JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

ETHIOPIAN ROADS AUTHORITY
MINISTRY OF PUBLIC WORKS AND URBAN DEVELOPMENT
ETHIOPIA

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR PROVISION OF ROAD MAINTENANCE EQUIPMENT FOR SHASHEMENE AND DIRE DAWA DISTRICTS IN ETHIOPIA

DECEMBER 1992

CONSTRUCTION PROJECT CONSULTANTS INC.

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PREFACE

In response to the request of the Transitional Government of Ethiopia, the Government of Japan decided to conduct a basic design study on the Project for Provision of Road Maintenance Equipment for Shashemene and Dire Dawa Districts and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Ethiopia a study team headed by Mr. Noriaki Kumai, Deputy Director General, Construction Machinery Engineering Center, Hokkaido Development Bureau, Hokkaido Development Agency and constituted by members of Construction Project Consultants, Inc., from 23 August to 11 September, 1992.

The team held discussions with the officials of the Transitional Government of Ethiopia and conducted a field survey at the study area. After the team returned to Japan, further studies were made. Then, the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between the two countries.

I wish to express my sincere appreciation to the officials of the Transitional Government of Ethiopia for their close cooperation extended to the team.

December, 1992

Kensuke Yanagiya

Kensuke YANAGIYA
President
Japan International Cooperation Agency

December, 1992

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Provision of Road Maintenance Equipment for Shashemene and Dire Dawa Districts in Ethiopia.

This study has been made by Construction Project Consultants, Inc. based on a contract with JICA, from August 18, 1992 to December 4, 1992. Throughout the study, we have taken into full consideration of the present situation in Ethiopia, and have planned the most appropriate project in the scheme of Japan's grant aid.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, and the Ministry of Foreign Affairs. We also wish to express our deep gratitude to the officials concerned of the Ministry of Public Works and Urban Development, and the Ethiopian Roads Authority of Ethiopia, JICA Ethiopia Office, and Embassy of Japan for their close cooperation and assistance during our study.

As last, we hope that this report will be effectively used for the promotion of the project.

Very truly yours,

Yoichi HIGAKI
Consultant Leader
Construction Project Consultants, Inc.

ETHIOPIA - PROJECT LOCATION MAP

ETHIOPIA - LOCATION MAP

ASMERA DIST.

ADIGRAT DIST.

GONDAR DIST.

COMBOLCHA DIST.

DEBRE MARKOS DIST.

ALEMGENA DIST.

JIMMA DIST.

DIRE DAWA DIST.

SHASHEMENE DIST.

ASPHALT ROADS

GRAVEL ROADS

RURAL ROADS

ASPHALT R. UNDER CONST.

GRAVEL R. UNDER COST.

SERVICE TO TRAFFIC

STATE BOUNDARIES

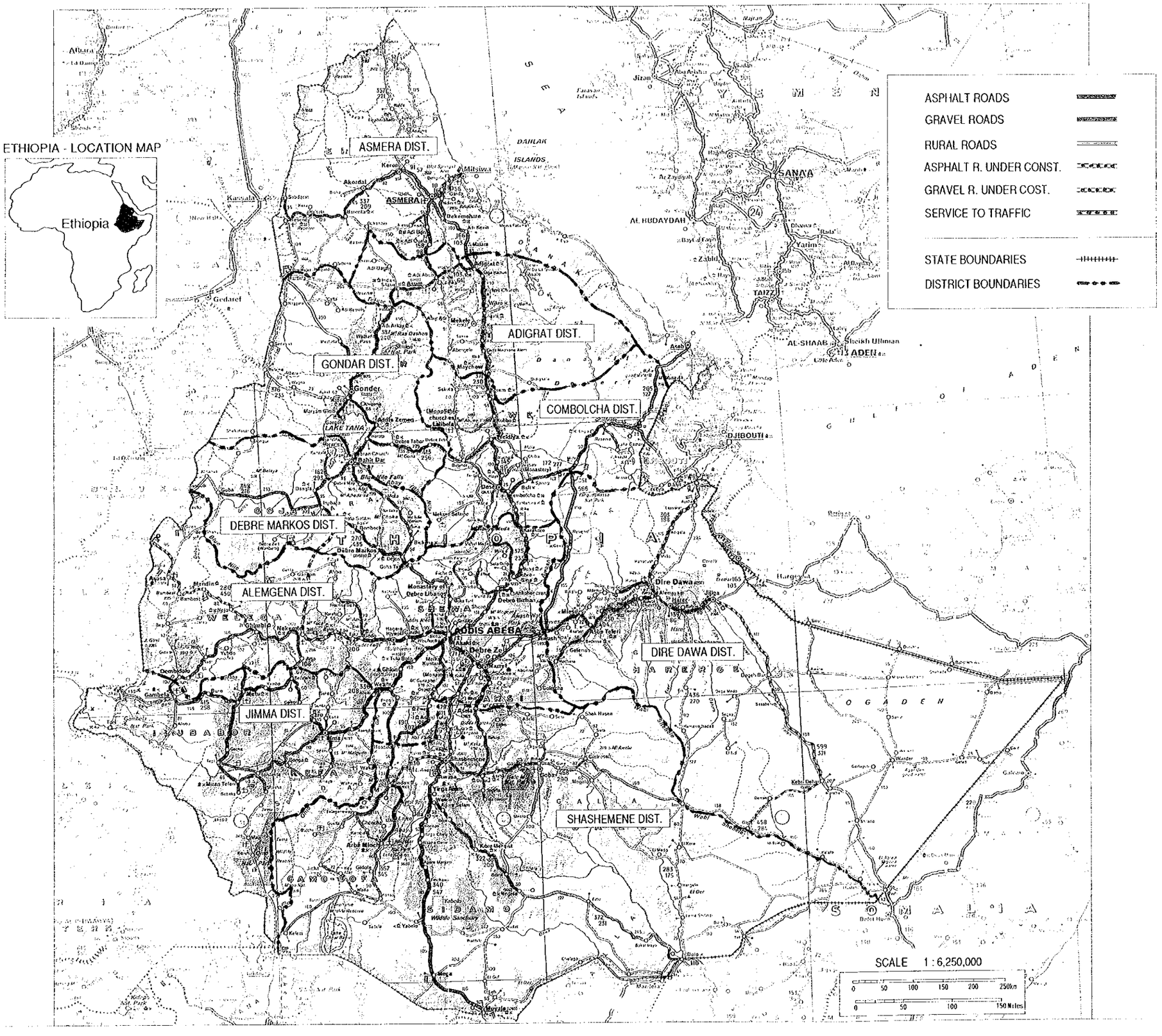
DISTRICT BOUNDARIES

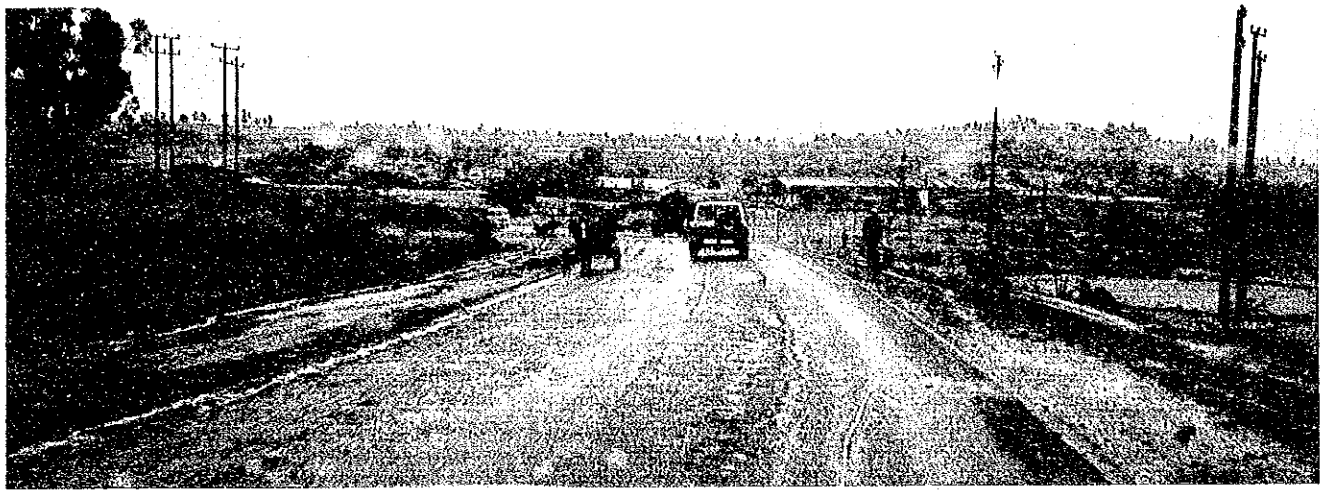
SCALE 1 : 6,250,000

0 50 100 150 200 250km

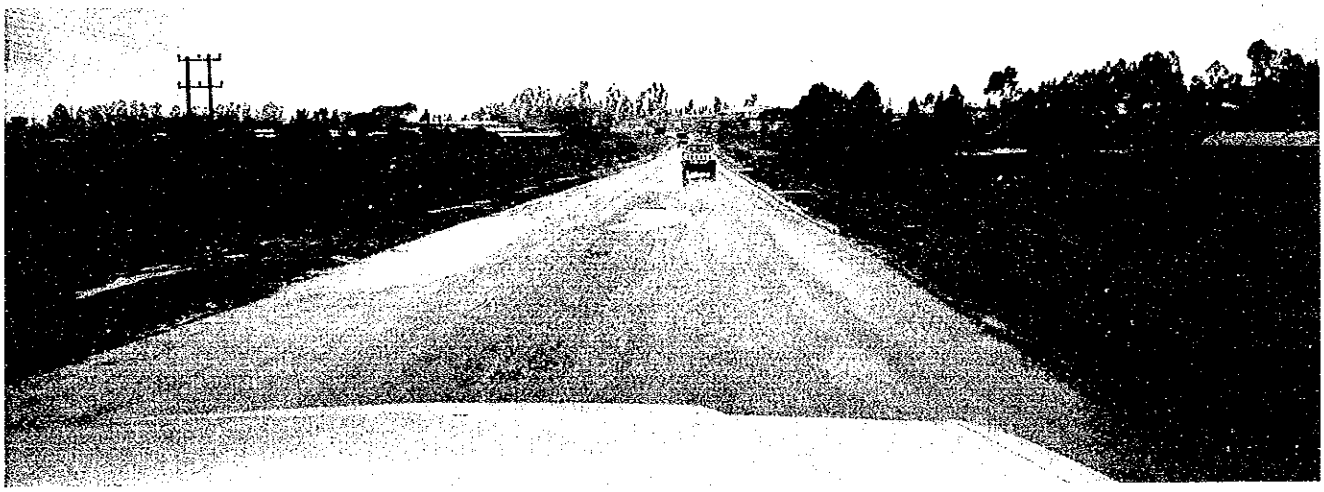
0 50 100 150 Miles

ETHIOPIA - PROJECT LOCATION MAP



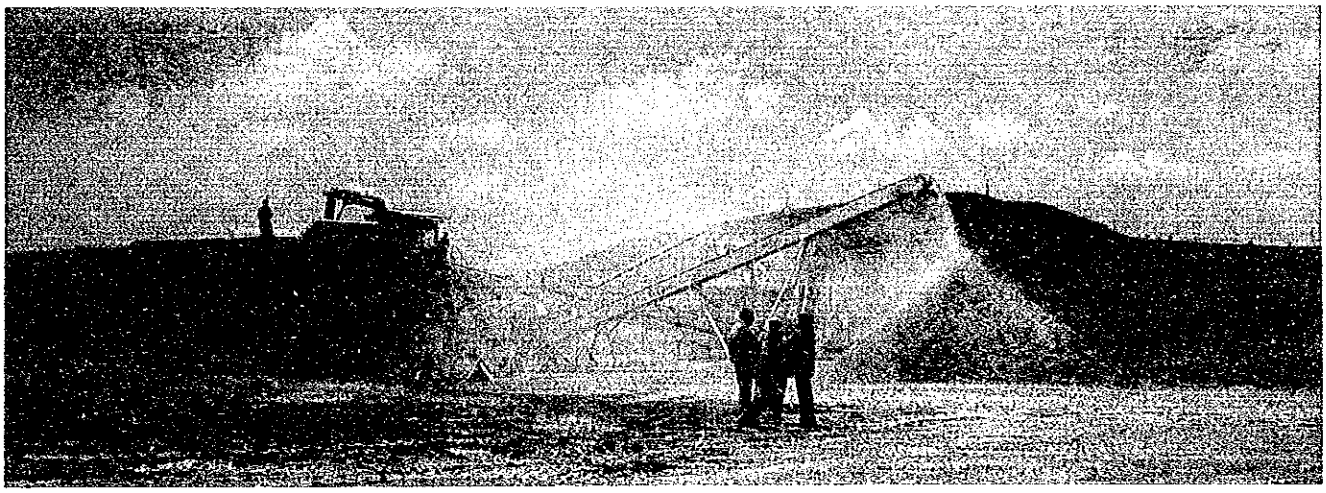


National road in the suburbs of Addis Ababa.
Irregular surfaces after the partial repair will need additional repair.



National road between Addis Ababa and Awash.
Surface treated asphalt road commences to be damaged.

