Ethiopian Roads Authority
The Federal Democratic Republic
of Ethiopia

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR
OPERATION AND MAINTENANCE OF
TRUNK ROAD: GOHA TSHION – DEJEN ROAD
(EQUIPMENT SUPPLY)
IN
THE FEDERAL DEMOCRATIC REPUBLIC
OF ETHIOPIA

April 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

KATAHIRA & ENGINEERS INTERNATIONAL

PREFACE

Japan International Cooperation Agency (JICA) conducted the preparatory survey on the Project for Operation and Maintenance of Trunk Road: Goha Tshion – Dejen (Equipment Supply) in the Federal Democratic Republic of Ethiopia.

JICA sent to Ethiopia a survey team from December 8 to December 22, 2009.

The team held discussions with the officials concerned of the Government of Ethiopia, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a draft report was sent to Ethiopia in order to discuss a draft outline design with JICA Ethiopia officials, and as this result, the present report was finalized.

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

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

April, 2010

Kiyofumi Konishi
Director General, Economic Infrastructure Department
Japan International Cooperation Agency

April, 2010

Letter of Transmittal

We are pleased to submit to you the preparatory survey report on the Project for Operation and Maintenance of Trunk Road: Goha Tshion – Dejen (Equipment Supply) in the Federal Democratic Republic of Ethiopia.

This Survey was conducted by Katahira & Engineers International, under a contract to JICA, during the period from December 2009 to April 2010. In conducting the survey, we have examined the feasibility and rationale of the project with due consideration to the present situation of Ethiopia and formulated the most appropriate outline design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Takuji Kono
Project manager,
Preparatory Survey team on the Project for
Operation and Maintenance of Trunk Road:
Goha Tshion – Dejen (Equipment Supply)
in the Federal Democratic Republic of Ethiopia
Katahira & Engineers International

SUMMARY

1. Outline of the Country

The Federal Democratic Republic of Ethiopia (hereinafter called "Ethiopia"), whose population is 80.71 million (in 2008, according to the World Bank) and area totals some 1.1 million square meters (approx. three times larger than Japan), is a landlocked country bordering Somalia to the east, Sudan to the West, Kenya to the south, Eritrea to the north, and Djibouti to the northeast, and located in the center of the "Horn of Africa", a peninsula in East Africa named after its shape like a horn of rhinoceros. Ethiopia has a vast highland with well-endowed rainfall conditions, as well as the headstream of River Nile, the longest river in the world. Some 85% of flow volume of the Nile comes from Lake Tana in Ethiopia. The country is bordered with Sudan, Djibouti and Somalia surrounded by the desert, serving as an oasis in the Horn of Africa. In such circumstances, Ethiopia tends to be populated. Rainfall of Ethiopia is brought in by the continental equatorial westerlies and Indian air masses from the south or east. The average temperature is 20-25℃ throughout the year, fairly comfortable for a region near the equator. The rainy season in the region located in the western part of the country and subject to this survey is in summer between June and September; approximately 88% of the annual rainfall, some 1500mm (average between 1993 and 2002) is concentrated in July, but there are small rainy seasons in February and March, too.

Looking at the industrial structure of Ethiopia from Gross Domestic Product (GDP), primary industry accounts for 43%, secondary industry 12%, and tertiary industry 45% (World Bank, 2008), respectively; and agriculture has a high percentage, as 85% of labor population engage in agriculture. Major agricultural products include barley and wheat, and Ethiopian native teff, corn, and kaoliang for staple foods. GDP, growing at 6% or so on a year-to-year basis around 2000, took a downward turn in 2001 and saw a negative growth in 2002/03. This was directly attributable to droughts and poor rain occurring over a large region of the country in 2000 and 2002. On the other hand, the growth rate turned around and saw an increase of 11.6% compared to the previous year in 2003. This was due to a great rainy season and good harvests of that year. The Government of Ethiopia, regarding agriculture as the basis for economic development, sets the agriculture-led industrialization and promotion towards a service economic as the basic economic policies. In this regard, the government regards the development of a road network connecting regions where an agricultural potential is high or industrial development regions to markets as a priority policy to vitalize the Ethiopian economy. As a result of the implementation of the priority policy, the country achieved the economic growth rate of 11.3%, and GNI of 220 US dollars her head (according to the World Bank in 2008).

2. Background of the Project

For landlocked Ethiopia, the main transportation artery is ground transportation. The country has been developing and improving roads under a Road Sector Development Program (RSDP) which started in

1997. However, the road density at the end of Phase III in 2010 is 45.7km/1000km^2, below the average in Africa as a whole, 50km/1000km^2: an improvement in the road density is a primary task in the road sector. National Route 3, the subject to the corporation Project, is an arterial road linking the granary of the country and the market in a north-south direction, and leading to Sudan. Some 80% of crude oil imported from Sudan is transported via this route. The Abay Gorge zone on this National Route 3, though it is a mere 40.45km in length, is a precipitous are with a height difference of 1500m, so that a sufficient road width cannot be secured, and that the zone has been a bottleneck of the route. In order to deal with an increased traffic volume, the third arterial road improvement work of a Grant Aid was carried out and completed in December 2009, whereby a road width in the gorge zone was expanded, and a decrepit Abay bridge built in 1948 was replaced with a new one. However, the unstable geographical conditions of the gorge and a spate of the concentrated heavy rain in the rainy season then triggered frequent and varied disasters to hinder the smooth traffic, such as landslides, slope failures, fall of rocks, and debris flows. Under these circumstances, although the Ethiopian Roads Authority (ERA) has been committed to road construction and maintenance of existing roads for higher road density, it does not have sufficient equipment to be allocated to countermeasure works against frequent landslides in this zone, and the maintenance of smooth traffics on National Route is under threat. Accordingly, Ethiopia has, viewing the route as the most crucial route for physical distribution, requested Japan to conduct a preparatory survey on a project to supply equipment for measures against landslides in Abay Gorge.

