strategies, which may be natural resource base, economic sector, based (e.g., agriculture, mining etc.) and non-natural resource based (migration, rent, etc.)

2.3.2 Poverty in Ethiopia

a) Definitions

Poverty has many dimensions extending beyond low level of income. It can be conceived of as situational syndrome characterized by inadequate food consumption, high mortality and morbidity rates, poor access to basic services such as water supply and sanitation, poor housing conditions, low educational levels, high unemployment or under employment and widespread marginalization of populations involved (Bambreh, 1996).

As there is no overall yardstick which can embrace all manifestations of poverty cut-off points are defined. Hence, 'absolute' and 'relative' poverty are two commonly used concepts in defining poverty lines below which people can be classified as being very poor or poor, (ESAP, 1988, World Bank, 1991, Rogers, 1994 and Hadgu, 1995). Absolute poverty is often described as lack of access to purchasing power sufficient and at least, to cover the cost of minimum basic needs. Relative poverty on the other hand, refers to a standard of living that is below a certain proportion of the national average income in the country. Relative poverty as such is primarily concerned with the distribution of income and, hence, inequality in living conditions among the population. In Ethiopia, the primary concern should probably lie in eradicating absolute poverty rather than tackling relative poverty. Hence, quantitative and qualitative estimates of absolute poverty are given hereunder.

b) Qualitative and Quantitative Estimates

Absolute poverty line is calculated on the basis of expenditure related to minimum nutritional intake and additional allowance for basic non-food needs. The food component of the poverty line is taken to provide levels of food poverty.

Food accounts for the bulk of the household expenditure in Ethiopia. According to the 1999/2000 Household Income and Consumption Expenditure Survey (HICES)[9], Rural households spend 65% of their budget on food while urban households spend 53% of their budget (Table 2.6). Hence average, food expenditure accounted for 67% of household budget. Among non-food items, house rent, construction materials, water, fuel and power absorb the highest share in the total household expenditure (16% for rural and 19% for urban households).

Table 2-6: **Share of Expenditure on Food Item in the Total Expenditure**

Items group	Rural	Urban	National
Cereals	32.60	19.80	25.07
Pulses	6.90	4.40	4.99
Oil seeds	0.20	0.10	0.14
Cereals preparations	0.02	0.40	0.31
Bread and other prepared foods	0.30	5.40	3.51
Meat	2.16	3.96	3.04
Fish	0.03	0.05	0.22
Milk, cheese and egg	2.17	1.27	2.24
Oils and fats	1.46	4.27	3.02
Vegetables & fruits	2.82	3.46	3.54
Spices	3.47	2.72	2.93
Potatoes and other tubers	8.95	1.73	4.14
Coffee, tea and buck thorn leaves	4.70	3.23	4.37
Salt, sugar and others	1.19	2.39	2.13
Food taken away from home milling charges	1.39	1.85	1.83
Beverages	0.28	0.26	0.29
Cigarette and tobacco	0.39	0.28	0.57
Clothing and footwear	8.03	10.02	8.97
House rent, construction materials, water fuel and power	15.69	19.42	18.26
Furniture, furnishing, household equipment	2.67	5.59	4.23
Medical care and health	0.86	1.22	0.91
Transport and communication	0.76	3.45	1.81
Recreation, entertainment and education	0.59	2.57	1.46
Personal care and effects	0.65	1.16	1.03
Miscellaneous non-food goods	1.69	1.07	0.99
Total	100.0	100.0	100.0

Source: Tassew and Tekie – Poverty Profile of Ethiopia, 1999/2000- A Report for MOFED, Jan. 31, 2002, Addis Ababa, Ethiopia.

[9] See Tassew Woldehanna and Tekie Alemu Poverty Profile of Ethiopia, 1999/2000, A Report for WMU of the Ministry of Finance and Economic Development (MOFED), Jan 31, 2002, Addis Ababa, Ethiopia.

Using the minimum calorie required for subsistence adjusted for the requirement of non-food expenditure, about 44% of the Ethiopian people are under absolute poverty (p_0). In other words, about 44% of the entire population is unable to get the minimum calorie intake of 2200 kcal per day per adult (adjusted for non-food expenditure). The proportion of absolutely poor people in the total population stood at 36.9% in urban areas and 45.4% in rural areas. Poverty is clearly more widespread in rural than in urban areas. The poverty gap index (p_1), the percentage of total consumption needed to bring the entire population to the poverty line is 12%, while the severity of poverty (p_2) is 0.045 (Table 2.7).

Table 2-7: **The Proportion of People Below the Absolute Poverty Line (p_0)**

	Rural	Urban	Total
P_0	0.454	0.369	0.442
P_1	0.122	0.101	0.119
P_2	0.046	1.039	0.045

Source: Tassew and Takie – Poverty Profile of Ethiopia -1999/200, Jan. 31, 2002, Addis Ababa, Ethiopia

- P_0 *corresponds to the fraction of individuals falling below the absolute poverty line* P_0 *is also known as poverty head count ratio.*
- P_1 *measures aggregate poverty deficit or gap relative to the poverty line.*
- P_2 *measures the squared proportional shortfalls from poverty line, which is commonly known as an index of the severity of poverty.*

The poverty situation showed only a slight improvement between 1995/1996 and 1999/2000. The proportion of people below the absolute poverty line was 45.5% in 1995/96, compared to 44.2% in 1999/00. For rural areas, the poverty head count ratio drenched from 47.5% to 45.4% over the same period. The poverty situation rather worsened in urban areas between 1995/96 and 1999/2000 (Table 2.8). It should be added that the difference between the two years was not statistically significant in all cases.

Table 2-8: **Comparison of Poverty Index (P_0) Between 1995/96 and 1999/2000**

Area	1995/96	1999/2000
Rural	47.5	45.5
Urban	33.2	36.9
Total	45.5	44.2

Source: Tassew and Teki- Poverty Profile of Ethiopia- 1999/2000- Jan. 31, 2002 Addis Ababa, Ethiopia.

A comparison of poverty by region showed significant variation. Poverty head count ratio is highest in Tigray region followed by Afar and Benishangul-Gumuz regions. Nearly 61% of the population in Tigray, 56% in Afar and 54% in Benishangul-Gumuz were unable to get the minimum calorie intake in 1999/2000 adjusted for non-food expenditure. When compared to most other regions, excluding the urban regions (Addis Ababa, Harari and Dire Dawa), Oromiya region is in a better situation. The percentage of people living below the absolute poverty line in Oromiya was 39.9% in 1999/2000, one of the lowest among the regions (Table 2.9). This is consistent with the high agricultural potential of the region.

Table 2-9: **Absolute Poverty Indices (Head count index-P_0) By Region, Rural, Urban & National (1999/2000)**

Regional State	Head count index		
	Rural	Urban	National
Tigray	0.616	0.0607	0.614
Afar	0.680	0.268	0.560
Amhara	0.429	0.311	0.418
Oromiya	0.404	0.359	0.399
Somaili	0.441	0.261	0.379
Benishanguli-Gumuz	0.558	0.289	0.540
SNNPR	0.517	0.402	0.509
Gambella	0.546	0.384	0.505
Harari	0.149	0.350	0.258
Addis Ababa	0.271	0.362	0.361
Dire Dawa	0.332	0.331	0.331
Total	0.454	0.369	0.442

Source: Tassew and Takie – Poverty Profile of Ethiopia – 1999/2000 – Jan. 31, 2002, Addis Ababa, Ethiopia.