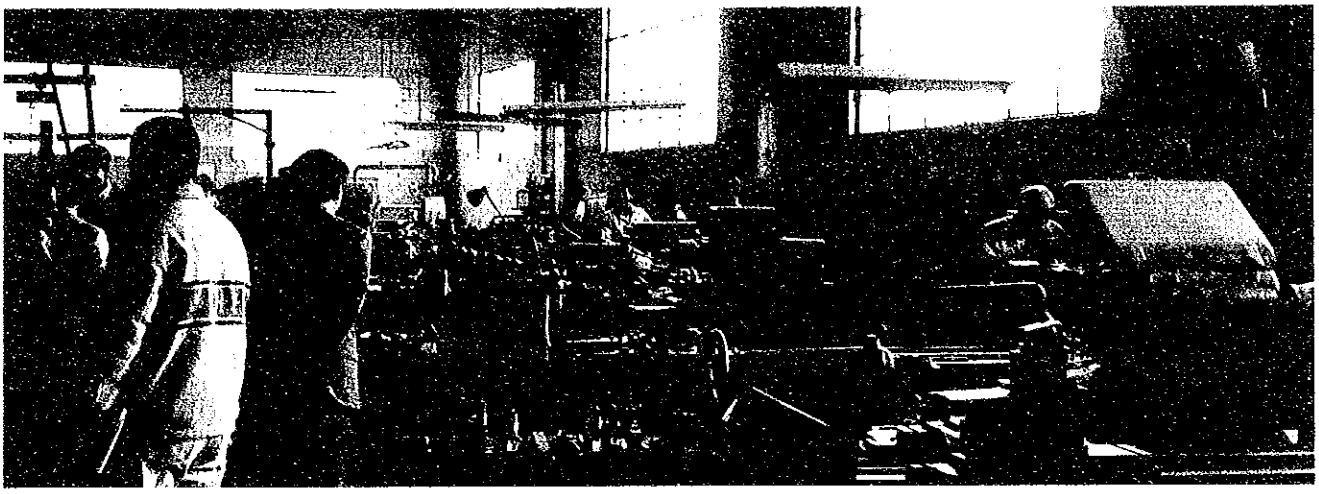
National road near Mojo. The surface is smooth.
Shoulder is under improvement.



Quarry plant at Mojo Section.
They are producing 4 kinds of gravel size (0-5,. 5-10, 10-20, 20-50mm).
Crusher capacity : 75 TPH class.

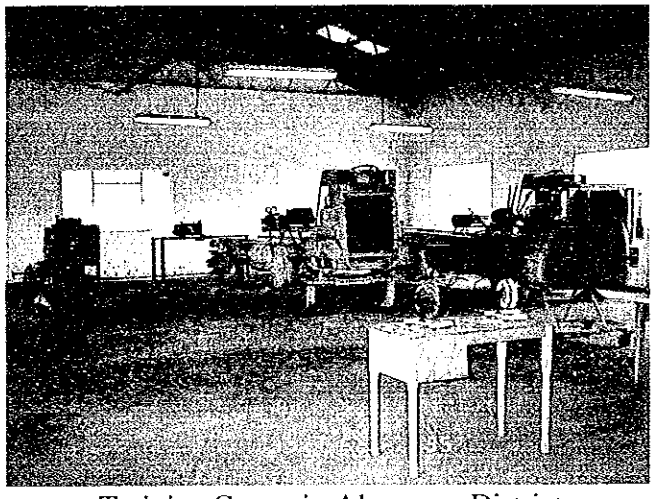
Crawler type drill machine is drilling holes for dynamite to blast the bedrock.

Heavy duty shop in Alemgena District - ERA.

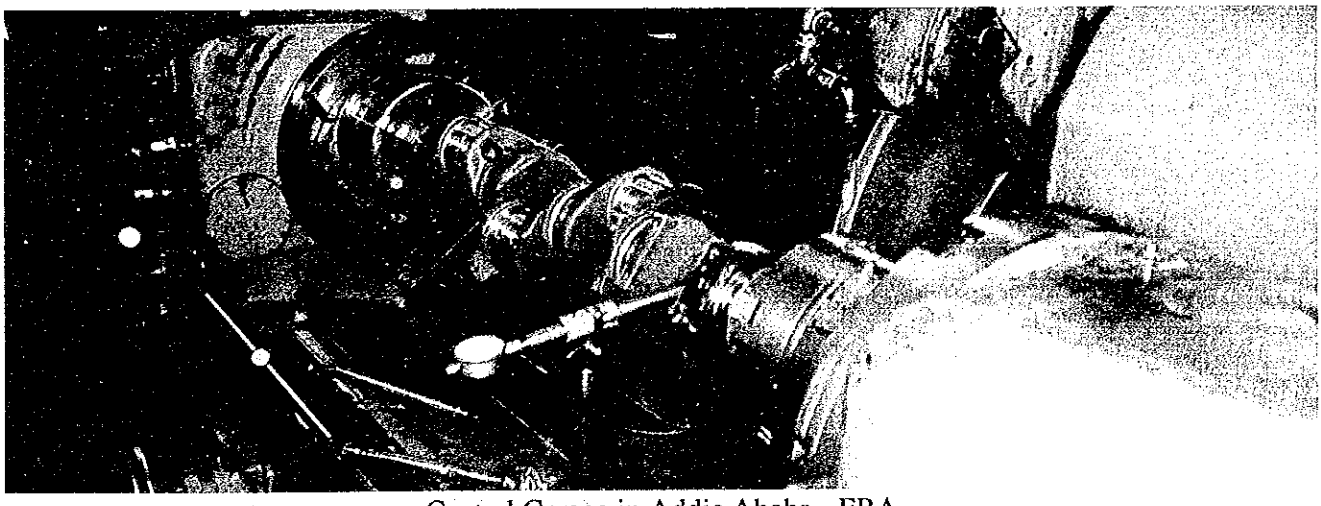


Machine shop in Alemgena District - ERA.
The machine tools are of various countries - Germany, USA, China, Italy, Cechoslovakia, etc.

Warehouse in Alemgena District - ERA.
Spare parts are stored and controlled
by using card system.



Training Center in Alemgena District.
Training models donated by manufacturers.



Central Garage in Addis Ababa - ERA.
The automobile engine crankshaft is being ground after additional material is welded.

SUMMARY

SUMMARY

Ethiopia is located in the middle-east of the African continent and its north-east runs along the Red Sea. It has an area of 1,221,900 Km^2 and a population of 5,032,000 (1989).

The principal industries of Ethiopia are agriculture and livestock farming, which are practiced in central plateau and their products constitute principal export items, especially coffee which holds the largest share in export.

After the socialist government of Mengistu lost power in 1991, the Transitional Government was established, and democratization is progressing under the administration. The political power will be transferred to a new government after the general election be held in 1993.

With internal conflicts that lasted 30 years till the change of government, frequent droughts in the 1980s, and influx of refugees from neighboring countries, Ethiopian economy was deteriorated, and Ethiopia has now started the Economic Recovery and Reconstruction Programme with assistance of the World Bank and other organizations.

Except for some 780 km of railway connecting Djibouti and Addis Ababa, the sole transport infrastructure in Ethiopia is 37,500 km of road network, on which 95%of inland transport relies. However road network has been aggravated because of neglect of the maintenance during the hostilities. In the meantime, road maintenance equipment in possession of Ethiopian Road Authority (ERA) has aged, and only 40% of the equipment remains at operable condition. Many equipment are almost abandoned because of lack of foreign exchanges for the procurement of spare parts.

Owing to the shortage of maintenance equipment, road rehabilitation has not been progressed as planned. Subsequently as road condition is compelled to getting worse day by day, the volume of road transport decreases and transportation cost increases rapidly. This problem becomes one of the largest bottleneck for the restoration of national economy, hence the Transitional Government provides the top priority to the improvement of the road under the Economic Recovery and Reconstruction Programme.

ERA, subsidiary to the Ministry of Public Works and Urban Development, manages 17,500 km of national road network, which consists of 11,500 km of main roads and 6,000 km of rural roads. Of the main road, 3,600 km are asphalted roads and 7,900 km

are gravel roads. These roads are administered by eight District Road Management Offices under the control of ERA Operation Division. Due to financial problems of the country, more emphases shall be placed on the rehabilitation and maintenance of existing roads than the costly construction of new roads. Thus far, road rehabilitation is an item which is given the first priority within the Emergency Recovery and Reconstruction Project (ERRP), that is an integral part of and the initial phase of the Economic Recovery and Reconstruction Programme.

In the above circumstances, the Transitional Government of Ethiopia requested the Japanese Government for the procurement of road maintenance equipment for two districts of Shashemene and Dire Dawa. In reply to the request, JICA despatched a basic design study team for the period of August 23 - September 11, 1992.

As a result of the basic design study, it is found out that an adequate road maintenances have been almost neglected, mainly because almost all the construction machinery possessed by ERA are worn by age and many of them are substantially wasted due to lack of spare parts.

The Project, that is, provision of road maintenance equipment for Shashemene and Dire Dawa Districts has been finalized subject to the result of the study on prevailing condition of the road maintenance equipment of the districts. Maintenance equipment for asphalted road and gravel road, and stone crushing equipment for road maintenance will be involved under the Project.

Considering the volume of works and the capacity of existing equipment, the Project embraces to deploy two paved road units and one gravel road unit, in Shashemene district, and, one paved road unit, one gravel road unit and one stone crushing unit, in Dire Dawa district, so as to cope with the requirements.

The Project will be implemented in two phases. Each phase will require some 3 months for detailed design (determine the content of the equipment, prepare the tender documents, assist ERA in tender, evaluating the tender and contracting) and some 10 months for mobilization of the equipment (inspect the equipment before shipment, attend the delivery and initial operation).

By the implementation of the Project the maintenance and rehabilitation of 3,377 km of national roads (paved road, 1,073 km, gravel road 2,034 km) will be attained in Shashemene and Dire Dawa districts, which will expedite the smooth transportation of

coffee and leather which are the principal agricultural produces, from the farms to the export ports, and foodstuffs and industrial products from import ports to domestic markets. Coffee is the most important agricultural product occupying more than half of the exports, and its increased production and exportation accelerated by the improvement of such export/import corridors is expected to contribute largely to improvement of the country's treasury, and reconstruction of the national economy.

Development of agriculture will help increase the income of and raise the living standard of some 13 million population of both districts. It will also improve the transportation of substantial relief cargo for the millions of people suffering from frequent drought.

The implementing organization of the Project is ERA, who shall be responsible for operation and maintenance of the equipment which wil be provided under the Project. Since ERA has been experienced in road maintenance work using equipment of similar nature, operators and mechanics for maintenance equipment procured under the Project are already secured by two Road Maintenance District Offices.

At Alemgena, some 20 km west of Addis Ababa, ERA operates Training Center, where training of some 200 of operators, mechanics, engineers and administrators is conducted annually.

Each of Shashemene and Dire Dawa District Road Management Office has a garage, functioned for machining, electrical work, welding, body work, painting, and wood work including warehouse. Repairs requiring higher expertise for engine, transmission and heavy electrical work are done at the Central Garage in Addis Ababa.

As the Transitional Government of Ethiopia places a top priority on the Project, it already plans to secure the required budgets.

In the context, it is recommended the Project listed below be implemented as immediately as possible under the Japanese Grant Aid Programme.

Phase	First			Second					Grand Total
Road Unit	Gravel Road Unit		Total	Gravel Road Unit	Asphalt Road Unit		Quarry Unit	Total	
District	Shashemene			Dire Dawa	Shashe-mene	Dire Dawa	Dire Dawa		
Equipment	(1)	(2)							
1. Bulldozer	1	1	3 *	1 *	-	-	-	-	3
2. Motor Grader	3	3	6	3	1	1	-	5	11
3. Wheel Loader	1	1	2	1	1	1	1	4	6
4. Vibratory Roller	1	1	2	1	2	2	-	5	7
5. Dump Truck	5	5	10	5	4	4	2	15	25
6. Asphalt Distributor	-	-	-	-	1	1	-	2	2
7. Water Truck	1	1	2	1	1	1	-	3	5
8. Station Wagon	1	1	2	1	-	-	-	1	3
9. Pick-up Truck	1	1	2	1	1	1	1	4	6
10. Grease Unit	1	1	2	1	1	1	1	4	6
11. Rock Crusher	-	-	-	-	-	-	1	4	1
12. Traxcavator	-	-	-	-	-	-	1	1	1
13. Air Compressor	-	-	-	-	-	-	1	1	1
14. Drill Wagon	-	-	-	-	-	-	1	1	1
15. Blasting Machine	-	-	-	-	-	-	1	1	1
16. Tool Set	1	1	2	1	1	1	1	4	6
17. Spare Parts	For two (2) years service								

Note: (1) One Bulldozer marked (*) which is assigned to the gravel unit of Dire Dawa District shall be delivered in the First Phase together with other two bulldozers for the convenience of the delivery and initial training.

(2) Recommended specification of each equipment is shown in the following table.

Equipment	Major Specification
1. Bulldozer	200 HP, w/Ripper, Sun roof
2. Motor Grader	135 HP, 3.7m wide blade, w/Cab.
3. Wheel Loader	130 HP, Powershift, BKT not less than 2.0m^3, w/Cab.
4. Vibratory Roller	130 HP, 8 ton w/Sun roof
5. Dump Truck	275 HP, not less than 7m^3, Rear 2 axle 6W•4D
6. Asphalt Distributor	160 HP, Tank capacity 6,000L, 4W•2D
7. Water Truck	275 HP, Tank capacity 13,000L, 4W•2D
8. Station Wagon	140 HP, Gasoline, 4WD, SWB, Seating capacity 5-7
9. Pick-up Truck	80 HP, Gasoline, 4WD, W seat, 500kg load
10. Grease Unit	Skid mounted, w/4~6 barrels
11. Rock Crusher	Portable type w/Generator, 50 TPH capacity
12. Traxcavator	200 HP, Powershift, BKT not less than 2.0m^3, w/Cab.
13. Air Compressor	Portable type w/D. Engine, 17m3/min, 7.0kg/cm^2
14. Drill Wagon	4.5 ton, w/Air drill, Hydraulic boom
15. Blasting Machine	Firing tension 1,400V, w/Galvanometer
16. Tool Set	Heavy Duty, more than 278 pcs
17. Spare Parts	Quantities for approx. 2 years service

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CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Objective of Basic Design Study

Before the Transitional Government of Ethiopia was established in July 1991, the long-term civil war and frequent drought made the national economic infrastructure disrupted. While, the Transitional Government has established the Economic Recovery and Reconstruction Programme, and out of which precedes the Emergency Recovery and Reconstruction Project (ERRP). Among the ERRP, the project which is given a top priority is an improvement of the road networks across the country. By the implementation of this project, the Ethiopian Roads Authority (ERA) under the Ministry of Public Works and Urban Development (MPWUD) aims at rebuilding of the road maintenance management system, however the insuffiency of road maintenance equipment has seriously hampered the pregress of the Project.

