 2 and each woreda. The environmentalist is more or less responsible for the whole range of environmental issues related to the project.

9.7. Training Needs and Institutional Strengthening

The members of the WPCUs and the ZPCU have diversified background in education, authority, gender, experience, and exposure. The combination of administrative and clan authorities with the technical experts is assumed to strengthen the coordination units through exchange of ideas among the members. The main duties and responsibilities of the coordinating units is facilitating and monitoring the new road project cycle, as indicated in the IMP. The present capacity of WPCU is not however, adequate to carry out the tasks listed in the IMP because some of the tasks are too technical e.g. diseases and compensation and others are too cultural and administrative, to be understood by all members of the units. This poses the need to build the capacity of the members of the unit to up grade their level of understanding.

To this end the consultant has identified capacity building program with the objective of increasing the capacity of the members to the level that they will be able to carry out the tasks assigned to them in the IMP. Two training program are envisaged to be conducted during the pre-construction and construction phases in order to address the distinct tasks of the CUs in the two phases. Moreover, the phased approach gives the possibility of applying result of training on implementation without delay.

To address the tasks to be carried out during the pre-construction phase. The training session also serves as feed back to confirm the PCUs duties and responsibilities and participation level in IMP. The coverage of training may focus on the following issues:

1. Main stages of the Project cycle of the new road
2. The IMPA and EMP particularly focusing on their responsibility
3. Compensation procedure of ERA

After the training the coordinating arrangement and monitoring process can be modified based on the feedback from the participants of the training.

The coverage of training during Construction phase may touch the following essential issues :

1. Environmental health sanitation management
2. Sexually transmitted disease
3. Malaria control
4. Road safety program
5. Human resource management
6. Monitoring and evaluation

Detailed training plan around the above areas should be prepared by the trainers.

Resource persons that will prepare training program and conduct training should come from the ANRS RRA, ERA, and at zone level.

9.8. Loss of land and property

9.8.1. Loss of agricultural land and displacement households in the rural area

The consultant team undertook field survey to assess the magnitude of rural buildings and agriculture land that may be affected within the right-of-way. The result is summarized below:

1. Alternative B is planned to pass over the already existing track and over uncultivated area.
2. Alternative C passes over an arid area with low number of inhabitants.
3. The Tigray region portion of Alternative A is designed to pass over the already existing road. The remaining portion of this route passes over the already existing track in Afar region.

Therefore, it is presumed that the rural stretch of the three alternative routes will not affect buildings nor agricultural land, within the right-of-way.

9.8.2. Loss of buildings and displacement of households in towns

The field survey carried out in Afar region it was confirmed that conventional houses are built in the woreda towns only. In Tigray region the conventional buildings to be affected by Alternative A are located in Addis Ketema town only. Totally about 60 conventional buildings, in Ab ala, Nehile, and Yalo and 20 buildings in Addis Ketema

are located within the right-of-way and are anticipated to be too close or fringing on the new road design so expected to be demolished.

Based on this finding Alternative A implies the demolishing of smallest number of buildings (50) and resettlement of people (250) , followed by Alternative B (60 buildings and 300 people) and C (80 buildings and 400 people).

A rough estimate of the cost required to compensate for the buildings anticipated to be demolished by each alternative route, has been calculated. Even though the buildings to be demolished are conventional their standard is quite poor, therefore, low unit costs are used to estimate the compensation costs. A summary of the buildings to be demolished in the three alternative routes and the estimated compensation cost is given in Tables 9.1-3.

It has to be noted that the three tables show estimates based on the present road design. The exact number of buildings to be demolished and a more realistic estimate of compensation cost will be determined during the detailed design study.

Table 9.1. Buildings within Right-of-Way in Alternative A

| | Village / Town | Number of Buildings to be Removed | | Estimated Cost of Buildings to be Removed | |
|---|-----------------------------|-----------------------------------|-----------|---|-------------------|
| | | Left | Right | Unit Cost (Birr) | Total Cost (Birr) |
| | <u>Alternative A</u> | | | | |
| 1 | Addis Ketema | 10 | 10 | 5000 | 100 000 |
| 2 | Woyra Wuha | - | - | - | - |
| 3 | Mehoni | - | - | - | - |
| 4 | Nehile | 5 | 5 | 2000 | 20 000 |
| 3 | Ab ala | 20 | 20 | 10000 | 400 000 |
| | | 40 | 40 | 17 000 | 520 000 |

Table 9.2. Buildings within Right-of-Way in Alternative B

| | Village / Town | Number of Buildings to be Removed | | Estimated Cost of Buildings to be Removed | |
|---|-----------------------------|-----------------------------------|-----------|---|-------------------|
| | | Left | Right | Unit Cost (Birr) | Total Cost (Birr) |
| | <u>Alternative B</u> | | | | |
| 1 | Ab Ala town | 20 | 20 | 10000 | 400 000 |
| 2 | Nehile town | 5 | 5 | 2000 | 20 000 |
| 3 | Yalo town | 5 | 5 | 4000 | 40 000 |
| | | 30 | 30 | 16 000 | 460 000 |

Table 9.3. Buildings within Right-of-Way in Alternative C

| | Village / Town | Number of Buildings to be Removed | | Estimated Cost of Buildings to be Removed | |
|-----------------------------|----------------|-----------------------------------|-----------|---|-------------------|
| | | Left | Right | Unit Cost (Birr) | Total Cost (Birr) |
| <u>Alternative C</u> | | | | | |
| 1 | Ab Ala town | 20 | 20 | 10000 | 400 000 |
| 2 | Yalo town | 5 | 5 | 4000 | 40 000 |
| | | 25 | 25 | 14 000 | 440 000 |

9.9. Additional Budget needed for IMP implementing institutions

In section 9.2. above an institutional arrangement that implements the impact mitigation plan has been proposed. In the same section the tasks of different institutions and persons during the pre-construction, implementation and operation and maintenance phases have also been identified. The budget requirement for the execution of the planned tasks is estimated to be Birr 214 500. (Table 9.4.) This estimated budget is common for the three Alternative routes.