A number of factors can explain the problem of poverty in Ethiopia. High population growth, current drought, diminishing land holdings, lack of no-farm technological innovation, land degradation and limited employment opportunities outside agriculture have led to very low levels of productivity and income. The average farm size has declined to less than 1 ha and some 60% of the farmers cultivate less than 0.5ha of land. Productive assets of rural communities and households have been exceeded as a result of repeated effects of drought over the years. The proportion of people requiring food assistance has averaged 10.3% over the years from 1981 to 2001 (Table 2.10). Low income and extreme poverty have undermined the capacity of farmers to invest on the farm (FDRE, Food Security Strategy. March 2002, Addis Ababa, Ethiopia).

Table 2-10: **Drought/Disaster Affected Population in Ethiopia, 1981-2001**

Year	Total Population (Million)	Disaster/Drought Affected Population (Million)	Proportion Affected (%)
1981	36.67	2.82	7.7
1982	37.77	3.70	9.8
1983	38.90	3.30	8.5
1984	40.07	4.21	10.5
1985	41.21	6.99	17.0
1986	42.39	6.14	14.5
1987	43.40	2.53	5.8
1988	44.84	4.16	9.3
1989	46.12	5.35	11.6
1990	47.44	3.21	6.8
1991	48.79	7.22	14.8
1992	50.18	7.85	15.6
1993	51.61	4.97	9.6
1994	63.09	6.70	12.6
1995	54.65	3.99	7.3
1996	56.37	2.78	4.9
1997	58.12	3.36	5.8
1998	59.88	4.10	6.8
1999	61.67	7.19	11.7
2000	63.50	10.56	16.6
2001	65.34	6.24	9.6
Average	52.10	5.37	10.3

Source: Affected Population from Disaster Prevention and Preparedness Commission (DPPC) and Total Population from Projections of National Office of Population.

Poverty has been prevalent in Ethiopia since the last few decades. The problem has grown intense as the economy of the country had been characterized by poor performance which had negative impacts on outputs, investment, revenues, expenditure and infrastructural development. The deterioration of the socio-economic situation has been aggravated by recurrent drought and the war which claimed thousands of human lives and substantial material resources of the country. The country is heavily dependent on food aid and inflow of grants and loans. Access to social services has been constrained while demand for social amenities increased with rapid population growth, resulting in substantial need for external assistance.

The 1999 National Labour Force Survey showed that about 2,198,787 persons faced unemployment of which 996,195 (45.3%) were found in urban areas and 1,202,592 (54.7%) in rural areas. Accordingly the rate of open unemployment at national level was 8% in 1999 with the great variation between urban and rural areas standing at 26.5% and 5.1% respectively. The survey result also showed that the unemployed were mainly the youth and females and unemployment was predominantly an urban phenomena.

c) Situation of Poverty in Oromia Regional State

As indicated earlier a very significant proportion (45%) of the population of Ethiopia live below the poverty line. In Oromia, however, out of a total population of 23 million in 2001 (projected on the basis of the 1994 census) 34.7% live below this line. Its relative poverty level is 19.9%.

The calorie intake per day per person in Oromia Region is 2004.53 while the national average is 1954 (WMU-march 1999). The per capita income was182.1 USD in 1999, which is also higher than the national average (USD 167) in the same year as reported by the same unit (WMU- 1999).

2.3.3 Applying the SLA Framework

The following important points need to be taken into account while applying the framework.

a) Assets

It is mandatory that we understand the natural resources as well as the needs that people have and the manner in which such information is gathered, which involves primarily the participatory assessment. Efforts must focus on how we can understand the holistic nature of people's lives.

b) Outcomes

A systematic method of ascertaining in what way people's priorities vary need be devised in the process of determining desired outcomes

c) Livelihood Strategies

In the light of what is stated above, the query should be about appropriate strategies, which help to achieve the desired outcomes of people including its implications for services, policies and programmes.

d) Institutions and Processes

Another key issue in applying the sustainable livelihood approach is the need to earmark the appropriate institutions and processes for creating this holistic people centered approach.

2.3.4 Principles Behind the SLA

The SLA is based on principles, which have implications on the way poverty focused development activities are undertaken. Past experience shows that poverty focused development activity should be:

- People centered with the understanding of the differences between groups of people and working with them in consonance with their livelihood strategies, social environments and ability to adapt.
- Build on a positive approach, which is respectful to people and regards them as persons with assets and opportunities, and not just needs. It is also important to base activities on positive aspects or strengths while working with institutions.
- Operational at multiple levels ensuring that micro level activity provides information for policy development and creation of an enabling environment and that people are supported by macro and meso level structures and processes in their endeavor to build upon their own strengths.
- Cognizant of the holistic nature of people's lives, their multiple livelihood strategies, the need for holistic responses rather than the institution driven sectoral approaches.
- Undertaken in partnership with both the public and private sectors.
- Sustainable with four key dimensions which include economic, institutional, social and environmental sustainability striking a balance between them.
- Provided with external support, which recognizes the dynamic nature of livelihood strategies, responds flexibly to changes in people's attitudes and develops longer-term commitments.

In brief, the SLA is based on people's participation and the human development approach, presumes linking macro and micro issues to comprehend and alter policies and processes embracing a learning process for taking action. Thus, the focus of this study is on learning from people on the ground; i.e. at the micro level, understanding issues,

which impact on their lives from the grassroots, and in which manner other levels react to the operation at micro level. It is mandatory that crosscutting issues like gender and the environment be integrated into all other aspects of studies pertaining to poverty alleviation.

Based on the assets concept, the SLA aims at promoting sustainable livelihood which can be identified as supporting:

- Access to natural resources while adequately conserving them;
- Maintenance of a social environment which is conducive for developing means of livelihood;
- Betterment of access to quality education, training, information, technology, nutrition and health;
- Provision of improved infrastructure;
- Development of the capacity of institutions to improve people's livelihoods;

In view of these considerations, this study on the sustainable livelihoods of artisanal mining communities in Ethiopia attempts to show to what extent these issues are being addressed by policy and practice/implementation of action programmes. It also throws some light on problems, raises policy issues and makes recommendations with regard to the role that SLA can play in alleviating and eventually eradicating poverty. It uses the concept of assets (natural, social, physical, financial and human) and vulnerabilities.

3 CASE STUDIES IN THE CONTEXT OF SUSTAINABLE LIVELIHOOD

3.1 Case Study 1—Livelihood of Artisanal Mining Community in Hayadima Site

3.1.1 Background

a) Location & Size

This case study report is prepared on the livelihood of artisanal mining communities in the Hayadima Kebele of Shakisso District in Borena Zone of Oromia Regional State. Hayadima is located between "Komata Shet" or Komata valley in the North and Quajimiti in the south, covering a distance of about 20kms to the South West of Shakisso Town, the district center. The area is bounded by the following geographical co-ordinates:

- Latitude = $5^0$30'' to $6^0$45''N.
- Longitude = $40^0$30'' to $41^0$20'' E

The area of the wereda is 4080 sq. kms while that of Hayadima is about 400 sq.kms. See location map of the area, Figure 1.1

b) Population

The population consists of 10,000 indigenous Gujii Oromo and 8,000 (44.4%) of the total, migrants from other parts of the country, a high proportion coming from the Southern Nations, Nationalities and Peoples Regional state (SNNPRS). Among the migrants, the second in number are said to have migrated from the neighboring Somali Regional State. Some have come from Somalia Republic. Out of the total population of the case study area it is estimated that 40% are females.

c) Physical Assets

The natural resources of the kebele were observed during the transect walk. The walk was undertaken from the north-western side of the main road to the south west by a group

of four members including persons with different specializations and one guide. According to the overall observation made by the group, the physical features of the area consist of mountains and hills, sloppy places and valleys covered with forest with undergrowth of bushes and grass. The valleys comprise of alluvial soil from which artisanal miners extract gold using the traditional method of production, i.e. panning. These valleys are dry except during the rainy seasons. There are two ponds made for the exclusive use of the local people whose main occupation is cattle rearing. Domestic animals encountered during the walk include cows, oxen calves, goats, donkeys and mules. Apes monkeys and antelopes were seen in the forest. The following table shows the physical features listed during the walk.