Thus, the Transitional Government of Ethiopia has requested the Government of Japan to procure the road maintenance equipment under the grant aid which will be used for maintenance of national roads in Shashemene and Dire Dawa Districts directed by ERA.

1.2 Despatch of the Study Team

In response to the request from the Transitional Government of Ethiopia, the Government of Japan decided to conduct a basic design study. Accordingly, JICA sent to Ethiopia a study team headed by Mr. Noriaki Kumai, Deputy Director General, Construction Machinery Engineering Center, Hokkaido Development Bureau, Hokkaido Development Agency, from August 23 to September 11, and the Transitional Government of Ethiopia and JICA exchanged "Minutes of Discussions" (see Appendix-4). The Team had conducted the basic design study for clarifying the necessity of the Project and the required road maintenance equipment.

1.3 Content of Study

The Basic Design Study Team conducted the following studies with the close cooperation of ERA. (See Appendix 2)

(1) Confirmation of content of the Request

(2) Examination of significance and size of the Project

(3) Study of administration and management system for the Project equipment

(4) Examination of presently existing road maintenance equipment

(5) Examination of administration and management system of present garages

(6) Examination of administration and management system for present warehouses

(7) Study of training system relating to the road equipment

(8) Confirmation of Ethiopia's undertakings relating to the implementation of the Project

CHAPTER 2

BACKGROUND OF THE PROJECT

CHAPTER 2 BACKGROUND OF THE PROJECT

2.1 Outline of Ethiopia

2.1.1 Land and Population

Ethiopia is situated at East Africa and it is bordered on the west by Sudan, on the south Kenya, on the east Somalia, and on the north East Djibouti and Red Sea. The total area of the country is approximately 1,221,900 sq. km. (about 3.3 times that of Japan). One major geographical feature of Ethiopia is the Great Rift Valley which separates the Western Highlands and the South Eastern Highlands, and the highlands on each side give way to vast semi-arid low land areas in the east and west and especially in the south of the country. The western highlands are massive with average height of 2,000 ~ 2,500m. The escarpment becomes lower towards the west, but higher and steeper towards the Rift Valley in the east. The south-eastern highlands are generally structured of volcanic rocks, but where the rivers cut deep, crystalline rocks are exposed. The South Eastern Highlands have high mountain on their western rim, but no clear-cut boundary to the east.

The region by climatic types range from equatorial desert to hot and cool steppe, and from tropical savannah and rain forest to warm temperature and cool highland.

The climate is grouped into three types: (1) Dry climate, (2) Tropical rainy climate and (3) Temperate rainy climate.

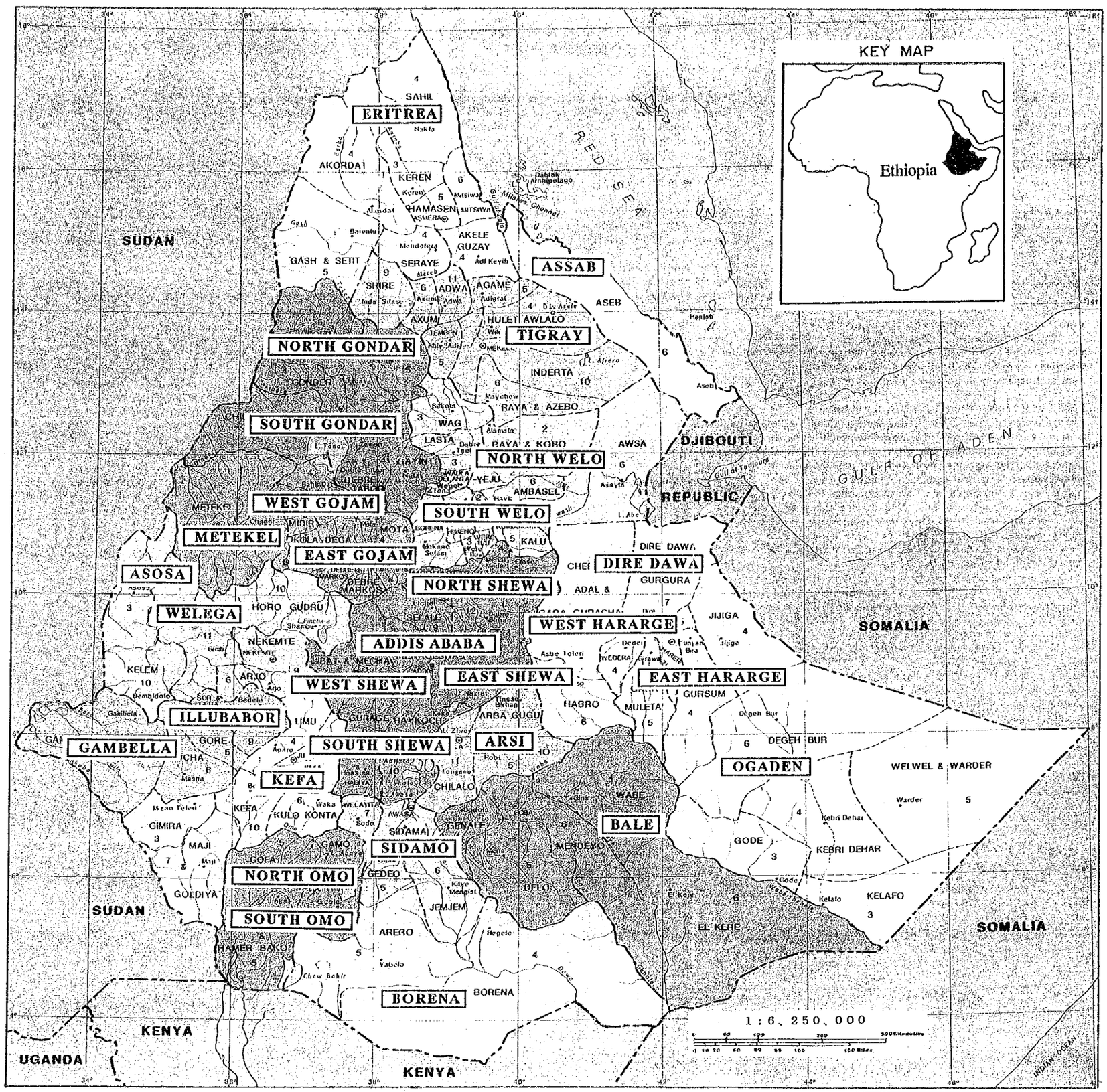
The climate in Addis Ababa is typical warm temperate climate which has distinct dry months in winter. The mean temperature of the coldest month is below 18°C, and for more than four months it has mean temperatures above 10°C. The annual rainfall is approximately 1,100 mm, and the rainfall of rainy season from July to September is approx. 600 mm.

The population of Ethiopia is estimated at 50.32 million (1989) and the average density is 41.2 per one sq. km. Ethiopia consists of 30 administrative regions. The Table 2.1.1 shows regional distribution of population in 1989.

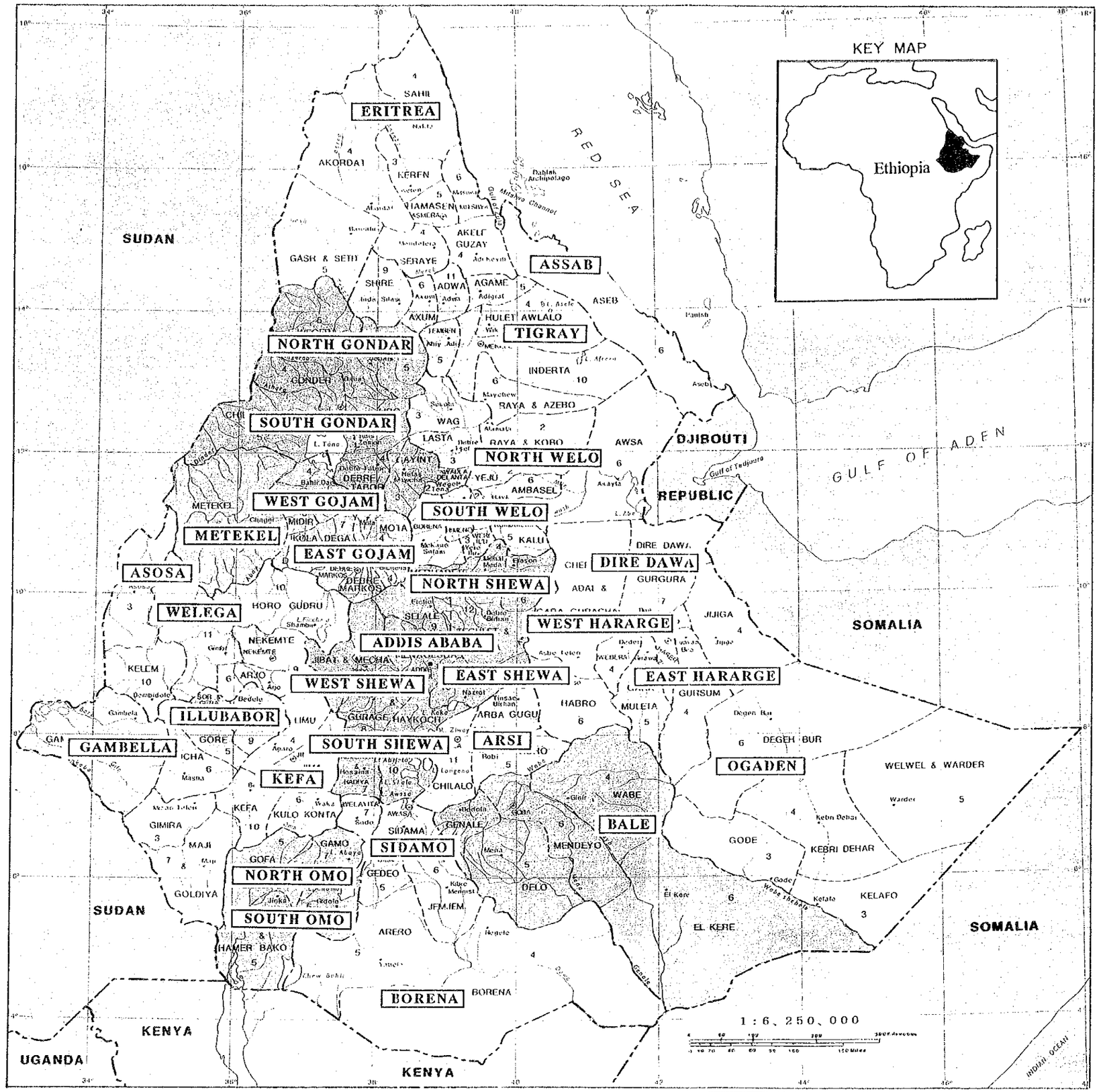
Table 2.1.1 Regional population

Code	Region	Population ('000)	Area (Km^2)	Population Density (persons/km^2)
01	Arsi	1,960	23,700	82.7
02	Aseb	450	40,200	11.1
03	Asosa	520	23,000	22.6
04	Bale	970	67,300	14.4
05	Borena	660	94,000	7.0
06	Dire Dawa	470	29,200	16.0
07	Eritrea	3,100	93,700	33.3
08	Gambella	180	26,000	6.8
09	East Gojam	1,540	14,000	110.8
10	West Gojam	2,010	17,300	116.1
11	North Gondar	1,850	62,000	29.8
12	South Gondar	1,700	17,000	99.5
13	East Hararge	2,520	90,600	27.9
14	West Hararge	1,350	33,200	40.6
15	Illubabor	2,830	35,000	80.8
16	Kefa	1,040	40,100	26.1
17	Metekel	380	30,500	12.4
18	Ogaden	830	179,300	4.6
19	North Omo	2,770	30,000	92.7
20	South Omo	240	22,000	11.1
21	North Shewa	2,320	5,200	448.9
22	East Shewa	920	12,800	72.2
23	Addis Ababa	2,670	23,200	115.0
24	West Shewa	2,940	17,000	175.0
25	South Shewa	2,340	27,000	86.4
26	Sidamo	2,710	21,000	130.4
27	Tigray	2,720	53,500	50.8
28	Welega	2,430	42,600	57.0
29	North Welo	1,470	30,800	47.7
30	South Welo	2,430	20,700	117.4
	Total	50,320	1,221,900	41.2

Source: Estimated on the data shown on Emergency Road Maintenance Project Report, (Nov. 1991)



ADMINISTRATIVE DIVISIONS



ADMINISTRATIVE DIVISIONS

2.1.2 Economy Situation

The Table 2.1.2 and 2.1.3 show the trend in GDP growth for three years, 1987 ~ 1989 by industrial origin, and the economic indicators.