Table 9.4. Per Diem and Transportation Cost for The Implementation of The Impact Mitigation Plan

| | Item | Total Person Days | Per Diem Per Person (Birr) | Total Cost (Birr) | |
|-----------|-----------------------------------|-------------------|----------------------------|--------------------|--------------------------|
| I | <u>Per Diem</u> | | | | |
| 1. | Zone and woreda experts | 150 | 200.00 | | 30 000.00 |
| 2. | Sociologist | 60 | 1000.00 | | 60 000.00 |
| 3. | Environmental/ Ecologist | 30 | 500.00 | | 15 000.00 |
| 4. | Six Trainers | 100 | 200.00 | | 20 000.00 |
| | | | | Sub-total | 125 000.00 |
| II | <u>Transportation Cost</u> | Unit | Unit Cost (Birr) | Quantity | Total Cost (Birr) |
| 1. | Cost of Station Wagon Service | day | 1000.00 | 60 | 60 000.00 |
| 2. | Air Ticket | round | 1000.00 | 10 | 10 000.00 |
| 3. | | | | | |
| | | | | Sub-total | 70,000 |
| | | | | (I + II) | 195 000.00 |
| | | | | 10% Contingency | 19 500.00 |
| | | | | GRAND TOTAL | 214 500.00 |

MITIGATION PLAN

| Ser No. | Environmental Issue | Mitigating Measures | Implementing Organization | Responsible Organization |
|----------|-------------------------------|--|---------------------------------|--------------------------|
| A | Pre-Construction Phase | | | |
| 1 | Alignment Location | <ul style="list-style-type: none"> ▪ Locating the alignment so as to avoid or minimize unfavorable geological conditions, steep slopes, etc. | Designing Team (the Consultant) | ERA |
| 2 | Soil Erosion and Drainage | <ul style="list-style-type: none"> • Proper & adequate drainage structures, lined side drains, retaining walls & masonry rubbles at slopes, appropriate angles of cut-and-fill are designed to prevent soil erosion; • Cutoff drains, diverting drains, and concrete dissipation structures are designed in order to avoid excessive concentration of flow and to slow fast-running floodwater in drains; • Stabilizing structures including gabions or stone pitching are designed to prevent erosion at the inlets & outlets of culverts & pipes. • Bridges, culverts & pipes are designed so that they will have sufficient opening to discharge the design flood and minimize scouring downstream. | Designing Team | ERA |
| 3 | Slope Stability | <ul style="list-style-type: none"> • Appropriate angles of cut-and-fill are adopted to protect vulnerable slopes; • The alignment and borrow sites are sensitively located so as to minimize slope destabilization; • Structures like retaining walls, rock fill, gabions, etc are designed to protect unstable slopes. | Designing Team | ERA |

| B | Construction Phase | | | |
|----------|---------------------------------|--|------------|--------------------------|
| 1 | Erosion and Sediment Deposition | <ul style="list-style-type: none"> • Constructing cutoff drains and diverting drains to avoid excessive concentration of flow; • Providing concrete dissipation structures to slow fast-running flood water in drains; • Constructing lined side ditches and diverting drains for sections with erosion vulnerable soils and slopes; • Constructing adequate drainage structures to provide proper drainage at cuts and fills; • Executing cuts at erosion prone areas during dry season and re-planting those sites as soon as possible; • Confining land clearing to what is absolutely necessary; • Designing & constructing bridges, culverts & pipes so that they would have sufficient opening to discharge the design flood, and minimize erosion and scouring downstream. • Replanting significantly affected areas particularly erosion prone slopes; • Rehabilitating borrow sites to natural contours and replanting with appropriate plant species; | Contractor | Supervision Organization |
| 2 | Drainage & Water pollution | <ul style="list-style-type: none"> • Proper disposal of earth or spoil material so as not to block the river water and affect water quality; • Preventing earthworks and stone works from impeding the rivers and existing drainage system; • Controlling careless disposal of used oil and lubricants, and minimizing spills of hazardous materials, which have the potential to contaminate the soil and pollute water resources; • Properly locating waste dumping areas, keeping in good shape and modifying and planting after construction. | Contractor | Supervision Organization |