Table 3-1: **Physical Features Listed During the Transect Walk in Hayadima**

Land use	Forest, farm and grassing land, artisanal mining (place gold mining)
Vegetation	Shewshewe, Muka Arba, Wanza, Bissana, Zigba, Dembi, Girar, Eucalyptus tree, Inset, Meta Koma, Matesa, Dokma, Bobeya,
Soil Type	Red soil, brown soil, white gravel
Water	No water, except AGME's water pipeline.
Domestic Animals	Cows, oxen, goats, chickens, donkeys, mules
Animal Feed	Grass
Crops	Maize
Insects	Grasshoppers, mosquitoes
Wild Animals	Apes, monkeys, antelopes
Dwellings and institutions	Huts, "waro:, church, mosque, health post, AGME camp etc.

The land use comprises 65% forest and farmland including grazing, 20% devoted to mining and 15% to settlements.

d) Economic Activity

The economy of the area is based on farming and cattle rearing. Maze is the principal farm product and the average yield per hectare of land is estimated at 2 quintals. Mining

also provides a traditional way of living for the Gujii society who for a long time participated in the activity and contributed towards mineral discoveries and output through informal activities i.e. outside the realm of official mining. Gold mining in the Shakisso area existed during the first half of the twentieth century, e.g. in Bedakessa, Mormora and Upper- Bore valleys etc). It provides alternative economic activity for the indigenous rural community.

Available data indicate that the hitherto known gold occurrences and deposits in Oromia occur in the Borena and Western Wellega Zones, being mainly associated with low grade metamorphic rock complexes of sedimentary and volcanic origin.

Based on spatial distribution, the zones of gold occurrences/deposits or potential areas in the Borana Zone can be categorized into Maleka-Moyale Kenticha, Agara Mariyam-Surruppa and Bulbul-Malka Arba belts.

The gold occurrence and/or deposits in these belts occur as placer and primary forms. The placer form of gold in weathering products of the primary forms occur as eluvial and/or alluvial types of accumulations.

Eluvial gold concentrations are normally generated and accumulated not very far from the primary sources and such deposits are commonly known to be of limited tonnage but on the other hand contain high gold grades and are easy to work. These type of deposits, regardless of their sizes and intensity of mineralization are very important during exploration for they indicate primary sources in their vicinities.

The other principal type of exogenetic deposits formed by mechanical weathering is the alluvial gold. Generally, these are subdivided and are recognized as spit placers, channel placers, valley placers, terrace placers and buried placers. Of these, the first two types are the main targets for exploitation by simple mining methods. As they are understood to be confined to younger valleys, where erosive actions are enforce, the development of alluvial deposits is rather thinner and are not sufficient enough to support mechanized

operation. According to D.Jelence (Mineral Occurrence of Ethiopia, 1960) prospecting for alluvial gold in Borena Zone started in 1936. Adola area placer gold deposit potentials by exploration category as of 1996 is shown in Annex 3.A.

Since the political change in 1990/91, people from all over Ethiopia and Somali refugees have moved to these valleys in great numbers and are engaged in manual placer gold mining. The exploitation by these people is mainly carried out under supervision of some individuals who are license holders. Currently, artisanal mining is being undertaken at seven principal sites; namely:

- Hayadima village
- Digga Debobessa *shet*/valley
- Ula Ulo *shet*/valley
- Kokebe *shet*/valley
- Samuna Dengay *shet*/ valley
- Bore *shet*/valley
- Bada Kessa *shet*/ valley

e) Physical Assets/Infrastructure

A large percentage of the mixed farming community in the kebele have dwellings with mud walls and thatched roofs. The migrant artisanal miners live in dwellings built form plastic or *waro* walls and roofs. Reed walls are also common.

Water is supplied to the residents of the locality mainly from the tailings dam, built by the Adola Gold Mining Enterprise and seasonal rain water accumulated in ponds. The water from the pump station on Bore tailings dam constructed by the Borena Zone Mining, Energy and Water Development Department is not used by the community because the structure collapsed for unknown technical reasons. Moreover, it is considered to be dangerous for the health as it contains mercury coming from the Enterprise's tailings dam.

There is no transportation service within the village. Freight vehicles (Isuzus) are used for transportation to other places within the wereda and buses to places elsewhere.

f) Trends

In Ethiopia, mining for precious metals, smelting of iron, salt extraction and pottery making from clays were known in various parts of the country since time immemorial. It was commenced with the advent of mining for placer gold by the local people particularly in Borena and Western Wellega Zones of Oromia, Asosa, Gambella and Tigray. The production mainly comes from a few small to medium sized alluvial and delluvial placer accumulation of gold and to a lesser extent, primary free deposits.

The extraction of gold from these placers were made by a very primitive method of mining using only simple equipments such as craw bars, pick axes, spades and wooden batea during panning.

The history of mineral industry in general and the development of mining in particular is associated with Adola Gold field/Shakisso area. Shakisso area is the premier mining region in the country.

a) History of Minerals/Rocks Development in Ethiopia.

• **Early 1890s First Period – Discovery of Placer Deposits.** The first period began with the discovery of placer deposits of gold and platinum in western Ethiopia (Western Wellega) and in south Ethiopia (Adola Gold Field or Shakisso) by different foreign prospectors.	
1935-1943	• An Italian company called Komina is reported to have produced about 70 kilograms of gold at a place called Bedakessa. It was further reported that after the Italian occupation the British continued the mining activity. • The most important one was the Adola Gold Field placers in Borena Zone where placer gold mining attracted individuals, companies and the government interests at large in the region. As a result exploration and actual mining operation started towards 1936; and worthwhile production was recorded in 1943. • The mine was taken over by the Ethiopian Government for many years the Gold field was operated by the Ministry of Finance using as many as 6,000 prisoners as miners. During the post-war years, the min mineral production in Oromia Region has been in the Borena Zone, gold being the principal mineral commodity produced. The occurrence of gold within the Adola auriferous belt became known during the Italian occupation of Ethiopia. • However, the Ethiopian government took over the operation and a mining enterprise called "Sidamo Mining Organization" was established. • Under the direction of this organization, placer gold using manual labour continued until 1951 when mechanical equipment has been introduced.
• **Early 1950s Second Period – Beginning Of Semi-Mechanized Mining**	
• 1951 –1959 A floating mechanical gold washing plant designed by the Bodinson the company of San Francisco (USA) was introduced at the Bedakessa valley.	
• 1959 – 1962 It moved to Shanka valley and the plant was fed by a P & H dragline until 1962. The most important development of 1962 was the semi-mechanization of Adola Placer Gold Filed by the Ministry of Mines & Energy. Implementation of it did not follow the conventional approach of exploration and development. Prevailing conditions at the time didn't warrant such undertakings.	