Table 2.1.2 GDP by type of economic activity

Sector	1987 (Birr mn)	%	1988 (Birr mn)	%	1989 (Birr mn)	%
Agriculture	4,307.6	40.7	4,594.7	41.3	4,699.6	41.4
Agriculture	4,035.1	38.2	4,305.6	38.7	4,391.5	38.6
Forestry	264.1	2.5	280.2	2.5	298.7	2.6
Fishery & Hunting	8.4	0.1	8.9	0.1	9.4	0.1
Industry	1,854.9	17.5	1,900.0	17.1	1,877.4	16.5
Mining & Quarrying	14.3	0.1	14.5	0.1	15.9	0.1
Manufacturing & Handicrafts & Small Scale Ind.	879.5	8.3	898.8	8.1	880.7	7.8
	375.4	3.6	38.0	3.5	390.0	3.4
Construction	442.1	4.2	439.7	4.0	415.5	3.7
Electricity & Water	143.6	1.4	159.0	1.4	175.3	1.5
Distribution	1,799.0	17.0	1,895.5	17.0	1,876.5	16.5
Trade	1,080.2	10.2	1,119.8	10.1	1,098.3	9.7
Transport & Communications	718.8	6.8	775.7	7.0	778.2	6.8
Other Services	2,610.3	24.7	2,731.7	24.6	2,909.8	25.6
Banking & Insurance	430.3	4.1	411.7	3.7	400.1	3.5
Public Adm. & Defence	1,175.3	11.1	1,277.3	11.5	1,424.4	12.5
Housing	255.1	2.4	260.3	2.3	270.9	2.4
Education	366.4	3.5	386.8	3.5	404.8	3.6
Health	86.2	0.8	91.1	0.8	95.1	0.8
Domestic Services	73.1	0.7	73.9	0.7	74.6	0.7
Others	223.9	2.1	230.6	2.1	239.9	2.1
GDP at Current Current Factor Cost	10,571.8	100.0	11,121.9	100.0	11,363.3	100.0
Indirect Taxes, Net	1,279.1	-	1,291.6		1,221.4	
GDP at Current Market Prices	11,850.9	-	12,413.5		12,584.7	

Source: Ministry of Finance & Foreign Relation

Table 2.1.3 Economic indicators

Macroeconomic Indicators	1988	1989	1990
GDP at market prices (Birr bn.)	11.85	12.41	12.58
Real factor cost GDP growth (%)	1.9	1.6	-0.9
Consumer Price Inflation (%)	7.1	7.8	5.1
Population mn.	47.51	48.90	50.32
Exports FOB $ mn.	773.4	902.8	756.9
Import CIF $ mn.	2,274.6	2,110.4	1,824.1
Current account $ mn.	-1,163.7	-708.8	-637.0
Debt Service ratio (%)	43.5	41.9	-

Principal Export 1989	$ mn	Principal Imports 1989	$ mn
Coffee	195.8	Food & live animals	142.3
Hides & skins	64.4	Motor vehicles	279.8
		Machinery (incl. aircraft)	162.0
		Crude petroleum	84.7

Main destination (exports) 1989	% of total	Main origins of import 1989	% of total
West Germany	23.6	USSR	18.4
USA	14.8	Italy	13.3
Japan	10.9	West Germany	10.2
France	4.9	USA	5.4
Italy	6.8	UK	8.3

Source: Ministry of Finance & Foreign Relation

2.1.3 ERRP

The Economic Recovery and Reconstruction Programme, and within it the Emergency Recover and Reconstruction Project (ERRP) have three main areas:

(1) Production Component. Provision of inputs for (i) agriculture; and (ii) private and public sector industry, and construction; representing 45% of project cost.

(2) Social Sector Component. (i) Reconstruction of damaged facilities in education; (ii) reequipment of damaged health facilities and provision of pharmaceuticals and medical supplies; (iii) rehabilitation of social infrastructure and promotion of small-scale income generating activities at the community level on a pilot-scale in one food sufficient area including Addis Ababa, which has a high proportion of displaced people, and in one food deficit rural area with extensive war damage, including provision of assistance for reintegration of demobilized soldiers; and (iv) provision of structural food aid in urban areas, particularly Addis Ababa; representing 20% of project cost.

(3) Infrastructure Component (i) reconstruction of water supply, telecommunications and power facilities; (ii) rebuilding of transport capacity through emergency maintenance of roads, provision of trucks, spares and tires, railroad, buses, and civil aviation; (iii) provision of petroleum products for incremental transport needs; and (iv) provision of contract trucking as contingency to safeguard against large-scale transport bottlenecks; representing 35% of project cost.

The total costs of the Economic Recovery and Reconstruction Programme (the Programme) is estimated at US$657 million, with a foreign exchange component of US$605 million or 92%. The Program would be funded in parallel from (i) the proposed new IDA credit of US$150 million (23%); (ii) reallocations within the existing IDA portfolio of US$80.7 million (12%); (iii) cofinancing of US$375 million from donors (57%), including ADB, EEC, European Investment Bank (EIB), Germany, Japan, the Netherlands, Sweden, UNDP and USAID; and (iv) contributions from Government, equivalent to US$52 million.

ERRP consists of most prioritized components of the Programme and is shared with the cost of US$150 or 23% of the total cost. Of which the cost for rehabilitation of infrastructures, especially of existing roads is estimated at US$98 million and occupies 65% of the cost of ERRP.

2.2 Outline of the Transport Sector

2.2.1 Transport System

(1) Road network

In terms of surface standard, the classified road network in Ethiopia consists of 17,500 km of all weather roads, of which 3,600 km are paved, 7,900 km are graveled, and the balance 6,000 km are unsurfaced roads. With a total land area of 1.22 sq.km, this road network has one of the lowest density in Africa (14.3/1,000 sq.km). A large proportion of these roads was built in the 1930s and 1940s and it is remarkable that these roads have been able to serve the increasingly heavy traffic for such a long period. The functional road classification system divides the network into Primary (2,300 km), Feeder (9,200 km) and Rural Roads (6,000 km). "Rural Roads" refers to the lowest class of the classified network. In addition there are some 20,000 km non-classified rural roads - mainly farm-to-market roads.

There is in the present system some confusion between the classification of roads and the type/geometric standard of the road. A proper functional classification system will enable government to define responsibilities, maintenance standards and development strategies for the various classes of roads. The types of road should be defined in the Designed Manual and reflect the geometric design and the bearing capacity governed by the Average Daily Traffic (ADT) and the vehicle distribution.

Regular traffic surveys have been carried our since 1957. Counts are carried out by ERA at designated counting stations on a regular basis. Relatively high traffic volumes have been observed along most of the road sections radiating from the capital especially along the import/export corridor. The vehicle fleet (See Table 2.2.3) in 1989/91 amounted to 58,738 vehicles; that is about 1.17 vehicles per 1,000 people (the lowest in

Africa). Due to old age of the fleet and virtually no replacement, its size has been declining over the last five years.

The most trafficked road in the country is the Addis Ababa - Assab road with sections between Addis Ababa and Nazreth carrying over 2,864 vehicles per day (See Table 2.2.2). The unusually high proportion of heavy vehicles on the road between Addis Ababa and Assab on the Red Sea is due to the fact that about 85 percent of the total export/import trade is carried on this route. Between Mille and Assab the ADT is about 460 v.p.d. Here, truck-trailer combinations is significant and constitute about 60 percent of the ADT.

(2) Railway

An old railway supplements road capacity to the Red Sea, connecting Addis Ababa with Djibouti, about 150 km south of Assab. Jointly owned by Ethiopia and Djibouti, the Chemin de Fer Djibouti-Ethiopia (CDE) is operated under the provisions of a 1981 treaty. The some 780 km of meter gauge single line is characterized by sharp curves and low embankments. Rail capacity is limited by track conditions and managerial problems. Imports carried include fertilizer, iron and steel while exports include molasses, sugar and some containers of textiles, hides and skins. The CDE has been trying to improve operations with the help of a limited rehabilitation program financed by the EEC and France. Without additional investment and, more important, changes in the treaty that would permit better management, it is doubtful whether traffic on the rail route could increase much beyond the present level of 300,000 tons.

(3) Ports

Ethiopia is served by three major ports; Assab, Massawa and Djibouti. In the late 1980's approximately 85 percent of Ethiopia's foreign trade was handled by Assab, 8 percent by Massawa and 7 percent by Djibouti. The port of Assab and the main road inland to Addis Ababa, therefore, represents Ethiopia's most important outlet to the sea. By early 1989, when the construction of the tug berth was completed, Assab had seven berths available for commercial shipping with an annual capacity of about 1.6 million tons of dry cargo. To handle general traffic growth and drought relief cargo, major expansion of the port was assessed to have high

priority and African Development Bank (AfDB) was providing funds to construct two multipurpose berths which would increase capacity to about 3 million tons per year. The berths were expected to be completed in late 1992.

The Ethiopian Parastatal, Marine Transport Authority (MTA), used to be responsible for the operation, management and development of Assab and Massawa. MTA was well managed and operated with considerable administrative autonomy. The port of Assab is now managed by an Eritrean parastatal, created after the de facto separation of Eritrea. A port agreement has been made between the Provisional and Transitional Governments. The Transitional Government has organized a major effort to clear the back log of cargo from the Port and congestion has been substantially reduced. Port capacity at Assab remains, however, a weak link in Ethiopia's international transport network.

(4) Inland Waterways

There are three lakes and two navigable rivers, therefore, some minor inland water transport supplements road and rail transport in the country but tonnage carried by water is relatively insignificant.

(5) Air Transport

Air transport is fairly well-developed and the best performing transport mode. Ethiopian Airlines and a number of foreign carriers serve two of the international airports (Addis Ababa and Dire Dawa) and Ethiopian Airlines also provides an extensive domestic service. Management of the airports and airfirelds is undertaken by the Civil Aviation Authority, under the control of Ministry of Transport & Communication (MOTAC). Ethiopian Airlines, a parastatal company under MOTAC, has been in service for over 40 years, provides scheduled services to about twenty countries and is currently in the process of expanding, particularly in freight operations.

Table 2.2.2 ADT and Traffic composition on main roads - 1990

Road Section	ADT 1990	Length kms.	Surface Type	Traffic Composition (%) Cars	Buses	Trucks	T/T
Addis-Nazareth	2,864	98	A	34	18	33	15
Diredawa-Harar (**)	991	51	A	50	19	26	5
Mojo-Awassa (*)	830	200	A	26	22	43	9
Awash-Dengego (**)	274	267	A/G	22	17	39	22
Nazareth-Assela	442	77	A	35	30	31	4
Addis-D/Markos	320	299	A	24	20	43	13
Awassa-Yabello (*)	276	290	A	16	18	61	5
Hazareth-Awash	659	125	A	15	9	26	50
Ghioh-Jimma	326	230	A	30	18	47	14
Addis-Ghion	702	116	A	32	29	35	4
Addis-Ambo	574	126	A	34	21	37	8
D/Markos-B/Dar	175	264	G	21	18	47	14
Combolcha-Dessie	738	25	A	40	15	37	8
Awash-Mille (**)	446	308	A	8	4	22	66
Mille-Assab	460	368	A	7	2	32	59
D/Barhan-Combolcha	217	246	A	29	19	43	9
Addis-D/Berhan	354	130	A	32	30	32	6
Azezo-Gondar	446	15	A	44	12	43	1
Ambo-Ghimbi	351	319	A/G	37	14	38	11
B/Dar-Azezo	177	160	G	27	13	52	8
Alemgena-Hossaina	202	232	G	29	25	40	6
Jijiga-D/Habur	781	171	G	21	4	56	19
Jimma-Agaro	238	44	A	37	13	47	3
Combolcha-Mille	177	138	A/G	18	15	44	23
Harar-Jijiga (**)	509	103	G	20	13	56	11
Shashemene-Dodola(*)	157	78	G	11	26	53	10
Shashemane-Sodo (*)	240	130	A/G	22	20	51	7
Assela-Dodola (*)	141	120	G	13	26	57	4
Hossaina-Sodo (*)	151	98	G	26	19	46	9
Sodo-Arbaminch (*)	184	122	G	23	15	55	7

Note: 1) Roads marked (*) is situated in Shashemene District, and those marked (**) in dire Dawa District.
2) T/T means Trailer trucks.

Table 2.2.3 Vehicle Fleet

Type of Vehicles	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91
1. Passenger cars	37,969	29,649	28,329	27,357	28,952	28,004
2. Land Rovers	-	9,401	10,020	8,364	8,438	8,811
3. Taxi	4,307	3,454	3,530	2,582	1,104	984
4. Small Buses	3,507	2,948	3,027	2,796	3,570	5,275
5. Large Buses	1,071	1,114	1,080	1,075	890	724
6. Mini Truck (up to 7t)	7,151	4,501	5,314	5,129	5,036	6,717
7. Trucks (7-14t)	6,843	5,226	6,192	5,284	2,956	4,733
8. Trailer	2,475	1,338	1,745	1,766	1,413	1,529
9. Truck-tractor	-	958	783	763	692	584
10. Semi-trailer	-	958	701	803	522	228
11. Tanker (liquid)	879	972	1,128	836	855	715
12. Trailers (liquid)	624	401	431	461	474	366
13. Semi-trailer (liquid)	-	64	67	21	83	68
Total	64,826	60,984	62,347	57,237	55,985	58,738

Source: Ministry of Transport and Communications, 1990

2.2.2 Present Condition of Roads

All weather roads in Ethiopia consist of about 11,500 km of main roads which are paved by asphalts or gravels, and 6,000 km of rural roads which are remained as unpaved (earthen). The Project roads are out of the main roads across the country which are entirely managed by Ethiopian Roads Authority (ERA) in the process of planning, construction and maintenance.

Table 2.2.4 shows the length of roads of each District of ERA by type of pavement. (Table 2.2.5 shows the details of the road sections of each District). According to the data, about 3,600 km or 31.5% of the total main roads is asphalted, and remaining 7,900 km or 68.5% is of gravel. Alemgena District has the longest maintenance extension totalling some 3,160 km or 27.4% of the total, the second Shashemene District some 1,750 km, 15.2% and the third Dire Dawa, some 1,630 km, 4.1%.

As most of these roads were built in 1930s, they have been aged and furthermore, they have not received sufficient maintenance services for almost two decades, they have stood in seriously deteriorated condition. According to the survey of Emergency Road Maintenance Project by ERA, 73% of the roads surveyed (2,600 km) are damaged and need rehabilitation, and 27% are acceptable but need routine and periodic maintenance. Generally, these roads are all failed or will become soon failed if maintenances be further neglected. Thus, a specified urgent maintenance or rehabilitation shall apply for the roads. The Transitional Government keenly recognizes critical conditions and puts one of the highest priority on maintaining and rehabilitating the existing roads.