| | | | | |
|----------|---|---|---|--------------------------------|
| 3 | Landscape Quality and Instability | <ul style="list-style-type: none"> Careful and proper execution of construction works; Avoiding side casting of spoil materials from road cuts down-slope; Constructing retaining walls, rock fills, etc. to protect slope instability; Re-planting the affected areas to restore the natural appearance of those sites wherever feasible; Restoring borrow sites to natural state and re-planting with appropriate plant species. | Contractor | Supervision Organization |
| 4 | Flora and Fauna | <ul style="list-style-type: none"> Minimizing clearing of existing vegetation or confining clearing to what is absolutely necessary; Construction workers should be told to protect natural resources and wild animals; in particular operators of heavy equipment should be told to avoid excessive damage to vegetation and side-tipping of spoil materials that could damage the adjacent vegetation; Replanting with appropriate plant species such as <i>Commiphora</i> spp. (indigenous) and true-man-tree (<i>Schinus molle</i> – exotic sp. but appropriate and adaptable for the agro-ecology of the project area); Designing & constructing road cross-section so that it would have lower vertical alignments, smaller cuts & fills, and flatter side slopes wherever possible to minimize impediment to movement of wild animals. | Contractor | Supervision Organization |
| C | Operation Phase | | | |
| 1 | Erosion, Sediment Deposition and Drainage | <ul style="list-style-type: none"> Follow up and maintenance of erosion protection structures upon their failures and damage; The drainage system will be periodically cleared so as to ensure water flow. | Regional Rural Roads Authority | Regional Rural Roads Authority |
| 2 | Flora & Fauna | <ul style="list-style-type: none"> Awareness raising drivers, who use the road, by installing signs and posters in wildlife areas so that they are cautioned and use optimum speed to minimize traffic killing of animals; Control poaching and collection of woody biomass for fuel, construction, charcoal making, etc. | Local Administration, Agriculture Offices | |

| | | | | |
|----------------|--|---|---|---------------------------------|
| 3 | Health and Traffic Safety | <ul style="list-style-type: none"> • Provision of health education about venereal diseases including AIDS; • Install hazard markings and signs to counter increased vehicle speeds esp. for sections passing through dense villages and difficult terrain; • Inform the local people on public meetings how to behave with motor vehicles. | Health Offices | |
| 4 | Accident Risks on Animal Herds | <ul style="list-style-type: none"> ▪ Identifying regular livestock crossing points and places, and restricting vehicle speed at the crossings; ▪ Increasing awareness of drivers about road safety; ▪ Creation of awareness among herd owners about possible danger of vehicle | Local Administration, Agriculture Offices, ERA/ARRA | |
| Ser No. | Social Issue | Mitigating Measures | Implementing Organization | Responsible Organization |
| A | Pre-construction Phase | | | |
| 1 | Loss of productive land | <ul style="list-style-type: none"> ▪ Disruption and/or destruction of grazing and crop land minimized and individuals and/or communities (men and women) compensated for loss of productive land/crops | Sociologist, W&ZPCUs, Contractor | Supervision Organization |
| 2 | Loss of property in the three woreda towns (no permanent property in the rural area) | <ul style="list-style-type: none"> ▪ Ensuring the construction of the project Ways that ensure the least possible negative impact on the livelihoods of those living along the road by the road construction identified. Compensation arranged for both men and women. Women to be represented in the committees to be established at the community and woreda level (30% of women members to be women). | Sociologist, W&ZPCUs, Contractor | Supervision Organization |
| 3 | Malaria | <ul style="list-style-type: none"> ▪ Ways to limit the spread of malaria among local people and that prevent the spread of malaria to in-coming project workers identified and applied. | Sociologist, W&ZPCUs, Contractor | Supervision Organization |

| | | | | |
|----------|--|--|--|--|
| 4 | Water borne diseases | <ul style="list-style-type: none"> Ways that minimize the incidence of water borne disease among local people identified and applied. Clean water supply and VIP latrines constructed for the use of project workers. Latrines to be used by men and women should be separated. | Sociologist, W&ZPCUs, Contractor | Supervision Organization |
| 5 | Loss of roadside grazing within the right of way | <ul style="list-style-type: none"> Adequate notice to livestock owners disseminated (so that they can make alternative arrangements for livestock feed) | Contractor | Supervision Organization |
| B | Construction Phase | | | |
| 1 | Risk of accident on animal herds caused by high speed of vehicle | <ul style="list-style-type: none"> A system that ensures reduced accident on animal herd created and applied | Sociologist, W&ZPCUs, Contractor | Supervision Organization |
| 2 | Reduced water supply and inconvenience of fetching water by the local people | <ul style="list-style-type: none"> An acceptable water supply system created to the local community and for the road construction phase. The system should be developed with participation of the community particularly women. | Sociologist, W&ZPCUs, Contractor | W&ZPCUs |
| 3 | Risk of conflict if project employs laborers from out side | <ul style="list-style-type: none"> Employ local people (men and women) in the project positions that don't require skill. 30% of the local people to be employed should be women. | Contractor | Supervision Organization and Z&WPCUs |

| | | | | |
|----------|--|--|--|--------------------------|
| 3 | Risk of disturbing local customs | <ul style="list-style-type: none"> Awareness about Afar tradition, customs and sacred places created among project workers. | Sociologist, W&ZPCUs, Contractor | W&ZPCUs |
| 4 | Sexually transmitted diseases | <ul style="list-style-type: none"> Awareness level of the project workers and local people about sexually transmitted diseases and HIV/AIDS increased. Preventive means provided to project workers and local people. | ZPCU and health department, Contractor | ZPCU |
| C | Operation Phase | | | |
| 1 | Lack of fuel and vehicle maintenance services may limit transport operators use the new road | <ul style="list-style-type: none"> Essential services such as feul station, tyre repair, spare part shops and maintenance garages. | Zand WPCUs | W&ZPCUs |
| 2 | Increased risk of accident due to increased settlement along the road and mobility of herds | <ul style="list-style-type: none"> Essential means that restrict speed to be introduced and road safety training to transport operators provided | Contractor & ZPCU | Supervision organization |