- **1978 – 1990 The Third Period the Establishment of Mineral Development (AGDE) and Project Exploration (AGEP) Institutions.**
  - The Adola Mineral Evaluation and Development Project (AMEDP) was established and its first task was to produce a detailed geological map of the region. In just twelve years the project's geologists mapped an area of nearly seven and a half thousand square kilometers identifying about 40 primary gold sources, numerous new alluvial deposits and range of rare metals.
  - Most of the extensive surveying of the region was virtually completed and economic evaluation and development of many of the discoveries was well under way by the AMEDP.
  - At Shakisso, the third major forms of gold mining was, the semi- mechanized hydraulic mining method for placer gold deposits by the then called Adola Gold Development Enterprise (AGDE). This is the oldest of all the Corporation's (EMRDC) Projects and was responsible for the exploitation of the alluvial or placer gold deposits in the Adola region.
  - This involves a mechanized alluvial gold operation with a flow sheet using powerful bulldozers /200 –350HP) for clearing, stripping, dumping pilling while gravel transportation and fielding to the washing plant is carried out by 140HP bulldozer. In the mining of large deposits, with overburden thickness of over 10 meters. (e.g. Kajimetti placer), a combination of Scraper-Bulldozer stripping system is used.
  - For processing of gold bearing gravels, the washing facilities including Rocker, Shakisso made washing plant, Russian PGSH-I-II-50, Power Screen, Richards, Ross- Box, were introduced in the past. At present the only operational plant is the Shakisso made washing plant. This simple mobile gold washing plant (20 - 25m^3/hr.) is locally designed and contains also sluice boxes.
  - The process of washing, disintegration and classification takes place on an inclined of screen of 15 -18m^2 with especially selected screens from 10mm to 18mm in diameter mesh and are inclined ($25^0 - 20^0$) in such way to allow for maximum pudling, to liberate under sizes which flow below to a set of sluice boxes, aggregating in length to 24 meters.
  - Amalgamation of gold from mineral concentrates with mercury is commonly practiced to recover fine particles of gold.
  - In Ethiopia mercury is used by AGDE in Borena Zone but not in the other Regions). Pocket amalgamator is fitted with rifles and traps containing liquid mercury. The amalgam is subsequently heated driving off the mercury as vapor, and leaving behind the fine gold.
  - The amalgam is collected and panned or cleaned up manually. Separator of bulk of mercury from the precious metal is effected by retorting process. The mercury is then reused for amalgamation. The fine gold remains as spongy mass as the solution is separated. The average purity of placer gold/bullion/in Shakisso area is about 900.

- Mercury so used gets into the environment in two ways:
  - When used in sluice boxes, mercury is lost to the tailings by flowing as a result of impact with other materials in the rifles, and
  - When burned off from amalgam is open containers, it is vaporized into the atmosphere.
- Currently, placer gold production from semi-mechanized hydraulic operation comes only from "Sleepry" mining site. The recovery of hydraulic method of mining ranges between 60% to 75% (Dr. Tesfaye 1984).

- **1984 –1985** Attempted were also made in early to the Ministry of Mines attempted to establish a gold Purchase Revolving Fund to purchase gold from manual gold produces in Borena Zone of Oromia (Shakisso and surrounding areas). The above two efforts to purchase gold were found to be eventually unsuccessful because of the price offered by the government purchasers which was much less than the international price of gold or from that offered by illegal buyers.

- **May 1990 The Fourth Period Marks the Liberalization of Mineral Industry and Gold-Rush.**
  - After the overthrow of the Derg Regime, the artisanal miners illegally started mining gold, platinum, gem stone, construction materials every where producing and selling illegally too. As to Borena Zone, the decline in the formal gold production however, led to flourishing of illegal gold mining and this period marked as the "Gold –rush" activity where artisanal placer gold miners operate all over the country since then.

- **1991** Large-scale primary gold mechanized mining started at Lega Dembi in the vicinity of placer gold mining in Shakisso, which is long known as Adola Gold fields. Annual gold output of the mine was 3000 kgs.

- **June 1993** The new Mining and Mining Income Tax Proclamations were issued.

- **1993** Attempts were made to organize artisanal producers by Oromia Regional State, Mines and Energy Bureau, through a revolving fund for purchase of gold established by the Ministry of finance and operated by Ethiopian Mineral Resources Development Corporation. This system functioned for a short period of time but was suspended as the purchasing procedures and control became cumbersome and the government gold purchasers could not compete with gold contraband traders.

- **1997** The Gold reserve at the initial mine planning stage is known to be 30 tons. In 1997 a private company known as MIDROC Ethiopia PLC owned the mine through the privatization process as of March 1998.

b) Short History of Artisanal Mining in Hayadima

Short history of artisanal mining in Hayadima area is as tabulated below.

Period	Description
Late 1900 – Early 1940	In Ethiopia artisanal mining of gold has been going on long before 1900 using primitive traditional mining techniques, which persists to date. Until recently, it was acquired mainly from the exploitation of alluvial placer deposits. The history of gold mining in Ethiopia is associated with Adola Gold Field which includes the Hayadima case study area.
Early 1940 – July 1991	Production recorded in Adola Gold Fields (Hayadima) was the highest but started mainly declining beginning from the end of 1950s until the change of government in 1991(See Annex 3.B) The price of gold was fully controlled by the only gold enterprise (AGDE)*. The number of workforce was estimated to be in hundered thousands. Although the records of the prices of gold and individual incomes in the case study area were not found, the miners operate in known and determined areas, slightly in an organized manner. The artisanal miners relation with the government shows that there was there was ample supply of basic necessities, mining inputs, technical assistance, administrative supports and health services. The artisanal miners were used to operate in all valleys without restrictions on placer deposits. The price used to be paid to the miners per unit weight of gold was not in any way near the international or the domestic market prices. For example, the miners who were operating on contract basis with AGDE was based on the price introduced in July 1987 and active until 1991. The price system in force between the AGDE and the National Bank of Ethiopia was that the gold concentrate having a

* The gold production figure includes the gold production from western part of Ethiopia.

Period	Description
	purity of not less than 90% to be sold to the National Bank at Birr 19 per gram ($9.18 per gm). The price schedule was given below in the same year. o Up to 14 gm gold concentrate, Birr 4 ($ 1.93 per gm). 1$=2.07Birr o 14-21 gm gold concentrate Birr 5 ($ 2.42 per gm); o 21-28 gm gold concentrate Birr 6 ($2.90 per gm); o 28-35 gm gold concentrate Birr 7 ($ 3.38 per gm); o 35 gm and above, Birr 8 ($3.86 per gm) It is logical to assume that the price would have been close to the domestic market price. • From early 1975 to late 1988 the artisanal miners in Shakkisso – Hayadima area were organized under the "Adola Traditional Gold Miners Association". The organization has been strong during the initial years, but it dissolved lastly because of different reasons. The used to work in groups. • In the late years of 1990, the number of miners was estimated to be about 200—500 and their income was much similar to the AGDE's payment rate for daily laborers, which was equivalent to about 2.50—3.00 Birr per day. From 1984 until the change of government in May 1991, the Shakisso—Hayadima with a total area of 7200 km^2 was identified and marked as the "Protected Area" for the mineral resources as well as forestry and wildlife natural resources of the region.