Table 2.2.4 Main Roads controlled by ERA

(Unit: Km)

No.	District	Asphalt	Gravel	Total
1.	Alemgena	1,246	1,917	3,163
2.	Gondar	15	681	696
3.	Combolcha	697	424	1,121
4.	Adigrat	153	502	655
5.	Debre Markos	96	927	1,023
6.	Dire Dawa	391	1,239	1,630
7.	Shashemene	682	1,065	1,747
8.	Jimma	353	1,136	1,489
	Total	3,633	7,891	11,524

Source: Interviews with ERA, 1992

Table 2.2.5 Main Road Inventory by Road Districts of ERA

Section Code No.	Name of Sections	Type of Road (km) Asphalt Road	Gravel Road	Total
1. Alemgena District				
111	Modjo	354	-	354
121	Hosana	-	189	189
122	Butajira	-	233	233
123	Wolekitie	-	232	232
131	Giyon	178	-	178
132	Ambo	184	75	259
133	Chancho (Sheno section)	146	26	172
134	Gebre Gurach	140	6	146
141	Bako	-	139	139
142	Gida Ayaha	-	75	75
143	Gimbi	-	129	129
144	Mendi	-	120	120
145	Asosa	-	132	132
146	Alem Teferi	-	138	138
147	Dembi Dolo	-	155	155
151	Debre Berehan	91	129	220
152	Shewa Robit	153	3	156
153	Molale	-	136	136
	Total	1,246	1,917	3,163
2. Gonder District				
311	Azeze	15	135	150
312	Dabat	-	156	156
313	Adiarkay	-	120	120
321	Addis Zemen	-	136	136
322	Debre Tabor	-	134	134
	Total	15	681	696

Table 2.2.5 (continued)

Section Code No.	Name of Sections	Type of Road (km) Asphalt Road	Gravel Road	Total
3. Conbolchia District				
411	Combolcha	171	53	224
412	Woldiya	92	95	187
421	Logiya	152	91	243
422	Assab	148	16	164
423	Ellidar	134	7	141
424	Sanka	-	162	162
	Total	697	424	1,121
4. Adigrat District				
511	Mekele (Wukro)	153	74	222
512	Michew	-	141	141
513	Adiabun	-	149	149
514	Inaselasie (Shire)	-	143	143
	Total	153	502	655
5. Debre Markos District				
611	Chemoga	96	60	156
612	Debre Work	-	134	134
613	Burie	-	128	128
614	Adiet	-	140	140
615	Dangela	-	128	128
616	Chagni	-	142	142
617	Mankushi	-	195	195
	Total	96	927	1,023
6. Dire Dawa District				
711	Dire Dawa (Dengego)	82	56	138
712	Hirna	-	140	140
713	Gelemso	-	132	132
721	Awash	309	77	386
731	Jijiga	-	110	110
732	Degehabure	-	191	191
733	Kebridehar	-	360	360
734	Godie	-	173	173
	Total	391	1,239	1,630

Table 2.2.5 (continued)

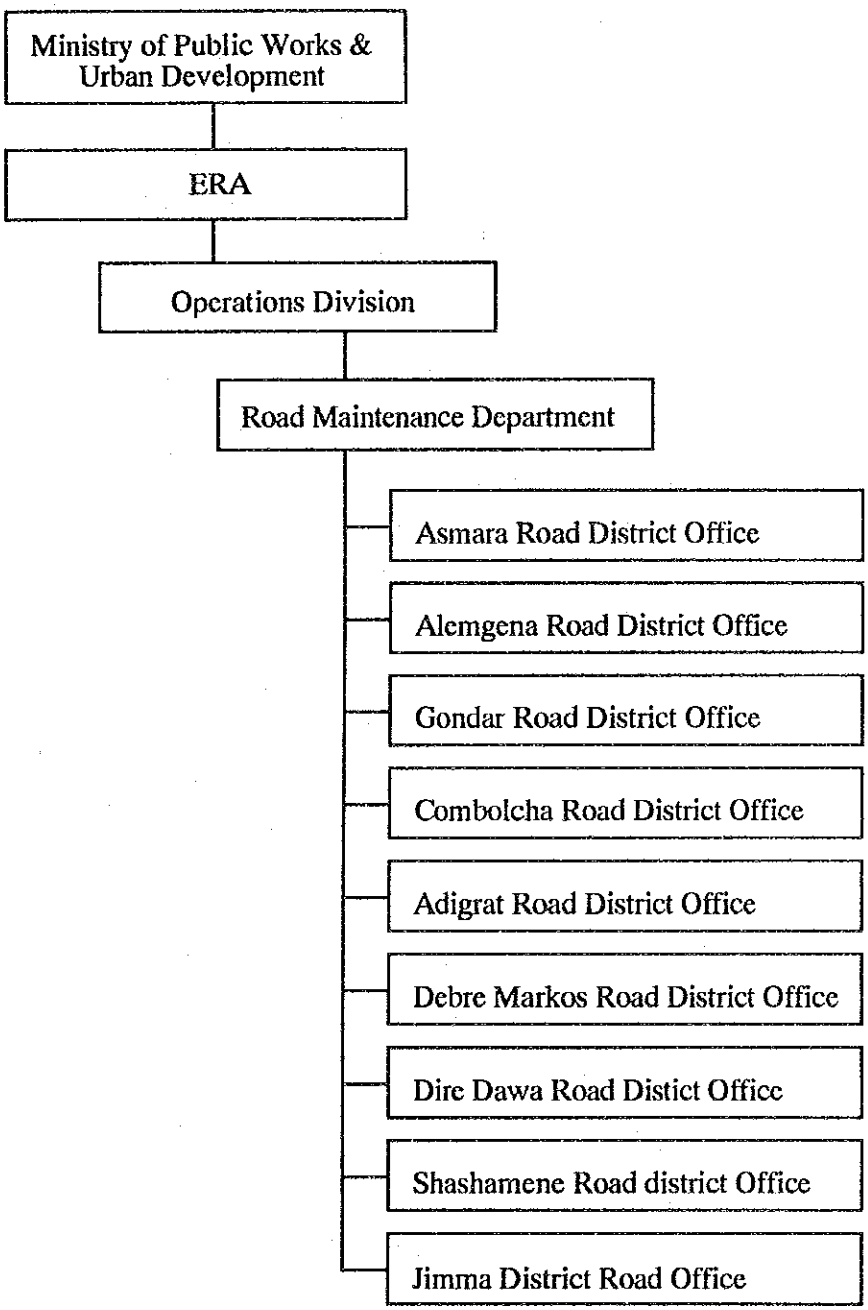
Section Code No.	Name of Sections	Type of Road (km) Asphalt Road	Gravel Road	Total
7. Shashemene District				
821	Wondo	94	110	204
813	Kibre Mengist	-	121	121
814	Shashemene	173	59	232
815	Negele	-	86	86
821	Fesehagenet	208	5	213
822	Mega	207	7	214
831	Bekoji	-	143	143
832	Goba (Robe)	-	64	64
833	Dodela	-	141	141
841	Sodo (Wolayita)	-	175	175
842	Arbaminch	-	56	56
843	Sodo (Bulki)	-	132	132
	Total	682	1,065	1,747
8. Jimma District				
911	Jimma	-	172	172
912	Asendabo	234	14	248
913	Bonga	-	220	220
914	Tepi	-	217	217
915	Meteso	-	86	86
921	Bedele	119	34	153
922	Arjo	-	93	93
923	Metu	-	138	138
924	Gambela	-	163	163
	Total	353	1,136	1,489

Source: Intefviews with ERA, 1992

2.2.3 Outline of Road Maintenance Equipment

(1) Organization of equipment management

The road maintenance equipment for the main roads is managed under the responsibility of ERA as simply diagrammed below.



As shown in the figure the Operations Division is responsible for the maintenance of the main roads and controls 9 Road District Offices. Each District Office possesses and manages the construction equipment required for the road maintenance operation.

(2) Current condition of road maintenance equipment

Following analyses are made on the existing road maintenance equipment on the basis of the data obtained through the study in Ethiopia.

(a) Actual situation

The following table shows a situation of the existing equipment owned by ERA.

Only 40% of the total unit in present possession of ERA are actually operating at sites. The maintenance of 11,500 km of main roads is carried out only with those scarce equipment. In order to attain the goal, there is urgent need to provide new replacement to the existing fleet of the equipment.

No.	Condition	Quantity	%
1.	Operating	1,037	40.0
2.	Under repair	593	22.9
3.	Scrap	961	37.1
	Total	2,591	100

(b) Classification by years of possession

The next table below gives the distribution of the existing equipment by year of possession.

Out of the total operable quantity, 672 units or 64.8% are under 10 years, while 365units or 35.2% are more than 10 years. This means that fairly old equipment is fairly well used, but an efficient work will not be expected because of the aged functions of equipment.

Mainly due to the difficulty in securing a budget for the replacement of equipment, ERA has been obliged to use older equipment by provisional repairs.

Period of Possession	Total Quantity	%	Operable Quantity	%
Under 5 years	703	(27.1)	373	(36.0)
6 - 10	522	(20.1)	299	(28.8)
11 - 15	805	(31.1)	260	(25.1)
16 - 20	371	(14.3)	87	(8.4)
Over 21 years	190	(7.4)	18	(1.7)
Total	2,591	(100.0)	1,037	(100.0)

(c) Equipment under repair or waiting for repair

Existing equipment required for repair work is classified by degree of repair as follows:

Required Maintenance	Quantity	%
Light Maintenance	99	16.7
Medium Maintenance	194	32.7
Heavy maintenance	299	50.6
Total	592	100.0

In the table, classification of equipment maintenance degree is defined as follows:

- Light : Replacement of parts brings the machine to operable condition
- Medium : Replacement of parts which requires disassembling, or renovation of parts brings the machine to operable.
- Heavy : Total rehabilitation of machine is needed to bring the machine to operable.

Equipment maintenance required for existing equipment is analized by the years of use is given below.

Number of year of use		Light		Medium		Heavy	
		Quantity	%	Quantity	%	Quantity	%
Under	5	27	27.3	54	27.8	62	20.7
	6 - 10	28	28.3	32	16.5	70	23.4
	11 - 15	34	34.3	78	40.2	142	47.5
	16 - 20	9	9.1	28	14.6	12	7.7
Over	21	1	1.0	2	1.0	2	0.7
Total		99	100.0	194	100.0	299	100.0

Out of old machines which requires maintenance/repair, it is judged that 49.5% of light and medium maintenance cases of 293 units can be brought back to operable condition if sufficient spare parts be supplied.

Considering the capacity of the existing Central Garage (analized hereinafter), part of the remaining heavy maintenance cases (229 units) can be provisionally rehabilitated if heavy budget be prepared with ERA. Most of them can be solved with the budget of ERA.

(d) Categorization of equipment possessed by ERA

The next table classifies all the equipment possessed by ERA.

It seems the numbers of specified equipment such as Motor Grader, Wheel Loader, Roller, Asphalt tank and Kettle are relatively too small.

It is recommended t strengthen the capacity of wheel type equipment.

Classification of equipment

	Category	Total Quantity		Operable Quantity	
No.	Equipment	Quantity	%	Quantity	%
1.	Dump Truck	750	28.9	273	26.3
2.	Bulldozer	301	11.6	106	0.2
3.	Motorgrader	337	13.0	99	9.3
4.	Wheel Loader	215	8.4	76	7.3
5.	Roller	180	6.9	56	5.4
6.	Equipment of Asphalt	44	1.7	21	2.0
7.	Compressor	59	2.3	47	4.5
8.	Generator	67	2.6	36	3.5
9.	FW Truck	157	6.1	95	9.2
10.	Transport Truck	176	6.8	106	10.2
11.	Excavator	17	0.7	10	1.0
12.	T.T. Lowbed	52	2.0	21	2.0
13.	Crane	11	0.4	18	0.8
14.	Rock Crusher	65	2.5	45	4.3
15.	Screen	19	0.7	-	-
16.	Others	141	5.4	38	3.7
	Total	2,591	100.0	1,037	100.0

(e) Classification of manufacturer of equipment

The table below shows the number of units classified by equipment manufacturers.

There are nine main (9) manufacturers who have supplied equipment to ERA. It seems more desirable to standardize the vehicles to the less possible manufacturers for the effective logistics, management, operation and maintenance, of equipment as well as control of spare parts and material.

No.	Manufacturer	Quantity	%
1.	Nissan	298	28.7
2.	Komatsu	119	11.5
3.	CAT	110	10.6
4.	Mitsubishi	61	5.9
5.	Volvo	43	4.2
6.	Hino	49	4.7
7.	M. Benz	34	3.3
8.	Sucania	34	3.3
9.	Kama	32	3.1
10.	Others	257	24.7
	Total	1,037	100.0

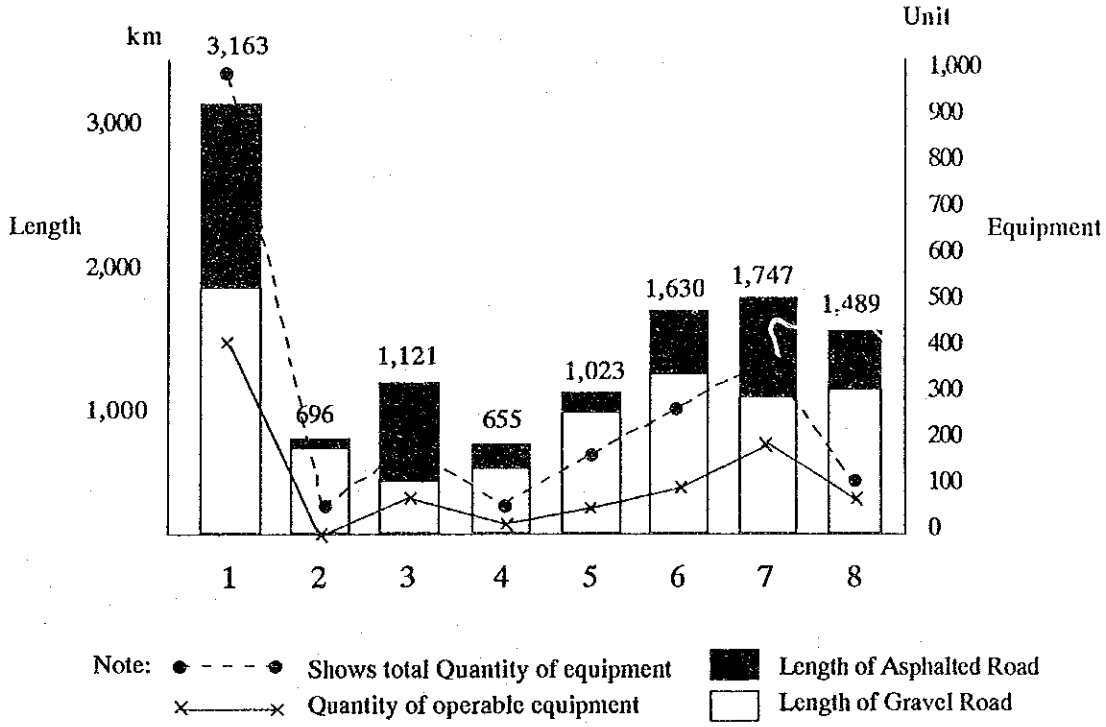
(f) Local agent

The following table shows the local agents of Japanese manufacturers.