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APPENDIX 1

SCOPING TABLE

APPENDIX 2

IMPACTS SUMMARY TABLE

SOCIAL/SOCIOLOGICAL IMPACTS COMPARISON SUMMARY

| Potential Impacts | Alternative A | Alternative B | Alternative C | Alternative Zero | Evaluation Base |
|---|---------------|---------------|---------------|------------------|--|
| HUMAN AND SOCIAL ENVIRONMENT | | | | | |
| Social Issues | | | | | |
| Social Acceptability | + | +++ | - | --- | A: Serving some Afar settlements; B: Serving many people and Afar settlements; C: Serving Afar areas, but not so many people; Zero: missing connections in Afar Region; |
| Resettlement/displacement | - | 0 | 0 | 0 | A: Possibly some resettlement needs in towns and villages; B: resettlement only in towns C: Resettlement is unlikely. |
| Demographic Changes | - | | - / 0 | 0 | A: The road creates the possibility but the probability of any significant changes is small; B: high possibility and probability |
| Change in Way of Life | + | ++ | + | 0 | A. Major change to income generating agriculture possible in Kalah Plain and in southern plain; B: Major income change through increased agro-pastoralism as C; C: Possibility for export of livestock products |
| Impacts on Women | + | ++ | + | 0 | A & B: Serves most people (on areas not yet accessible) |
| Impact on Indigenous Peoples | -/0 | - | - | 0 | B & C: on nomadic area |
| Induced Development | ++ | ++ | + | -- | A: Serves most people +development of Kalah Plain and Southern Plains; B: Serves most Afar people in settlements presently not accessible by motorized vehicles, and development of livestock; C: Development of livestock; Zero: impeding development |
| Conflicts between Locals and Immigrants | - | - | - | 0 | A tempts more immigrants during construction time, B some immigrants during construction and after completion of road & C critical due to few population character; A Possible conflicts about agricultural development |
| Human and Economic Issues | | | | | |
| Cultural heritage | - / 0 | - / 0 | - / 0 | 0 | Some religious places/monuments of local importance could be located close to roads B: cemeteries |
| Aesthetic sites | -- | - | - | 0 | A and B: Mountainous areas with valuable landscape |
| Infrastructure/services | ++ | ++ | + | 0 | A: Serves most people including those having access now; B: Serves most people who have no access now; C: Serves least people. |
| Public health & safety | ++ | +++ | + | - | A and C: As above; Zero: With growing population the situation gets worse |
| Disease vectors | -- | - | - | 0 | New vector breeding sites likely created in borrow pits & other draiange impeded areas |
| Agricultural land | -- | -- | - | 0 | A: highland plains of high agricultural value/potential meaning more losses of agricultural land; B: small agricultural land in Kalah plain and pasture land; C mainly pasture land. |
| Livestock | - | - | - | 0 | More animals killed due to traffic |
| Private property | -- | - | - | 0 | A: splits most settlements including those affected by existing roads; B: Splits some settlements, which were least disturbed before; C: splits least settlements. |
| Employment opportunities | ++ | + | + | 0 | A create more opportunities for permanent new jobs (more settlements along the roads)B creates more opportunities for permanent new jobs |
| National Economy | ++ | + | + | 0 | A are more beneficial due to shorter road |
| Regional Economy | ++ | ++ | + | - | A: Brings most benefits to Tigray Region; B: Brings most benefits to Afar Region; brings major benefits to Afar region and people C: Brings benefits to Afar Region but to a smaller degree. |
| Local economy | + | ++ | + | - | A serves most people who have access at present; B serves most people who have no access at present; C: Zero: as above |
| TRAFFIC SAFETY | - | - | - | 0 | More traffic causes more accidents, especially in settlements without access at present |

Note:

Impacts are described as a change expected in the future compared to the present state of each issue
Impacts are assessed excluding any mitigation measures

| | |
|-----|-----------------------------|
| +++ | significant positive impact |
| ++ | moderate positive impact |
| + | low positive impact |
| 0 | no change |
| - | low negative impact |
| -- | moderate negative impact |

| Potential Impacts | Alternative A | Alternative B | Alternative C | Alternative Zero | Evaluation Base |
|-------------------|-----------------------------------|---------------|---------------|------------------|-----------------|
| | - - - significant negative impact | | | | |

APPENDIX 3

**QUESTIONNAIRE FOR ENVIRONMENTAL
AND SOCIAL SURVEY**

APPENDIX 3: CHECKLISTS - SEMI-STRUCTURED INTERVIEWS FOR FOCUS GROUP DISCUSSIONS:

- Woreda Administration and sectoral offices
- Government social service workers in study area
- Clan leaders
- Local population along the road alignment
- Small businesses
- Transport operators

CHECKLIST: WOREDA ADMINISTRATION AND SECTORAL OFFICES

Introduction:

- possible road construction between Yalo and Dalol, both in Afar Region
- social impact assessment of the possible road construction
- in a process of trying to understand the possible positive and negative aspects related to road construction in the area
- would appreciate assistance in the process since you know the area best

Have you heard about these plans (yes/no)? From where? What did you hear?

Name of the Region:

Name of the Zone:

Name of the Woreda:

Names of the Persons:

Population

- What is the total population of the woreda
- How is it distributed within the woreda?
- What is the gender composition of adults?
- What is the gender composition of the heads of households?