<table>
<tr><th>Period</th><th>Description</th></tr>
<tr><td>May,1991- July 1993</td><td>

Change of government took place;
A decline in the formal gold production led to flourishing of illegal gold mining in Ethiopia in general and an intensive gold-rush activity in Hayadima/Shakisso area in particular;
Government's (AGDE's) contractual relation terminated and artisanal miners commenced working illegally on most accessible high-grade placer deposits and selling the product to any gold trader rather than to the government. It was reported that those days the price of gold varied from Birr 70—80 per gm and was much close to the international market. The income per head and an employment opportunity of artisanal miners were considered the highest.
During the gold rush process, artisanal miners broke the rules and regulations in use, the "protected area" within the designated Shakisso/Hayadima areas, and there was no provision left to protect the proper utilization and conservation of mineral resources and the country's dwindling forest and wildlife resources;
In 1992/93 the government had initiated a pilot gold purchasing project by allocating Birr 10.8 million which was to be implemented by AGDE as a means of controlling gold trafficking. Accordingly, the gold illegally produced by artisanal miners at Shakisso/Hayadima area and purchased by AGDE from Miazia 1985—Hamle 1988 EC was shown below (Source: AGDE)

<table>
<tr><th>Financial Year</th><th>Production in gms</th></tr>
<tr><td>Miazia 1985 –Sene 1986</td><td>195,990</td></tr>
<tr><td>Hamle 1987-Sene 1988</td><td>84,635</td></tr>
<tr><td>Hamle 1988-Megabit 1989</td><td>44, 482</td></tr>
</table>
</td></tr>
</table>

Period	Description
	As shown above, after Sene 1988Ec, the purchase of gold on a trial basis showed a sudden decline reaching only 44,482 gms during Hamle 1988 to Megabit 1989 and thereafter far below. This is mainly caused by the fact that the purchase activities was neither able to compete or take a large part of traded gold. Whereas the illegal traders were more effective and smart enough to buy more gold by offering better prices to miners on the spot as compared with the committee administered pricing system of the Government's pilot project (MoM, 2000/01)
June 1993-to date	• The new mining and mining income tax proclamation were issued including the artisanal mining; • According the MoM, during 1994, significant attempts were made in Oromia and Tigray to organize, licensing and monitoring the artisanal mining operations; • Initially many artisanal miners were licensed to work individually and in groups. However, the attempt failed because of the problems related to the access to resource base, i.e., a right to own mineral gold reserve/deposit, the traditional land owners, who is currently fully or partially managed by license holders. This resulted in that no more artisanal miner is working on his own mining area but to work with license holders on a piece-rate basis. The miner then works and produces an average of 26.38 gm per year selling at a rate of Birr 40 per gm valued at 1055 Birr per annum i.e., to sustain an average of 5 family members as gross income (See the Case Study Report on Hayadima section 5.11). This income is spent to buy essential supplies, mining tools/equipment, medication, etc. which is mainly brought in from Kenya at higher price.

Period	Description
June 1993-to date	• Rich and minable deposits are highly exhausted/depleted; • Number of miners is more than the mineral resource capacity; • In short, the current network of gold trading could be shown as follows: License holders (artisanal miners) to onsite collectors; Onsite collectors to local traders (mostly business men); Local traders to Foreign traders (mostly Kenyans, Somalis, Ugandan, Tanzanian)

According to discussions held with community members, different levels and systems of livelihoods have been evidenced in the Kebele during different eras. Three eras can be identified for highlighting major events and their impacts on people. During the Haile Selassie Era, natural resources were not scarce. Mountains, hills and valleys were covered with forests. There was little farming. Gold could be easily mined. The cost of living was low and the supply of consumption goods was commensurate with demand. Medical services were given freely and production tools were supplied free of charge as the miners produced for the government for wages. The rights of miners were limited.

During the Derg administration, there was not much difficulty in mining gold. Government was the sole buyer of gold at reasonable prices. As consumption goods were available at moderate prices and medical services were given free of charge, life was not very strenuous although people could not exercise any freedom. Administration was highly centralized.

At present, people are given democratic rights. But the migration of persons from different areas resulted in the depletion of natural resources and the congestion which created sanitary and health problems in settlements near the mining sites. The overall dismal socio-economic situation has deepened poverty in the area. The vulnerability of the Kebele residents to different sources of hazard has increased.

3.1.2 Previous Work and NGO/CBO Support

a) Previous Works

Various efforts have been made to strengthen the mining sector. With respect to the artisanal mining activities, the efforts made include setting up of cooperatives and countering the illegal trade of gold.

- ***Efforts Made in Respect of Illegal Trading of Gold.***

Various studies were carried out in respect of illegal trading of gold between 1970 and 1980 E.C.

The Ministry of Mines has undertaken several studies and attempted to take measures which were meant to prevent the illegal production and smuggling of gold to neighboring countries and sales to local merchants against the interest/benefits of local communities and the country. The studies focused on how to gather gold on purchase basis to make it available as a source of revenue for economic development and for meeting the basic needs of communities in terms of goods and services. Accordingly, attempts were made to set up purchasing (trade) posts at various convenient places in the vicinities of artisanal mining sites. At the same time efforts were made to supply consumption goods to local markets to cover the needs of artisanal miners. However, since buyers in neighboring countries could offer better prices the project could not succeed.

In 1976 E.C a study report which was issued by a team of experts on the potentials of gold production was circulated in the market. It also confirmed that gold produced by individual and groups of artisanal miners was being smuggled across borders to neighboring countries (Sudan, Kenya and Somalia) and illegally supplied to goldsmiths and individuals in the country. In 1986 E.C. a study report on "Small-scale Mining Development in Ethiopia" was prepared by an expert (G.W. Walrond) for the United Nations Department of Technical Co-operation for Development.

However, these efforts could not prevent the situation from getting worse although they made the following observations:

- Illegal production and smuggling of gold is very difficult to stop and attempts to curb it involve high expenditures.
- Production of gold and other valuable minerals should be privatized and systems of using such products for development purposes must be carefully designed.
- There is a need to give legal support in order to make artisanal mining activities contribute to improvement of the livelihood of the miners and national economic development.
- Many countries e.g. Brazil, Surinam, Venezuela Cuba, Guyana, Zaire, etc have managed to increase their gold holdings and enhancing their foreign currency earnings by purchasing locally produced gold at high prices.
- It is necessary to enable the government to acquire the locally produced gold by making official price of the commodity commensurate to that which the black market offers.
- Among the measures which were recommended to help control illegal production and trading of gold was the issuance of policies and strategies which create conducive environment for the production and marketing of gold by small scattered reserves.

- ***Strengthening of Artisanal Mining Activities.***

The AGDE identified potential artisanal miners and devised means of improving the livelihood of about 1500 mine workers through mining and processing techniques together with support services (medication, safety clothes, etc.) which resulted in improvements of the productivity. About 100 incapacitated miners, especially those who were approaching pensionable age and used to sell gold to the government through AGDE's management were identified, given the right to pension and kept at AGDE's special home in its Shakisso hospital compound. Others who were not able to mine gold because of occupational hazards were put in off-mine income generating activities like bamboo crafting, petty trading, operating nursery, etc. They were put in a re-settlement programme which took them to weredas adjacent to Shakkisso. (Borena Zone in Oromia

and Sidama Zone in SNNPRS). But the social and economic gains were short-term and the programme lacked the backing of government and therefore, could not be sustainable.