Ethiopian Agents	Japanese manufacturers
MOENCO (English)	Komatsu, Toyota, Koyo Kikai
Nyala Motors	Nissan Diesel, Kubota, Tadano, Nissan, Sakai
Ethio-Nippon	Mitsubishi Auto.
Riess Engineer (French)	Mitsubishi
Ethio Amalgamated	Hino, Kato
Michel Cott	Isuzu

(g) Distribution of equipment by Road District of ERA

The local distribution of equipment is shown in Fig. 2.2.15.



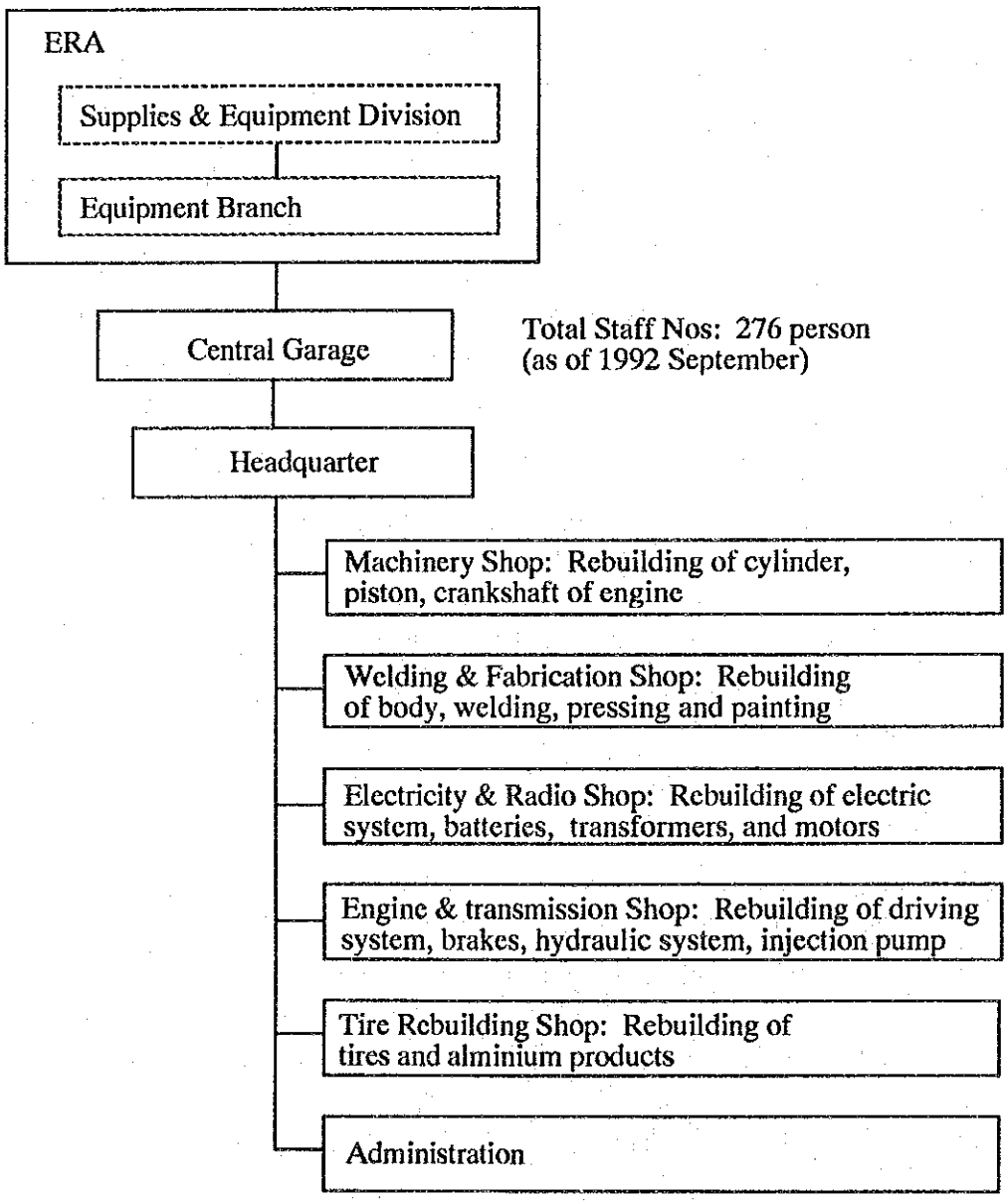
No.	District	Asphalted Road (km)	Gravel Road (km)	Length (km)	Equipment Q'ty Total	(Operable)
0	ASMARA	-	-	-	-	
1	ALEMGENA	1,246	1,917	3,163	953	(390)
2	GONDAR	15	681	696	69	(3)
3	CONBOLCHIA	697	424	1,121	181	(69)
4	ADIGRAT	153	502	655	53	(14)
5	DEBRE MARKOS	96	927	1,023	160	(44)
6	DIRE DAWA	391	1,139	1,630	243	(77)
7	SHASHEMENE	682	1,065	1,747	355	(166)
8	JIMMA	353	1,136	1,489	87	(45)
	TOTAL	3,633	7,891	11,524	2,101	(808) (38.5%)

Fig. 2.2.15 Road Length and Quantity of Equipment by Road Districts of ERA

(3) Situation of the Central Garage of ERA

The Central Garage was founded as a factory for rebuilding of components and limited heavy maintenance service for ERA equipment, and has relatively various installations to cope with routine requests from the Road District Offices and separate project offices. It is managed by the staff and mechanics who have generally received training at the Alemgena Training Center.

Fig. 2.2.16 Organization of Central Garage



The Central Garage divided into six division includes 5 shops of (a) Machinery, (b) Welding, Fabrication & Building Carpenter, (c) Electricity & Radio (d)Engine & Transmission, (e) Tire & Rebuilding and (f) Administration section.

The service capacity of each shop and section is shown below.

Machinery Shop	Installation:	Old machine tool made in China, Checoslovakiya, Italy, USA and Germany
	Ability:	Able to rebuild all engine components using the measurement ability.
Welding, Fabrication & Building Carpenter Shop	Installation:	Old type machine:- Drill, Press, cutter, etc. made in China, Germany with age of 15 years or more.
	Ability:	Competent ability of manufacturing.
Electricity & Radio Shop	Installation:	Equipment with universal electric testers of old U.S. model, but broken.
	Ability:	Sufficient working knowledge of motors and electric parts.
Engine & Transmission Shop	Installation:	Insufficient tool sets. Equipped with an old type injection pump tester.
	Ability:	Have good working knowledge concerning the production, and carry out the rebuilding of torque converter and the adjusting of bearing and gear.
Tire & Rebuilding Shop	Installation:	Relatively new machine for tyre rebuilding equipped.
	Ability:	Have good knowledge of works and products of tyres.
Administration Section	Installation:	Old type office
	Ability:	Managerial offices have full knowledge of management and procedures. The management system is well established.

As described in detail, the Central Garage carry out basic equipment repair works fairly well, although installations are generally old and require the some supplementary facilities.

(4) Central Warehouse of ERA

The Central Warehouse consists of: storehouse of consumable supplies for construction equipment, spare parts for vehicles, parts for production plant, spare parts for construction heavy equipment, stocks of scrapped component, and administration office.

The Central Warehouse is well managed by management staff and storekeepers who have been given training at Alemgena Training Center subject to Management Warehouse System.

The management of warehouse is well appreciated, and most of daily routine job for receiving and delivery is manually carried out. While, the Central Warehouse lacks, at present time, up-to-date information on new machine and spare parts. Fairly old microfiche of spare parts are being used by the procurement section as follows.

	Manufacturer	Microfiche-Model Year
1.	Komatsu, Cummins	1979 ~ 1981
2.	CAT	1972 ~ 1981
3.	Nissan	~ 1972
4.	Toyota	1981
5.	Volvo	1981 ~ 1983
6.	M. Benz	~ 1979
7.	Fiat	1982

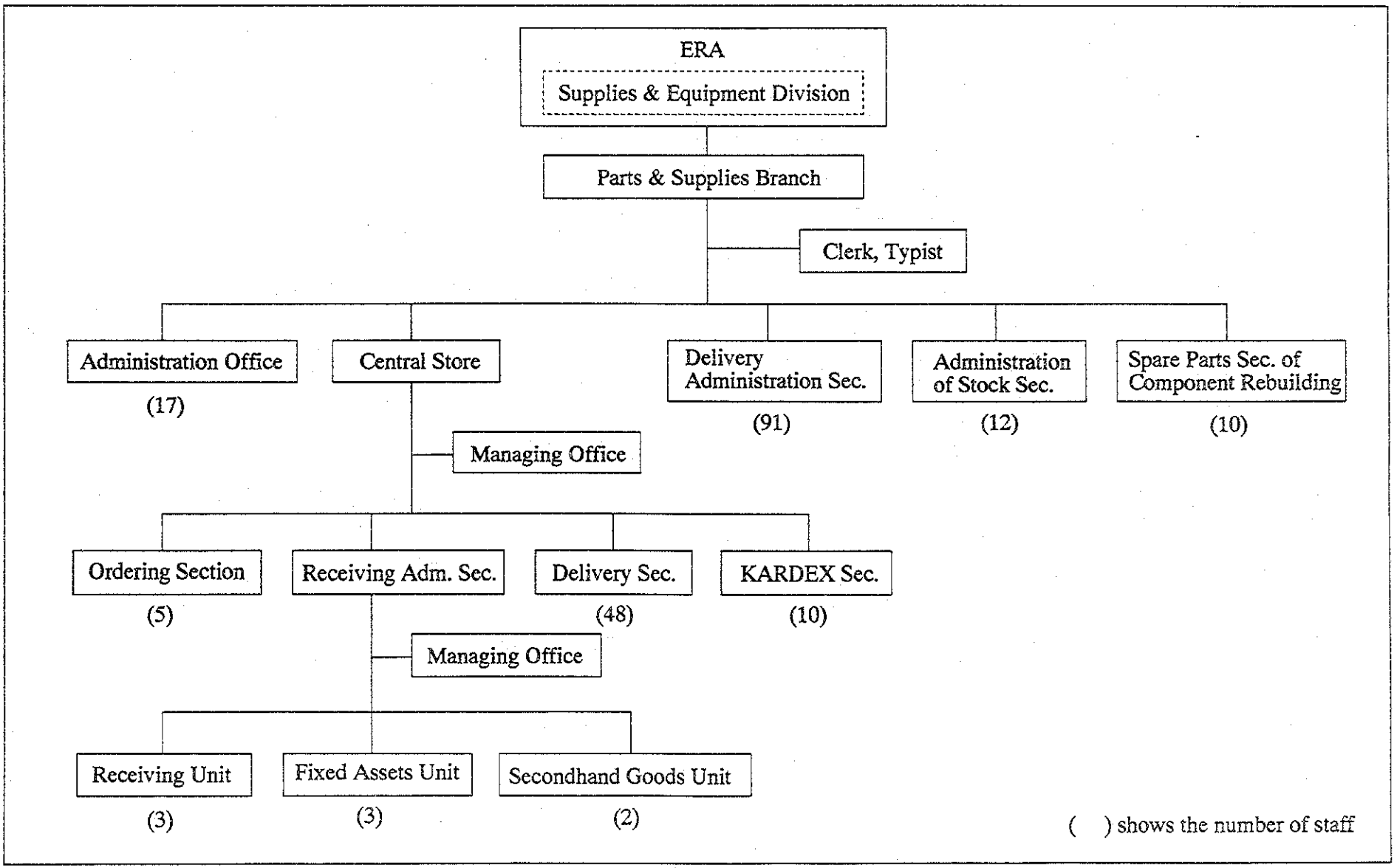


Fig. 2.2.18 Organization Chart of Central Warehouse

2.2.4 Training on Maintenance Equipment

ERA establishes Alemgena Training Center within the compound of Alemgena Road district Office. The Training Center have 35 instructors who provide training to new annual trainees and give in-service training to old trainees as follows:

Applicants	Training course	Description
1. Mechanic	Theory:	Instruction on structure, power transmission, and operation system using cut model of machine.
	Practice:	Training on writing of daily, weekly and annual report, practicing of assembling and disassembling of machine.
2. Electrics	Theory:	Instruction of electric work knowledge using a dummy installation, model and slides.
	Practice:	Training on rebuilding, disassembling and rehabilitation of electrical parts, practice of writing reports for information
3. Operator	Theory:	Instruction of general operation knowledge using models for mastering mechanisms and systems for preventive maintenance: before, in and after of operation.
	Practice:	Training on operation fundamentals and checking of equipment condition: Bulldozer, Grader, Dump Truck and Roller
4. Officer	Theory:	Instruction on Managing System and format of document and reports, accounting reports.
	Practice:	Practicing documents and reports writing in ERA form.

After finishing the training course of this center, they are generally promoted to new positions with new evaluated salary. This training system seems to be very supportable to the activative organization of ERA.

2.2.5 Present Situation of Roads and Equipment in the Project Area

(1) Road Maintenance of Shashemene and Dire Dawa Road Districts

The Table 2.2.21 shows the recent actual operations of road maintenance in both Shashemene and Dire Dawa Districts.