Development activities

- What are the main sources of income to the woreda council
- What are the main development priorities in the woreda?
- What are the major development activities at present in the woreda?
- How do they affect travel and transport inputs?
- Who does most of the travel and transportation in these activities?
- How do men/women benefit?

- What is the major development potential of the woreda?
 - What are the major donors/NGOs involved?
 - Are there special training programmes?
- Economic activities
- What are the main agricultural crops/ other productive activities for food and cash?
 - What % of the products are usually sold within the producing villages and what % is sold outside such villages?
 - Who usually sells products, men or women?
 - Who usually keeps the income from the sale of crops, men and women?
 - What are the income levels of:
 - better off households
 - average households
 - men
 - women
 - How is the income spent by women/men?
 - How significant is the private commercial sector?
 - What are the main businesses?
- Distribution of social and economic services relevant to accessibility needs
- How many of the following exist in the woreda
 - Woreda town
 - Government institutions in the woreda town
 - Other institutions in the woreda town
 - Accessibility of the woreda town
 - Hospitals
 - Health centers
 - Dispensaries
 - Vet clinics
 - Type of means of transport
 - Fuelwood sources
 - Livestock Markets
 - Grain and other materials markets
 - Shops
 - Grinding mills

□ Transportation facilities

- What is the present means of transportation of the people (by priority order)
- What are the most important uses of the road by people at present?
- Who are the main users of the local roads?
- In case the Ab-Ala - Yalo road is constructed, what would be the best route?
 - Who would be the expected road users and beneficiaries of the Yalo - Ab-Ala road?
 - What are the needs of the users for roads and transport services?
 - What is the demand of road and its services and needed improvements?
 - Which groups which may be adversely affected by the project, and how it is possible to mitigate or avoid these adverse affects?
 - Which groups are most vulnerable in this worda?
 - What would be the adverse impacts/positive impacts of road construction on vulnerable groups?
 - What is the demand and willingness to take responsibility and to participate in the proposed investment or its maintenance?
 - What is the motivation for changed environment of the population?

□ Accessibility

How far is location of :

- Nearest clinics _____ Means of transport _____
- Nearest hospitals _____ Means of transport _____
- Nearest vet clinics _____ Means of transport _____
- Nearest clinics _____ Means of transport _____
- Nearest grain market Primary _____ Secondary _____ Tertiary _____
Means of transport _____
- Nearest livestock market Primary _____ Secondary _____ Tertiary _____
Means of transport _____
- Nearest post office _____ Means of transport _____
- Nearest bank _____ Means of transport _____

□ Gender :

- Which activities are the men and women of the project area involved in?
- Do they play a role in the transport sector?
- Which transport activities are women and men involved in?
- Do they use public or private transport? If the answer is yes, specify which ones?

- How would the construction of the road affect the activities of women?
 - Will the road under consideration solve the transport problems they encounter in the conduct of their public, family and social activities?
 - What proportion of men and women use the means of transport concerned by the project? How often do they use it on a weekly, monthly and yearly basis?
 - How can the population (women/men) participate in the implementation of the project?
 - What impact will the project have on their (women/men) activities and living conditions (positive or negative impacts)?
- Benefits of the road to be constructed
- What do you think will be the benefits of the road to be constructed and why?
 - to the community at large
 - for the business community
 - for governmental administrative staff
 - to the communities along the road
 - to tourism
 - to any other persons/groups
- Negative issues related to road construction
- What problems would you expect with the road and/or related to construction of Yalo-Ab-ala road?
 - Which groups would have problems with the road or who could be suffering most of the road?
 - Would you think there will be resettlement/displacement caused by the road construction?
 - Would you think there will be loss of agricultural land or grazing area caused by the road construction?
 - How these problems should/could be decreased or eliminated according to your judgment?
 - What types of measures and by whom can be taken to mitigate the anticipated problems caused by the construction of the road?
- Compensation issues
- Would you expect that resettlement/displacement is expected in your woreda
 - What would be the just compensation due to the loss of farm land, grazing area or other property to the road construction?
- Settlement patterns
- Many people are settling down by the roads and build their houses there. What are the biggest reasons for that?

- Would you think people would settle down along the Yalo-Dalol road in your woreda?
 - Who are the people who would prefer to settle down by the road?
 - What are the reasons for the new settlements?
- Road construction period
- Road construction needs machinery and labor, which disturbs the normal life of the road side people. What would be the biggest problems caused by the construction work?
 - What would be the social and environmental problems to the local people left behind by the road construction machinery or their storage?
 - What could/should be done to avoid or mitigate the problems?
 - What benefits are the construction workers/camps bringing to the area?
 - How could the benefits be increased or made permanent?
 - What problems are the construction workers/camps bringing to the area? What should be done to avoid the problems?
 - What should be taken into consideration during the construction of the road to mitigate the problems during construction period?
- Livelihoods: Improvement/Impoverishment
- Does the potential benefit from the road depend on other facilities being available, e.g. transport, credit? Could the project do anything to make sure that these facilities are made available?
 - If economic activities are currently carried out along the roadside, can the project ensure safety without affecting the livelihoods of the traders, livestock grazers, agricultural land etc?
- Road safety and traffic accidents
- What are/would be the biggest reasons for road accidents?
 - What are the most typical accidents?
 - According to your judgment, what should be the first tasks to decrease the amount of accidents? Who should do it?
 - Has many of your vehicles had any accident on roads? If yes, what was the reason for accident? What happened after the accident, what measures were taken to deal with the accident?
- Cultural, historical and religious sites
- Are there any cultural, historic or religious sites in your woreda
 - How should/could they be taken into consideration in the design of the road alignment?