During May 5- July 1, 1994, the Mineral Operations Department(MOD) and the UNDP conducted a small-scale mining seminar and fully mechanized processing demonstration programme in Borena Zone (Shakisso, Megado, Hayadima and Hagremariam areas). The programme was designed and organized to assist these illegal gold miners in Shakisso to operate in safe working conditions and properly use natural resources, to establish legal cooperatives of gold miners, which will eventually be converted into small-scale mining enterprises. As a result about 1876 artisanal miners participated in this training/demonstration programme. According to the report produced by the team in August 1994, the mission was successfully accomplished by converting some of the participants to the idea of forming cooperatives and subsequently establishing small-scale gold miners' enterprises. However, the implementation could not be sustainable because of unclear reasons.

b) NGOs Support

There are no NGOs providing services to the artisanal miners at Hayadima except in few special cases like the one time blood testing on HIV/AIDS conducted by the Mekan Yesus Church.

3.1.3 Performance of Placer Gold Mining Industry

In Borena Zone artisanal miners (also called traditional miners) work on alluvial, delluvial and technogenic (tailings) deposits. On virgin deposits the gravel of the gold bearing sediment composed of quartz pebbles and fine sandstones ranging in thickness from 0.5 m to 2 meters. Some primary gold deposits are also under exploitation/e.g. Sakaro; Kadijimetti etc) through manual crushing and grinding of the exposed (weathered) quartz veins and fragments. Major mining activities are concentrated in this Zone. The main reasons for placing emphasis on the Borena deposits probably stems

from its geographical location, the accessibility of the area, favorable climatic conditions, availability of workable deposits and presence of big rivers like Mormora and Awatta.

In Borena Zone gold has been mined for over half a century to present times. At initial years, production of the precious metal was entirely dependent on primitive traditional mining techniques.

An improved method of small-scale gold mining in Borena goes hand in hand with traditional mining methods. In the West the old traditional ways of mining for gold continued while in the Adola/Shakisso area an improvement in mining methods are gradually introduced.

Based on location and nature of the deposit, its content of gold, underground water conditions, and availability of water for the treatment of gravel, two(three) distinct types of artisanal mining operations can be distinguished, namely:

- Shallow and deep pitting and
- Ground Sluicing.

a) Shallow and Deep Pitting

This operation is widely used where water is quite scarce and the overburden is thick. The artisanal operators, as seen at Borena Zone and those operating in other regions, essentially dig pits of approximately a 10 meter diameter to 3m to 15m deep and in certain cases up to 25m to reach gold bearing gravels and to the bed rock. Pit spacing by artisanal miners varies widely depending on the slope, and stability of the over burden and grade of the placer. In rich gravels, the pit distances are dangerously close, some times as close as less than 1.0meter. In areas of stable grounds pits are spaced as wide as 10meters apart, widening the working areas at the bottom of the pit. Once the basal gravel is reached or struck, miners drift following pay streaks for a distance up to 30m, recovering the gold bearing gravel. The excavated and piled gold bearing materials are loaded into baskets or cut drums of 100kg capacity.

Hoisting of the gravel is made possible with the help of rope using a pulley powered lifting system. This lifting system is locally called "Mangallya". This is a dangerous procedure unless done cautiously and skillfully. The remaining top portion of the gravel is left intact and pillars are left over a certain distance and previous workings back filled with waste from present excavations.

At the surface, the recovered gravel or ore is carried by miners and sometimes transported by donkeys and small trucks to a nearby, stream or to a pond/source of water.

Like almost all methods of recovering the valuable minerals in placers, panning is based on the fact that the material to be recovered is considerably heavier than the worthless grains of sand and other materials that are to be discarded.

At the nearest source of water, the gravel is washed or panned in a batea (a cone shaped tray of diameter 350-510mm depth 40-42mm, made of wood) which is the principal means of processing. An experienced person can pan or wash, on average, about $0.5m^3$ per day. Because of such low throughput only very rich deposits are selectively treated using such panning techniques. It is estimated that the gold recovery by this method is not more than 35% of the reserve.

Currently, this method of operation is well demonstrated at Korkoro, Kadijimetti, Kakobie, etc. mining sites.

b) Ground Sluicing

This method is used in valleys where sufficient water is available, the overburden is not too thick, the associated soil materials are soft, loose and the grade of slopes are allowable. Its advantage is that greater quantities of materials can be processed than bateas, so that more gravels with lower gold contents can be treated. In sluicing operation the separation is achieved by a stream of water running through a channel mixed with placer material fed by artisanal miners.

Following gravel materials disintegration the light materials are washed away and the heavier particles, containing fine gold, settle down in narrow channels. The collected heavy concentrate is then panned in bateas for gold separation.

Alternatively, such method of washing and panning is particularly operational in areas where the tailings from the semi-mechanized or hydraulicing operations have been found to be exceptionally rich (1.5 to 3.0 grams/m^3) in gold (Wollena, Bedakessa, Lega Demibi, etc) and where water is sufficiently present.

Picks, shovels, axes whipsaws, basket and perhaps wheels for making wheelbarrow, wood bateas were about all the mining equipments/tools required.

The unimpressive production figure is believed to reflect a low degree of acceptability of the technology by the miners; and of course the grade and the recovery also affects the magnitude of the output. Hence, the determination of the appropriateness of the technology requires further detailed research and development studies.

c) Production

Total recorded gold production by the artisanal/traditional miners within the designated Shakisso area of 7200 sq. km which is reserved for mining development in southern Ethiopia, Adola in the last 45 years amounts to about 28 tons. (See Annex 3. B).

In its early years operation, in the 1930's, production recorded in the Adola Gold Fields of Borena Zone, was the highest but started declining beginning from the middle of the 1940's. The decline in the formal gold production, however, led to the flourishing of the illegal gold mining.

3.1.4 Composition of Artisanal Miners

Currently in Borena Zone/Shakisso area, the number of artisanal miners engaged in productive activity are estimated to be from 80 to 120 thousand persons. No real census has been conducted so far.

These can be categorized principally into manual operators who could work independently and as contract operators.

The artisanal miners comprise of groups of people or individuals who are landless farmers, youths, ex-soldiers, women, etc. Children, older people and very rarely women get engaged in tailings (old dumps) areas of gold production. Involvement of women in mining is less intensive in Borena Zone than in other areas of the country. Apart from Adola, the Regional/Zone Tigray, Moyale, Agere-Mariam, Arero, Akobo and western Regions have many artisanal miners. The number of artisanal miners in Ethiopia varies widely, depending on season, alternative work opportunity and prices of products.

Despite the long history of mining at Adola-Borena Zone, the Gujji tribe only marginally participated in mining as the farmer-miner doing mining as a secondary occupation.

3.1.5 Livelihood Analysis of Social Groups

The livelihood of all social groups is marked with vulnerabilities arising from recurring drought. Lack of water causes the herdsmen to move from their usual residences to perennial riverbanks during the dry seasons. Crop production is also affected by drought. Artisanal mining activities also become less productive during the dry seasons due to lack of water. Moreover, the alluvial soil in the mined areas is running out of gold.