Table 2.2.21 Road Maintenance Operations in Project Districts

Code No.	Road maintenance Activity	Unit	Shashemene		Dire Dawa	
			1989/90	1990/91	1989/90	1990/91
11	Asphalt Patching	M	71,852	49,371	112,008	154,214
12	Base Failure Repair	M	-	-	-	-
13	Blading Gravel Road	km	5,088	2,362	6,941	15,336
14	Spot Repair Gravel Road	M	23,765	17,026	27,909	31,933
21	Culvent cleaning	No.	566	418	201	199
22	Ditch cleaning (Hand)	M	215,710	151,325	92,244	133,434
23	Ditch Cleaning (Machine)	M	465,934	263,700	268,025	714,900
31	Shoulder blading	km	-	-	411	164
32	Brush clearing	M	906,139	494,988	399,240	685,514
40	Betterment	M•H	138,029	4,399	9,866	8,012
41	Base Preparation	M	-	-	6,050	1,259
42	Surface Treatment	km	-	-	-	-
43	Plant Mix Overlay	M	-	-	-	-
44	Road Mix Overlay	M	900	-	-	-
45	Gravel Resurfacing	M	282,027	114,765	275,604	415,670
46	Shoulder Rehabilitation	M	-	-	-	-
47	Concrete Masonry Construction	km	-	-	-	-
48	Double Surface Treatment	No.	-	-	-	-
49	Camp Improvements	km	76,760	172,627	29,000	22,316
51	Dry/Mortar Masosnry Repair	M•H	11	14	106	1,678
53	Sign/Marker Maintenance	No.	56	380	126	637
54	Emergency Repair	No.	447	55	8,753	1,901
55	Other Routine Maintenance	M•H	48,736	44,326	322	666
61	Plant Mix Production	M•H	-	-	-	-
62	Crushing	ton	27,280	7,734	-	-
63	Select Material Production	M	40,587	24,628	131,424	265,240
64	Masonry Stone Production	M	5,362	2,643	13,085	7,426
91	Equipment Deadline Repair	H	65,063	-	12,558	-
92	Work for Others	H	81,792	-	-	-
93	Stand-by/Time	H	22,195	-	2,802	-

(2) Equipment Condition in Shashemene and Dire Dawa Road Districts

Following two tables give the inventory data of equipment deployed to Shashemene and Dire Dawa Road Districts. The operating rate of the equipment is fairly low even with old type equipment which is used and maintained very carefully for fairly long time.

Operating Conditions	Shashemene		Dire Dawa	
	Quantity	%	Quantity	%
Operable	105	60.7	45	61.6
Under Repair	-	-	16	21.9
Scraps	67	39.3	12	16.5
Not verified	-	-	-	-
Total	173	100.0	73	100.0

Model Year	Shashemene				Dire Dawa			
	Quantity		%		Quantity		%	
1985 ~	43	(41)	24.9	(39.1)	13	(10)	17.8	(22.2)
1984 ~ 1980	31	(16)	18.0	(15.2)	2	(1)	2.7	(2.2)
1979 ~ 1975	62	(31)	35.8	(29.5)	25	(11)	34.2	(24.4)
1974 ~1970	22	(9)	12.7	(8.6)	5	(2)	6.9	(4.4)
1969 ~	10	(4)	5.8	(3.8)	5	(3)	6.9	(6.7)
Not verified	5	(4)	2.8	(3.8)	23	(18)	31.5	(40.0)
Total	173	(105)	100.0	(100.0)	73	(45)	100.0	(100.0)

( ) : for the operable equipment.

The following table shows ratio of operable equipment for total ones by the model year of both districts.

Model Year	Shashemene			Dire Dawa		
	Total	Operable	Operable/ Total %	Total	Operating	Operable/ Total %
1985~	43	41	95.3	13	10	76.9
1984~1980	31	16	51.6	2	1	50.0
1979~1975	62	31	50.5	25	11	44.0
1974~1970	22	9	40.9	5	2	40.5
~1969	10	4	40.0	5	3	60.0
Not verified	5	4	80.0	23	18	78.2
Total	173	105	60.7	73	45	61.6

Out of the equipment manufactured in 1960s, 40% of the equipment remain in operable condition in Shashemene and 60% in Dire Dawa District.
In the case of the equipment procured 15 years ago the percentage of the equipment operable is 51% and 44% respectively in Shashemene and Dire Dawa District. The resultant maintenance capability of equipment may be judged by the figures.

The following table shows the quantity of operable equipment corresponding to which will be strengthened under the Project.

Equipment	Shashemene		Dire Dawa	
	Equipment Operable	Equipment Inventrizcd	Equipment Operable	Equipment Inventrized
1. Buildozer	5	(7)	4	(8)
2. Motor Grader	10	(17)	9	(13)
3. Wheel Loader	7	(11)	4	(8)
4. Vibratory Roller	5	(10)	2	(2)
5. Dump Truck	25	(36)	18	(26)
6. Asphalt Distributor	2	(2)	-	(-)
7. Water Tank Truck	4	(6)	-	(-)
8. Station Wagon	2	(5)	2	(7)
9. Pick-up Truck,	-	(-)	1	(1)
10. Grease Unit	-	(2)	-	(-)
11. rock Crusher	4	(8)	-	(-)
12. Traxcavator	2	(3)	-	(-)
13. Air Compressor	2	(4)	-	(-)
14. Wagon Drill	1	(1)	-	(-)
15. Blasting Machine	-	(1)	-	(-)
Total	71	(112)	40	(65)

2.3 Maintenance and Rehabilitation of Existing Main Roads

Ethiopia is now proceeding the Emergency Recovery and Reconstruction Projects (ERRP) among which one of the most important and prioritized project is the emergency rehabilitation of the existing main roads. All activities related to construction, maintenance rehabilitation, procurement of road equipment, technical training are responsibilities of the ERA under the Ministry of Public Works and Urban Development (MPWUD). The main roads are administered by 9 Road District Offices under the control of Operations Division of ERA.

2.3.1 Organization of MPWUD and ERA

The Transitional Government consists of 19 ministries, 6 commissions, 6 authorities, 2 institutes, one agency and one bank.
The major ministries other than MPWUD includes:

- Ministry of External Economic cooperation
- Ministry of Foreign Affairs
- Ministry of Finance
- Ministry of Justice
- Ministry of Agriculture, Environmental Protection and Protection
- Ministry of State Farm, Coffee and Tea Development

The MPWUD is organized as shown in Figure 2.3.1. The organization of ERA is also given in Figure 2.3.2 and the Figure 2.3.3 shows the typical organization and members of the Road District Office under the control of ERA.

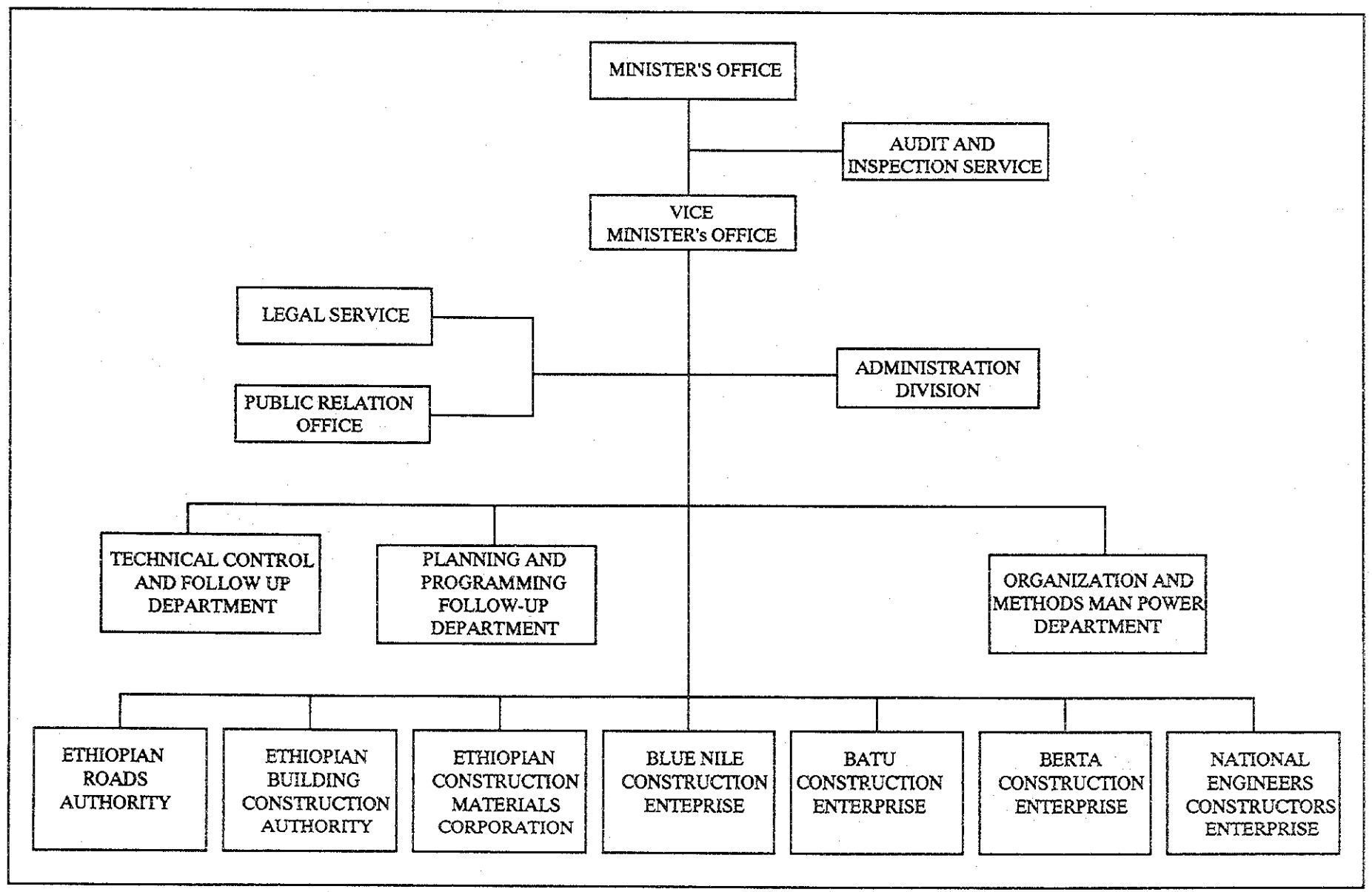
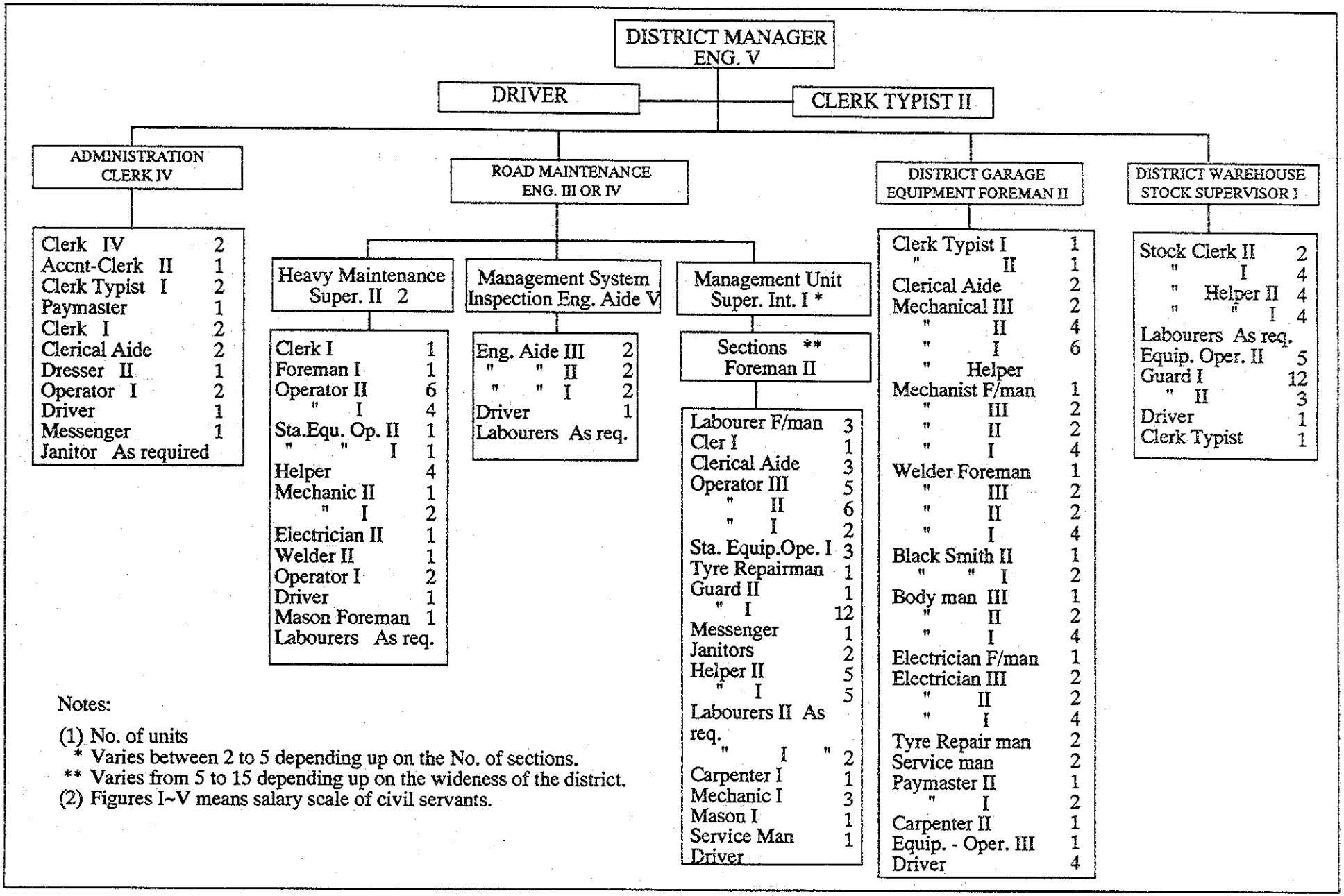