- ❑ Participation in decision-making
 - Who are the individuals or groups who especially should be contacted?
 - Especially for which road construction activities affecting people (loss of land, drainage design, location of schools etc.) should local people be contacted?
 - Who/which ministry/authority should have the responsibility to decide that environment will be taken into consideration?

- ❑ Ownership and commitment
 - What would be the contribution of the woreda to the road construction during detailed design, construction and operation and maintenance

- ❑ Marketing
 - Price of grain by type and season in the nearest market ____ the tertiary market____
 - Price of livestock bt type and season in the nearest market ____the tertiary market____
 - Price of various services by type and season in the nearest market/town/institution____ The tertiary market/next town/next institution

CHECKLIST: CLAN LEADERS

Introduction:

- possible road construction between Yalo and Dalol, both in Afar Region
- social impact assessment of the possible road construction
- in a process of trying to understand the possible positive and negative aspects related to road construction in the area
- would appreciate assistance in the process since you know the area best

Have you heard about these plans (yes/no)? From where? What did you hear?

Name of the Region:

Name of the Zone:

Name of the Woreda:

Name of the Clan:

Names of the Persons:

- ❑ What are the main development priorities in your area? For men/For women?
- ❑ Do you or any member of your family own any transport - donkey, cart, camel, wheel barrow [list]
 - Who owns it?
 - Who uses it?
 - What is it used for?
- ❑ How often are you using already existing road? To go from where to where?
- ❑ What kinds of benefits have you seen to come with the availability of the road?
- ❑ What kind of negative issues have you realized concerning the existing road?
- ❑ If the road is constructed between Yalo and Ab-Ala, what would be the benefits of it? (direct the discussion to be able to specify)
- ❑ If the road is constructed, what would be the negative aspects of it?
- ❑ If the road is constructed in your vicinity, where should it be located? Why?
- ❑ If the road is constructed between Yalo and Ab-Ala who would use it?
- ❑ If the road is constructed between Yalo and Ab-Ala would you use it? To go where? How often?
- ❑ If the road is constructed and transport services become available would you think you would use them? Yes/How, Where? No/Why?
- ❑ In which cases would you use public transport?
- ❑ If the road is constructed would you think it would change the way you are living? How?
- ❑ Would you think that there is anybody who would suffer from the road construction? Why?
- ❑ How would you react if because of the road construction you would lose some livestock grazing area, business, agricultural land etc.?
- ❑ Would you think that more people would settle down along the road side if it was constructed? Why?
- ❑ How would you react if somebody had to move the location of his/her house?
- ❑ How would you solve the situation?
- ❑ Who would particularly benefit from the road construction? Why?
- ❑ What kind of impact would you think the road would have in the lives of women? Positive/negative? Specify?
- ❑ If the road was constructed between Yalo and Ab-Ala what would be the best route? Why?
- ❑ If the road to be constructed between Yalo and Ab-Ala would cross the region boarder would you see any problem/benefit in it? What kind?
- ❑ Are you at present using roads that cross regional border between Tigray and Afar? What is the benefit/negative aspect?
- ❑ Would you like to be informed of the road construction activities? How?
- ❑ Would you like to be involved in road works?
- ❑ How would you like to be involved in the road works?
- ❑ Has anyone in the household worked in a job where they are paid?

- ❑ How would react if road construction workers came to your own neighborhood?
 - Why would it be positive? Why would it be negative?
- ❑ How would you react if they were using your water source for construction?
- ❑ Who are the individuals or groups who especially should be contacted prior and during construction?
- ❑ Especially for which road construction activities affecting people (loss of land, drainage design, location of schools etc.) should local people be contacted?
- ❑ If there are problems during the road construction, how should these problems be decreased or eliminated according to your judgment?
- ❑ What types of measures and by whom can be taken to mitigate the anticipated problems caused by the construction of the road?
- ❑ Marketing
 - Price of grain by type and season in the nearest market ____ the tertiary market____
 - Price of livestock bt type and season in the nearest market ____the tertiary market____
 - Price of various services by type and season in the nearest market/town/institution____ The tertiary market/next town/next institution

CHECKLIST: LOCAL POPULATION ALONG THE ROAD SIDE

Introduction:

- possible road construction between Yalo and Dalol, both in Afar Region
- social impact assessment of the possible road construction
- in a process of trying to understand the possible positive and negative aspects related to road construction in the area
- would appreciate assistance in the process since you know the area best

Have you heard about these plans (yes/no)? From where? What did you hear?

Name of the Region:

Name of the Zone:

Name of the Woreda:

Name of the Kebele:

Names of the Persons:

- How old is the kebele/settlement/town?
- How was the site chosen?
- Do people often go out of the village? Where do they go? Why?
- How do they travel?
- Where is the nearest
 - health center
 - school
 - grinding mill
 - shop
- Where is the nearest market?
- How do people get their products to market? Men/Women
- What forms of transport are there in the village/area?
- What are the main development priorities? For men/For women?
- What Government services visit in the village/area?
- Are there any development organizations working in the area? Which ones?
 - What do they do?
- Do you or any member of your family own any transport - donkey, cart, camel, wheel barrow [list]
 - Who owns it?
 - Who uses it?
 - What is it used for?
- How often are you using already existing road? To go from where to where?