Box 1. Categorization of Social Groups by Wealth

Category	Percent	Assets
1. Very poor	15%	No assets Live by begging
2. Poor	80%	- have no private house - have no furniture - have problems to prepare food - have production tools, at least spade and batea
3. Better off	4%	- have private house - have furniture - have means for preparing food - have production tools
4. Rich	1%	- have private house - have furniture (better quality) - have means of preparing food - have equipments

The desired outcomes of the community as expressed during the discussions held with different groups consist of improvement of methods of production and diversification of activities, which are expected to generate better incomes resulting in improved livelihood. Community members have, thus, indicated their belief in making their desired outcomes real through better incomes and social amenities for the acquisition of which assistance is expected from the government and NGOs.

3.1.6 Role of Artisanal Mining in the Village

Although the role of artisanal mining is not fully understood in the villages/sites its significance in employment generation, the development of infrastructures, housing and human settlements is adequately recognized.

Expanded gold mining or quarrying means increased employment opportunities in the sector and supporting services. Increased economic activities which result from more

gold production will contribute towards alleviating the unemployment problem. Artisanal mining activity sites open up rural areas to the adjacent places (wereda and kebeles). As artisanal miners are consumers of farm products and other commodities, the activities create greater trading opportunities for farmers and service providers in the locality.

3.1.7 Institutions

There are very few institutions in the kebele. Social service institutions are very few in number. They cover only a very small proportion of the population providing limited service. *Idir* and other mutual assistance associations which are common in other communities in the country are non-existent among the artisanal miners. There are only one health post and one elementary school, two churches and one mosque in Hayadima area catering to the population in the locality.

3.1.8 Major Issues and Recommendations

Numerous issues relating to livelihood that require various forms of intervention were identified. These issues along with their possible solutions are tabulated below.

Summary of main issues arising and possible solutions

No.	Issues	Possible solution
1	The exhaustion of high grade and easily exploitable areas and lack of prospecting and exploration activities to discover for more mineable reserves resulted in the production fall.	Carry out further systematic prospecting and exploration for virgin placer gold resources an recheck the leftover placer deposits (in small creeks, terraces, water logged and tailings).
2	Environmental management is totally neglected in the rural areas of Shakisso and Senkelle study areas.	There is an urgent need and meaningful for environmental education. Consideration should be give to establishing a cadre of community be given to establishing a cadre of community environmenta workers, who are member of the community, especially adults linked to practical mining farmin activities
3	Use of back ward mining practice by artisanal miners resulted in poor processing recovery and wastage of mineral resources	In order to enhance for example recovery of placer gold and platinum, deposits, a combination o two stage extraction process, namely, extraction of coarse and free materials using sluice box an re-processing of fine tailings using cyanidisation method is recommended. The heap leachin (cyanidisation) method for gold and silver is considered for deposits which are marginal o uneconomical for conventional processing.
4	Illegal mineral trading	Preventing illegal production and smuggling of minerals by organizing artisanal/traditional miner into co-operatives, legalize, the sector create alternative financial and technical assistance an advice to the government the promotion of low cost, efficient and safer semi mechanized, mining processing equipment
5	Improper utilization and failure to give attention to the conservation of natural resources in general mineral resources in particular	Assess the actual wastage of placer gold resulting from both artisanal and mechanized mining operations. This assessment should include the estimation of reserves and grade and should aim at devising proper processing techniques regarding an efficient recovery of gold deposits.

No.	Issues	Possible solution
6	Lack of basic infrastructure	Give utmost attention to the developing infrastructures including roads, electricity and water to promote mineral exploration and mining development with particular emphasis given to the construction of all weather roads that connect localities where mineral resources have been identified with major towns and service rendering centers.
7	Unsafe mining/quarrying practices resulted in loss of life and property	Artisanal miners should be licensed and be given access to proper tools and safety equipment and advice on proper mining practices, particularly mining on appropriated benches and maintaining safe slopes where applicable.
8	The contribution of non-metallic minerals (industrial minerals, construction, materials, gem stones, etc) to the national economy was long masked by only one mineral gold production.	Requires the governments, change in attitude towards their contribution to the national economy based on their current production volume with respect to their income value and their potential for further development.
9	The number of health institutions in the artisanal mining areas is too small when compared to the size of the population.	All stakeholders (government, NGOs, the private sector and communities) should be involved in creating conducive health and safety situation in the artisanl mining areas by strengthening existing basic services in terms of staff and equipment as well as establishing new ones.
10	Educational opportunities are provided only to a minority of the population in artisanal mining areas. Moreover, a very insignificant number of artisanal miners have acquired skills through training.	In order to increase the capacity of the artisanal miners to enhance their productivity and improve their livelihoods the new education policy should be translated into action in artisanal mining areas. Concerted action of all concerned institutions is necessary for attainment of fruitful results.

3.2 Case Study 2 – Livelihood of the Artisanal Mining Community in Senkelle

3.2.1 Background

This case study report is prepared on the livelihood of artisanal mining communities in Senkelle and Farisi Kebeles of Ambo district.

a) Location & Size

Senkelle is located in Western Shewa Zone at 5km NNW of the town of Ambo and 130km west of Addis Ababa. It is situated very close to Ambo town and the general conditions of Ambo are considered to be similar and taken to describe its general features. Although the Senkelle quarry site is administratively located in Guder Woreda, the residents depend on Ambo town for most of their basic social service requirements. The area is bounded by the following geographical coordinates:

Latitude: $08^0$46''11''N – $09^0$09'25''N

Longitude: $37^0$45'15'' E – $38^0$08'40''E (See Location Map Figure 1.2)

b) Population

Ambo is the name of a district as well the capital of Western Shewa Zone of Oromia Regional State. According to the 1994 population census Ambo town has a population of 177,465 of which 51% were female.

c) Physical Assets

A transect walk was undertaken by a group of five members including a study team member, two data collectors and two persons from the locality. The physical features observed during the walk consisted of hills, sloppy places and valleys. The sloppy places and valleys comprised of grazing and farmland part of which is covered by grass. Some parts of the hills are covered by bushes. The hills where the quarries are located are mainly rocky. Generally, the land consists of red soil and is denuded of trees except small patches or groups of eucalyptus trees. There is one spring in the valley near Ambo Mineral Water Factory from which some residents of the area fetch water for household use.

Table 3-2: **Physical Features Listed During the Transect Walk at Senkelle Sandstone Quarry (South North)**

Land use	Farm, grassland, artisanal mining (sandstone quarry)
Domestic Animals	Cows, goats, donkeys, horses, sheep, etc.
Vegetation	Zigba, Inset, Gerbi, Bisana, Adami, Kiltu, Dambi
Water	No water
Soil Type	Red soil
Animal Feed	Grass
Crops	Teff, maize, wheat, barley
Insects	Mosquitoes
Dwelling and Institutions	Dwelling, church, police station, Ambo mineral water factory, health post

Domestic animals observed during the walk include cows, oxen calves, bulls, goats, sheep, donkeys and horses. Although wild animals are not seen during the transect walk it is known that hyenas exist in the area.