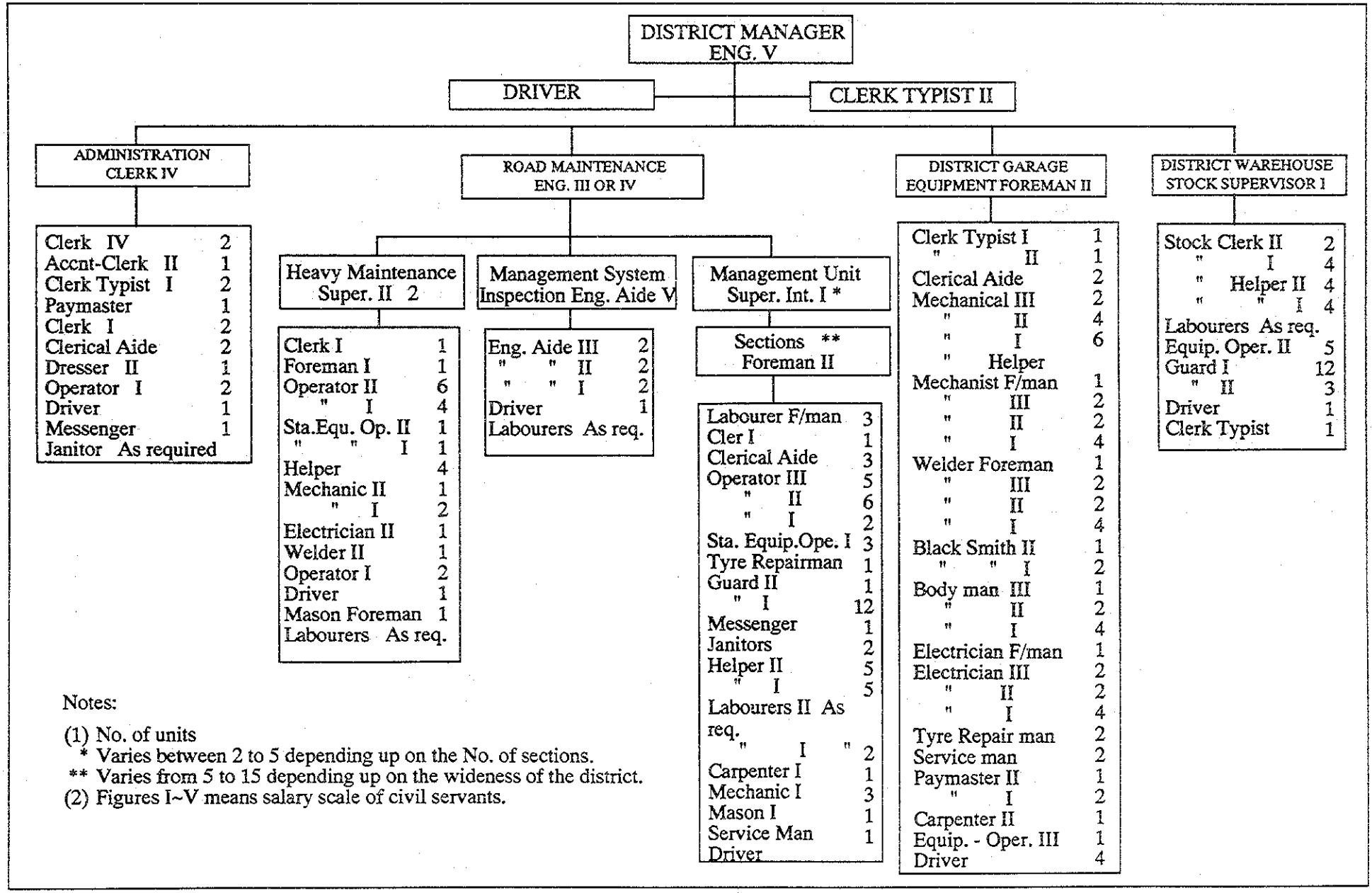
Fig. 2.3.1 Organization Chart of Ministry of Public Works and Urban Development



Notes:

(1) No. of units
* Varies between 2 to 5 depending up on the No. of sections.
** Varies from 5 to 15 depending up on the wideness of the district.
(2) Figures I~V means salary scale of civil servants.

Fig. 2.3.3 ERA - Road District Office Organization Chart



Notes:

(1) No. of units
* Varies between 2 to 5 depending up on the No. of sections.
** Varies from 5 to 15 depending up on the wideness of the district.
(2) Figures I~V means salary scale of civil servants.

Fig. 2.3.3 ERA - Road District Office Organization Chart

The equipment requested by Ethiopia will be deployed to the Management Unit in this chart. Since the priority is given on the maintenance/rehabilitation of existing main roads at present time rather than construction of new main roads, the primary job of ERA shall be strengthening institution of maintenance of main roads. The road maintenance and rehabilitation activity is directly and immediately carried out by the Management Unit of Road district Office, which is divided mainly into two types:- i.e. Asphalted Road Unit and Gravel Road Unit depending on the road surface type. The road length managed by each District is already shown in Table 2.2.4. However, the length of roads are not satisfactorily maintained/rehabilitated due to lack of operable equipment of existing fleet, thus only provisional repairs are conducted.

The periodic maintenance and routine repair of the road equipment are performed by each Garage of Road District Office. While, the major repairs such as engine overhaul are basically conducted by the Central Garage under the Supply & Equipment Division of ERA in Addis Ababa. As to the parts or oil required for maintenance or repair of the equipment, the ordinary parts and oil are stored at District Warehouse, and the special parts are stored at Central Warehouse under, Supplies & Equipment Division of ERA.

2.3.2 Funds for Roads Maintenance

The Planning & Programming Division of ERA is responsible for budgeting and planning of all roads. The finance for road maintenance and rehabilitation is usually disbursed from the working budget, and the capital finance for road construction, procurement of construction equipment, etc. is primarily disbursed from the development budget sourced by car import duties, petroleum products tax, etc.

The budget increase since 1988/89 is encouraging an increase of road maintenance and rehabilitation expenditure for maintenance and rehabilitation of the entire road networks across Ethiopia. However, it is practically difficult to carry out an effective road maintenance and rehabilitation due to the aging fleet of equipment and lack of foreign currency for procurement of spare parts.

2.4 Outline and Concept of the Request

Because of the civil war which lasted for 30 years until the political change and the frequent drought, the national economy has been seriously affected and remained stagnant. As the result, the whole country road networks have not been well maintained and exceeded its economical design life, and then the seriously bad condition of roads is making an increase of economic burden in transport sector.

With this background, the Transitional Government (TG) has programmed the ERRP and expediting the urgent rehabilitation of main roads. However, mainly due to lack of funds the procurement of road equipment does not proceed, and the project can not be progressed. In order to improve this condition, the TG of Ethiopia has requested the Government of Japan for Grant Aid for the "Project for provision of Road Maintenance Equipment" (Project).

(1) Objectives of the Project

The Project will be executed to maintain and rehabilitate the main roads in both Shashemene and Dire Dawa Road Districts with the following objectives.

- Make roads passable for the trucks carrying relief cargos to reach the needy population in war and drought affected areas of the country.
- Reduce vehicle operating costs by providing a smoother running surface.
- Reduce road deterioration so that the speed of trucks be increased resulting in higher utilization of the roads and raising capacity of transported commodities be realized which is very critical in the country.
- Improve the condition of roads so that interrupted social service programmes can be resumed.
- Facilitate the implementation of agricultural and industrial development programmes.

To accomplish these objectives, one of the most effective project will be provision of the equipment for maintenance and rehabilitation of both existing asphalted and gravel roads in the influential road districts.

(2) Implementing Agency

Shashemene and Dire Dawa Road District Offices under Operations Division of ERA shall be implementing Agency of the Project.

(3) Content of Road Works

Mainwork	Description
Maintenance of Asphalted road	• Asphalt Patching • Base Failure Repair • Shoulder Blading • Base Preparation • Single Surface Treatment • Road Mix Overlay • Shoulder Rehabilitation • Double Surface Treatment
Maintenance of Gravel road	• Blading Gravel Road • Spot Repair of Gravel Roads • Ditch Cleaning (M) • Gravel Resurfacing • Select Material Production
Quarry	• Crushing

(4) Road Length of Maintenance and Rehabilitation

District	Asphalted Road	Gravel road
Shashemene district	682 km	1,065 km
Dire Dawa District	391 km	1,239 km

(5) Requested Equipment

Requested equipment are shown below:

Asphalted Road Maintenance Equipment Unit

Equipment		Quantity
• Motor Grader	(135 HP)	1
• Wheel Loader	(130 HP)	1
• Vibratory Roller	(8 ton)	2
• Dump Truck	(7 m3)	4
• Asphalt Distributor	(6,000 L)	1
• Water Tank Truck	(13,000 L)	1
• Pick-up Truck	(W. Cabin)	1
• Grease Unit	(Skid)	1
• Tool Set	(HD)	1
• Spare Parts	Quantities for 2 years service	Lump sum

Gravel Road Maintenance Equipment Unit

Equipment		Quantity
• Bulldozer	(200 HP)	1
• Motor Grader	(135 HP)	3
• Wheel Loader	(130 HP)	1
• Vibratory Roller	(8 ton)	1
• Dump Truck	(7 m3)	5
• Water Tank Truck	(13,000 L)	1
• Station Wagon	(SWB)	1
• Pick-up Truck	(W. Cabin)	1
• Grease Unit	(Skid)	1
• Tool Set	(HD)	1
• Spare Parts	Quantities for 2 years service	Lump sum

Quarry Plant Equipment Unit

Equipment		Quantity
• Wheel Loader	(130 HP)	1
• Dump Truck	(7 m3)	2
• Rock Crusher	(50 TPH)	1
• Traxcavator	(200 HP)	1
• Air Compressor	(17 m3/m)	1
• Wagon Drill	(4.5 ton)	1
• Blasting Machine		1
• Pick-up Truck	(W. cabin)	1
• Grease Unit	(Skid)	1
• Tool Set	(HD)	1
• Spare Parts	Quantities for 2 years service	Lump Sum

(6) Deployment of Equipment

Equipment Unit	Shashemene District	Dire Dawa District
Asphalted Road Maintenance	1 unit	1 unit
Gravel Road Maintenance	2 units	1 unit
Quarry Plant	-	1 unit

(7) Detail of Equipment requested

The following table shows the details of equipment requested from ERA.

Table 2.4.1 Requested Equipment

	Equipment	Asphalted Road		Gravel Road			Quarry	
		Shashe-mene	Dire Dawa	Shashemene (1)	(2)	Dire Dawa	Dire Dawa	Total
1.	Bulldozer (200HP)	-	-	1	1	1	-	3
2.	Motor Grader (135HP)	1	1	3	3	3	-	11
3.	Wheel Loader (130HP)	1	1	1	1	1	1	6
4.	Vibratory Roller (8t)	2	2	1	1	1	-	7
5.	Dump Truck (7m3)	4	4	5	5	5	2	25
6.	A. Distributor (600L)	1	1	-	-	-	-	2
7.	Water Tank Truck (13000L)	1	1	1	1	1	-	5
8.	Station Wagon (SWB)	-	-	1	1	1	-	3
9.	Pick-up Truck (W.Cab)	1	1	1	1	1	1	6
10.	Grease Unit (Skid)	1	1	1	1	1	1	6
11.	Rock Crusher (50TPH)	-	-	-	-	-	1	1
12.	Traxcavator (200HP)	-	-	-	-	-	1	1
13.	Air Compressor (17m3m)	-	-	-	-	-	1	1
14.	Drill Wagon (4.5t)	-	-	-	-	-	1	1
15.	Blasting Machine	-	-	-	-	-	1	1
16.	Tool Set (HD)	1	1	1	1	1	1	6
17.	Spare Parts	Quantities for approx. 2 years service						
						Total		85

2.5 Outline of the Project Area

2.5.1 Location and Condition of Project Area

(1) Shashemene Road District

Three administrative regions (Bale, Sidamo and Gamo Gofa) are covered by the operations of the Shashemene District. The total area of the three regions is 269,000 km2, about 21 percent of the total area of Ethiopia.

The population in the three Regions was estimated to be 7.5 million in 1991, about 15 percent of the population of Ethiopia. The cattle population of these Regions was estimated to be 4.4 million, about 19 percent of the total cattle population in Ethiopia.

The three Regions produced 22,342 tons of coffee in 1991, accounting for 37 percent of the total coffee production in the country.

All three regions have large areas of great agricultural potential. A wide variety of cereals and oil seeds are now produced for the market. Resource surveys of the river basins in these regions show the possibilities for irrigated agriculture. There are opportunities for the production of commercial crops including cotton, fruits, sugar cane as well as food crops. Coffee production is expected to increase and exported profitably through neighbouring countries. There are also possibilities for developing beef exports.

There are some areas in these regions believed to contain important deposits of gold, and other valuable minerals. Exploration of huge areas is still in progress and results of geological surveys are expected in the years ahead. The mining potential is already of real value to the national economy.

In view of the foregoing general appraisal of resources, the three regions are of high priority in the Road Development Master Plan. The Maintenance Project for Shashemene is therefore of tremendous importance in supporting the development activities in the three Regions.

On the other hand, some of the lowland areas in the three administrative regions are affected by drought, and as a result the rural population which

depends directly on the exploitation of land and livestock resources has been forced to live below the subsistence level. The situation is currently aggravated leading to acute food shortages, threatening the lives of millions of people. The delivery of relief cargo to the areas affected by drought would depend on the improvement of the serviceability of the road network in the three regions.

(2) Dire Dawa Road District

The total area of the region covered by Dire Dawa Road District is 332,400 km2, about 27 percent of the total area of the country.

The population of the regions in the Dire Road Dawa District was estimated at 5.2 million (1991), which is about 10 percent of the total population in Ethiopia.

The best quality coffee in Ethiopia is produced in some of the areas covered by the Dire Dawa Road District; 1,830 tons of coffee are produced in the regions.

The regions have the advantage of proximity to cheap export route.

Coffee is exported through Djiboutti. Possible markets for citrus fruits exists in Djiboutti, the Middle East and Europe. Good markets are seen for avocado butter in Europe and for jams, juices and canned fruit wine in Europe and the Middle East. Beef might also be profitable, if produced intensively. The roads in Dire Dawa District also serve possible mining ventures.

The Eastern Region in District is now confronted with a major drought. The Government is now embarking on a major relief and rehabilitation campaign. Unfortunately, the condition of the roads in the District is the major problem creating obstacles to smooth operation. It is now obvious that serious deficiencies exist in the current road network. As a result road transport costs are high, there is frequent breakdown of trucks, and truck speeds are low affecting the level of utilization of the fleet. A major relief food distribution and rehabilitation program will be severely disrupted unless an urgent maintenance program is put in place.