- ❑ What kinds of benefits have you seen to come with the availability of the road?
- ❑ What kind of negative issues have you realized concerning the existing road?
- ❑ If the road is constructed between Yalo and Ab-Ala, what would be the benefits of it? (direct the discussion to be able to specify)
- ❑ If the road is constructed, what would be the negative aspects of it?
- ❑ If the road is constructed in your vicinity (kebele), where should it be located?
- ❑ If the road is constructed between Yalo and Ab-Ala who would use it?
- ❑ If the road is constructed between Yalo and Ab-Ala would you use it? To go where? How often?
- ❑ If the road is constructed and transport services become available would you think you would use them? Yes/How, Where? No/Why?
- ❑ How much would you think public transportation would charge you?
- ❑ Would you think you can afford to those prices?
- ❑ In which case would you use public transport?
- ❑ If the road was constructed would you think it would change the way you are living? How?
- ❑ Would you think that there is anybody who would suffer from the road construction? Why?
- ❑ How would you react if because of the road construction you would lose some livestock grazing area, business, agricultural land etc.?
- ❑ Would you think that more people would settle down along the road side if it was constructed? Why?
- ❑ How would you react if somebody had to move the location of his/her house?
- ❑ How would you solve the situation?
- ❑ Who would particularly benefit from the road construction? Why?
- ❑ What kind of impact would you think the road would have in the lives of women? Positive/negative? Specify?
- ❑ If the road was constructed between Yalo and Ab-Ala what would be the best route? Why?
- ❑ If the road to be constructed between Yalo and Ab-Ala would cross the region boarder would you see any problem/benefit in it? What kind?
- ❑ Are you at present using roads that cross regional border between Tigray and Afar? What is the benefit/negative aspect?
- ❑ For what purpose would you use the road if it crosses the regional border? How often?
- ❑ Would you like to be informed of the road construction activities? How?
- ❑ Would you like to be involved in road works?
- ❑ How would you like to be involved in the road works?
- ❑ Has anyone in the household worked in a job where they are paid?
- ❑ How would react if road construction workers came to your own kebele?
- ❑ Why would it be positive? Why would it be negative?
- ❑ How would you react if they were using your water source for construction?

CHECKLIST: GOVERNMENT SOCIAL SERVICE WORKERS (teachers, health center etc.)

Introduction:

- possible road construction between Yalo and Dalol, both in Afar Region
- social impact assessment of the possible road construction
- in a process of trying to understand the possible positive and negative aspects related to road construction in the area
- would appreciate assistance in the process since you know the area best

Have you heard about these plans (yes/no)? From where? What did you hear?

Name of the Region:

Name of the Zone:

Name of the Woreda:

Name of the Kebele:

Names of persons:

- If the road is constructed between Yalo and Ab-Ala, what would be the benefits of it? (direct the discussion to be able to specify)
- What would be the exact benefits for yourself?
- If the road is constructed, what would be the negative aspects of it? For you?
- If the road is constructed in your vicinity, where should it be located?
- If the road is constructed between Yalo and Ab-Ala who would use it?
- If the road is constructed between Yalo and Ab-Ala would you use it? To go where? How often?
- If the road is constructed and transport services become available would you think you would use them? Yes/How, Where? No/Why?
- How much would you think public transportation would charge you?
- Would you think you can afford to those prices?
- In which case would you use public transport?
- If the road was constructed would you think it would change the way you are living? How? Positive/Negative?
- Would you think that there is anybody who would suffer from the road construction? Why?
- Would you think that more people would settle down along the road side if it was constructed? Why?
- Who would particularly benefit from the road construction? Why?
- What kind of impact would you think the road would have in the lives of women? Positive/negative? Specify?
- If the road is constructed between Yalo and Ab-Ala what would be the best route? Why?

- ❑ If the road to be constructed between Yalo and Ab-Ala would cross the region boarder would you see any problem/benefit in it? What kind? [only it this alternative is selected]
- ❑ Are you at present using roads that cross regional border between Tigray and Afar? What is the benefit/negative aspect? [only if this alternative is selected]
- ❑ For what purpose would you use the road if it crosses the regional border? How often? [only if this alternative is selected]

CHECKLIST: SMALL BUSINESSES

Introduction:

- possible road construction between Yalo and Dalol, both in Afar Region
- social impact assessment of the possible road construction
- in a process of trying to understand the possible positive and negative aspects related to road construction in the area
- would appreciate assistance in the process since you know the area best

Have you heard about these plans (yes/no)? From where? What did you hear?

Name of the Region:

Name of the Zone:

Name of the Woreda:

Name of the Kebele:

Names of Persons:

- What type of business do you run?
- Do you own this business?
- Why was this location chosen for your business?
- What are the main problems that you encounter?
- How would you see an improvement of the quality/construction of a road would impact your business?
- Are there any problems you might foresee?
- How do you set your prices?

CHECKLIST: TRANSPORT OPERATORS

Introduction:

- possible road construction between Yalo and Dalol, both in Afar Region
- social impact assessment of the possible road construction
- in a process of trying to understand the possible positive and negative aspects related to road construction in the area
- would appreciate assistance in the process since you know the area best

Have you heard about these plans (yes/no)? From where? What did you hear?