The area is geologically formed by sedimentary rocks which is unsuitable for agricultural activity. The natural resource base on which population of the study area depends is threatened as a result of inappropriate land use practices such as excessive deforestation and over grazing; high population growth rate leading to shortage of land for cultivation and grazing. As a result about 30-50% of the population in the study area are landless

The Ambo district is popularly known for its three major industrial sources of products, viz mineral water, lime and sandstone all of which are located within the vicinity of the study area adjacent to one another. These are briefly discussed below:

Senkelle Sandstone

Senkelle sandstones (locally called *Dhaga Gurage*) are an indurated variety of sandstones quarried for dimension stone from the area, as popular building or ornamental stones used in construction industries. They are mainly used as decorative stones. At present most of the growing towns in Oromia and adjacent areas make use of the these stones for building construction.

The sandstone is an Upper Sandstone and is a clastic sedimentary rock composed of indurated sand grains, most of which fall within the size range of 2 to 0.06,. It is fine to medium grained in friable. The color is generally gray, brownish gray, pale brown, pinkish, yellowish and reddish or combination of one or two of the color kinds above. The resource is estimated to be more than 3 million cubic meters enough for about 100 years.

Mining of the sand stone by artisanal method dates back to the 1960's. Currently artisanal mining is being undertaken at three principal quarries namely;

- *Dhega Gurage* (the oldest)- East quarry
- Chewak – East quarry, and
- Boji (New) – West quarry

The main quarry is Dhega Gurage(east quarry),where more than 20 license owners are operating. Senkelle sandstone is quarried manually in a small open-pit like workings. Its attractive color and easy workability makes the stone attractive.

The artisanal quarrying operation involves clearing-digging –breaking – sorting for quality and cutting/sizing processes using shovel; dibble/wedge iron; pick with wedge; sledge hammer and mattock. The stone can be carved/trimmed into manageable geometric shapes for use in building construction.

The commonly known products include the following:-

- Naturally irregular shapes and broken sizes which are mined without further dressing to be used for small buildings road aggregate, rip-rap, rock fill.
- The common standard products have a size with thickness of 10, 15 and 20cm and used as decorative stone for houses, fences etc. works.
- Monumental stones.

Because of the inaccessibility of adjacent areas, the excavation of sandstone is presently confined to the three localities (Dhaga Gurage and Chewak in the east and Boji in the west). If organized properly the activity can provide more employment opportunities.

The currently operational quarries are owned by about 40 private licensed owners. The artisanal miners work for these license owners for payment on piece rate basis. The estimated annual production is 13,000 to 15,000 m^3 per year.

Lime

Locally lime used to be produced by burning traditionally built kilns and some by modern kilns. The latter is still operational at small-scale production level.

Senkelle Ethio-Lime Factory is the oldest and still is the major supplier of lime in the country. The modern factory was established in 1970, and has an annual production capacity of 6000 tons of lime. It is located 7kms west of Ambo or 137 kms west of Addis Ababa, on the asphalt road to Nekemte. The Senkelle limestone is the major source of lime for the factory's raw material supply.

Limestone/Calcium carbonate

Lime has a lot of industrial uses the main one being construction. The limitation associated with its processing is shortage of energy/electricity, and in adequacy of wood which is used for burning it into lime.

Mineral Water

Ambo/Senkelle is very popular in the country for its mineral water, Ambo mineral water. In Ethiopia, the diversity of geological, hydro-geological, hydro-chemical and climatic conditions are the main reasons for the occurrence of various types of mineralized water. However, despite such occurrences, not much systematic investigation and development of mineral water resources has been carried out.

The mineral water occurs in a confined limestone formation at a depth of about 100 meters. All the wells drilled exhibited artesian conditions with their piezometic surfaces occurring above the ground. Ambo Mineral Water Bottling Plant is situated adjacent to the Senkelle Sandstone deposit under exploitation. Until 1977, the production well of Ambo Mineral Water at Senkelle gave a free discharge of about 20 liters per second. However, the new boreholes were drilled to replace the old one with a discharge rate of 10 and 8.5 litters per second respectively.

d) Economy

The main economic base of the population is agriculture (mixed farming). The increase of population has forced every body to share the same resource such as natural resources and services. Off farm activities for some segment of population include sandstone quarrying for dimension stone, petty trading, weaving, etc. Off-farm employment in general is very high in the area, particularly more than 800 persons supporting an estimated number of 4000 household members are known to be engaged in sandstone excavation. Most of the miners developed great interest to see their children engage in this mining operation because of the promising profits generated from the activity.

There is little potential for increasing livestock population without seriously decreasing nutritional status and increasing land and grazing area degradation. There is no potential for increasing grazing area either. On the other hand, there is some possibility of increasing livestock feed resources through increased quantity crop residue which may assist in bridging the food deficit gap that already exists and may allow additional oxen and goat to be introduced in the area on credit basis for improving crop production.

e) Infrastructure and Social Services

The study area, Senkelle and Farisi Kebele, is crossed by only a segment of an asphalt road (Ambo-Nekemte). Apart from this, the kebele is inaccessible by road except one all-weather road to *Daga Gurage and Chewak* quarry sites and seasonal access road to Bojji quarry site. The construction of access road to north of the Senkelle village is very difficult, because of the ruggedness of the terrain.

The whole population of Senkelle & Farisi Kebele is being serviced by nearest health center, clinics and hospital of Ambo town (5km). However, there is lack of basic health services such as health post, provision of first aid, contraceptive distribution delivery and health education in the village itself.

According to the information from the Western Shewa Zone Health Bureau, the most common ailments of the study area, in order of their importance, include malaria, pneumonia, helminthes/parasites, diarrhea, acute upper respiratory infections/asthma, dermatitis, homicide, sexually transmitted disease, gastritis, rheumatism and anemia. Only one elementary school (1-6) is situated within the study area. The study team met 10 children below 15 years working as artisanal labor force in the quarry operation. Moreover, the moral drop of parents whose children were unable to secure job even after completing high school have contributed to the decrease in school attendance. Otherwise the community depends on its own organizations such as churches, one extension agent called Development Agents/(DA) and traditional leaders/*Idir* chairpersons.

Currently electricity is supplied only to government organizations (Ambo Mineral Water, Senkelle Lime Factory and Oromia Police Training Center). For the future quarry and vicinity development plan, electric power supply connection should be made from the nearest point possible i.e. from Ambo Mineral Water Bottling Factory.

Most streams are seasonal and as a result the problem of drinking water is serious. The current sources of drinking water are undeveloped spring water and rivers.

Generally the study area doesn't receive adequate basic services like health facilities, safe drinking water, etc. Two small shops are the only service rendering establishments in the village. There is only one flourmill for the whole community.

Trends

Some of the major events that have happened since the 1942 E.C (1949/50 G.C) are provided below:

Date (G.C.)	Events
1949/50	The use of sandstone as a dimension stone was not know by the villagers and only 1(one) Italian person commenced the production.
1957/58	During Haile Selassie Regime about 3(three) persons of which one was an Italian person.
	In the adjacent of Senkelle sandstone and its surroundings lime was supplied local producers by burning traditionally built kilns.
1967/68	During Derg Regime, the member of people working on sandstone production reached about 10 and these are an Ethiopian "Gurage" tribe and the quarry was named after them Senkelle sandstone is locally called "Dhaga Gurage".
1974/75	Ambo Mineral Water with annual plant capacity of about 90 million bottle per annum plant was established adjacent to the Senkelle Sandstone deposit.
1997/98	Number of quarry owners reached from 30-40 license and the number of artisanal miners (prequel labor) at Senkelle sandstone is estimated to be range from 600-800 people. The operation involves manual workers using simple tool implements.