Name of the Region:

Name of the Zone:

Name of the Woreda:

Name of the Kebele:

Names of Persons:

- What type of transport do you operate?
- Do you own it?
- What routes do you run?
- Why was this route chosen?
- What problems do you encounter?
- How do you set your prices?
- What kinds of benefits have you seen to come with the availability of the road?
- What kind of negative issues have you realized concerning existing roads?
- If the road is constructed between Yalo and Ab-Ala, what would be the benefits of it? (direct the discussion to be able to specify)
- If the road is constructed, what would be the negative aspects of it?
- If the road is constructed would you start operating in the area? Yes/Why? No/Why?
- If the road is constructed where should it be located that you would start operating in the area?
- If the road is constructed between Yalo and Ab-Ala who would use it?
- If the road was constructed between Yalo and Ab-Ala what would be the best route? Why?
- If the road to be constructed between Yalo and Ab-Ala would cross the region boarder would you see any problem/benefit in it? What kind?

APPENDIX 4

RESPONSE TO EIA SOCIAL COMMENTS

RESPONSE TO EIA SOCIAL COMMENTS OF DRAFT FINAL EIA REPORT OF YALO-DALOL ROAD

Comment

1. Coverage of Adverse Social Impacts

The Draft Final EIA report (February 2002) covers the main issues that are of concern for Bank's safeguard policy; i.e. culture heritage, indigenous people, resettlement and health. However, the report is not detailed in the sense that it does not quantify, it doesn't provide figures about project-specific impacts. It provides a broad framework of adverse social impacts to be anticipated along the three alignments (A, B, C) under study. *Although the lack of figures partly results from the fact that three alternative roads were studied and none had yet been selected, the report would benefit from quantifying the social impacts as those impacts constitute one of the central criteria in the road selection process.*

Reply

Comment noted and the required data have been inserted in the final report.

Comment

2. Policy, Legal and Institutional Framework

The EIA Report makes relevant references to the Ethiopian policy and regulations. *However, as the current study is conducted within the context of World Bank's credit framework, the report would benefit from incorporating relevant regulatory texts relating to World Bank policies and regulations.*

Reply

Comment noted and a summary of the World Bank Operational Directive has been inserted in the final report.

Comment

3. Impact on Cultural Heritage

The report underscores that the Afar region is rich in culture heritage sites. None of the sites will, however, be affected by the road construction operations of the three alignments studied. In this context, the report would benefit from: *a) providing the number of important archeological sites found in the Afar Region and b) make recommendations on whether or not archeological screening would be needed, when and where it should be executed.*

Reply

The archeological sites in the project area and the actions to be taken has already been indicated in the draft final report on pages 70 and 93.

Comment

4. Resettlement

The findings of the report suggest that land acquisition will take place but resettlement will be minimized and no significant variation in resettlement is expected between the three alignments. While alignment A would induce more resettlement than alignment B and C, the figures are presumed to be minor, given the low population density of the presumed project area. ***The Report would benefit from: a) provide estimates of the number of households and the number of people presumed to be resettled in each one of the alternatives and b) make clear recommendations on what kind of resettlement/rehabilitation preparation/action to be taken in accordance with Bank Policy (Operational Policies OP.12 and Annex A of the same document). The document is available at ERA, Planning and Programming Division – the Environmental Monitoring Unit.***

Reply

- 4.a. Comment noted and the required data have been inserted in the final report.
- 4.b. The World Bank Operational directive is the framework reference for the establishment of The Resettlement/Rehabilitation Policy by ERA. The summary of this directive has been inserted in the final document (following comment 2). Therefore, in this way the World Bank's policy on resettlement/rehabilitation preparation/action to be taken has been incorporated in the final report. The detailed resettlement/rehabilitation plan will be worked out upon completion of the detailed design.

Comment

5. Indigenous People

The EIA report advances that social impacts on local population will be positive as those populations will benefit from better access to transportation means and that there are some small groups of ethnic minorities in the project area. ***The Report would benefit from clarifying the difference between indigenous group and ethnic minority. Are the Afar or the Tigrinians indigenous people? Would Afar or Tigrinians in Addis be considered ethnic minorities?***

Reply

The definition of indigenous group and ethnic minority has been given pages 43 in Ethnic Composition section.

Comment

6. Health and HIV/AIDS

Although the EIA report refers to the HIV/AIDS policy of ERA, it does not address the issue of the HIV/AIDS impact of the road construction operations. *The Report would benefit from establishing the linkage between HIV/AIDS and road construction and suggest mitigation measures.*

Reply

Linkage between HIV/AIDS and road construction and mitigation measure has already been given in the draft final report, page 93. Following the comment new suggestion has been inserted in the impact mitigation part of the final report.

Comment

7. Other Social Issues of Concern

Participation – Consultations – The EIA report concludes that, alignment B received most support in the consultations conducted with regional and local stakeholders. *The Report would benefit from taking this finding into account and suggest how it should be used in the selection process.*

Reply

The issue has been addressed in the draft final report, page 81.

Comment

Gender – The EIA Report suggests that Alignment B is presumed to induce most positive impacts on Afar women in terms of enhanced access to transportation means, as most of the road would pass through settlements in the Afar Region. *The Report would benefit from clearly suggesting how this finding should be incorporated in the project planning and implementation phases in order to ensure positive impacts on women.*

Reply

Comment noted and the gender issue has been mainstreamed in the impact mitigation plan of the final report.