3. The Result of the Survey and Contents of the Project

To meet the request from Ethiopia, the Government of Japan decided to conduct a preparatory survey on a project to supply equipment for countermeasure works against landslides in Abay Gorge, and dispatched a Survey Team to the site, via the Japan International Cooperation Agency (JICA), for 15 days from December 8-22, 2009. According to the findings of the survey, the ERA will be in charge of landslide countermeasure works in the Abay Gorge zone on National Route 3 during the rainy season (from June to September) in 2010, with the help of a Counter Part Fund (CPF) of a Grant Aid for increased food production (2KR) and equipment to be rented. At the moment, however, there is no prospect of handling landslides for 2011 on. In consideration of the significance of National Route 3 for physical distribution in Ethiopia and the assistance which Japan has given via Grant Aids to the route, the necessity, urgency and relevance have been sufficiently proved. The field survey has also found that the contents of equipment initially requested are not enough for countermeasure works against expected landslides, so that some equipment will be newly added and that the quantities of some other equipment will be changed. The name, specifications and quantity of equipment which will be procured upon consultation with the ERA, the executing agency of the landslide countermeasure works, will be shown in Table 1.

Table 1 Specifications and Quantity of Equipment to be Procured

No.	Equipment	Specifications	Initially requested	Finally requested
1-1	Excavator	Bucket capacity: 1.4m^3,with hydraulic port for breaker	4	2
1-2	Hydraulic Breaker	Weight: 1,200kg	0	2
2	Wheel Excavator	Bucket capacity: 0.8m^3	0	2
3	Bulldozer	Weight: 38ton, U-shaped blade, and multi-shank ripper	2	2
4	Motor Grader	Blade width: 3.7m, scarifier, and front blade	2	2
5	Wheel Loader	Bucket capacity: 3.0m^3	2	2
6	Horizontal Boring Machine	Bore diameter φ133, and crawler mounted type	1	1
7	Dump Truck	Loading capacity: more than 15ton 6×4	16	14
8	Truck Trailer	Loading capacity: more than 40ton, truck tractor on 3 axles, and semi-trailer on 3 axles	2	1
9	Compressor(L)	Weight: 140kw	0	1
10	Compressor(S)	Weight: 62.5kw	2	1
11	Crawler Rock Drill	A grade of bore diameter φ65, rod length 3,000mm, and air consumption 16m^3/min	0	1
12	Jack Hammer	Weight: 18kg	4	2
13	Tire Roller	Weight: 8.5-13ton	2	1
14	Road Roller	Weight: 8-10ton	0	1
15	Asphalt Finisher	A grade of paving width 4.5m, crawler mounted type, and propane gas	0	1
16	Asphalt Distributor	Tank capacity: more than 6,000Lit	0	1
17	Water Tank Truck	Tank capacity: more than 8,000Lit, and self-priming pump mounted type	0	1
18	Truck with Crane	Loading capacity:10ton, 4-section crane boom, and 2.95t×5m or higher	0	1
19	Asphalt Plant	35ton/h or higher, and wet filter. Including power generator	0	1
20	Hot Mini Mixer	4,000kg/h, and mobile type	2	2
21	Aggregate Plant	35ton/h or higher, including power generator. Diameter of particles produced: 0-40mm	0	1
22	Pickup Truck	4WD, and double cabin	2	2
23	Station Wagon	4WD, and capacity of 7 or more passengers	2	2
24	Mobile Workshop Van	4WD, and amounting repair equipment	0	1
25	Workshop Equipment	Repair tools, etc.	2	1
26	Total Station	Precision of angle measurement: 3" or lower	2	2
27	Digital Level	Precision of height: 1.0mm or lower, and precision of distance: ±0.1%×Dm or lower	2	2
28	Power Broom	For cleaning of road surface	2	0

Source: made by JICA survey team

4. Operation Plan and Cost Estimation of the Project

If the Project is to be implemented under Japan's Grant Aid scheme, the estimated time period required to prepare detailed design and procure equipment will be 4.0 months and 9.5 months, respectively. The Project will be implemented in accordance with the Japan's Grant Aid scheme and the cost will be determined before concluding the Exchange of Note (E/N) for the Project.

5. Project Evaluation and Recommendations

Rental equipments for landslide countermeasure works along National Route 3 in Abay Gorge section are available in the outskirts of Addis Ababa. Those equipments need to transport between Addis Ababa and Abay Gorge with a distance of about 200km taking about 5 hours approximately. However, the equipment procured under this project will set both sides of Abay Gorge section at Goha Tsion and Dejen so that the time for transportation will shorten from the present about 5 hours to about 0.5 hours in the future.

Index for achievement level	Current figure (Transportation time from Addis Ababa area to the site)	Planned figure (Transportation time from the parking areas to the site)
Equipment transportation time to landslide site in Abay Gorge section	About 5 hours	About 0.5 hours

Source: made by JICA survey team

(1) Direct Effects and Extent of Improvement

(i) Landslide countermeasure works along National Route 3 of Abay Gorge section will start about 4.5 hours earlier than that of the present condition.

(2) Indirect Effects and Extent of Improvement

(i) Realizing stable oil transportation from Sudan, and contributing to the maintenance of a stability of the Ethiopian economy

(ii) Contributing to the development of technologies in Ethiopia concerning landslide countermeasure works

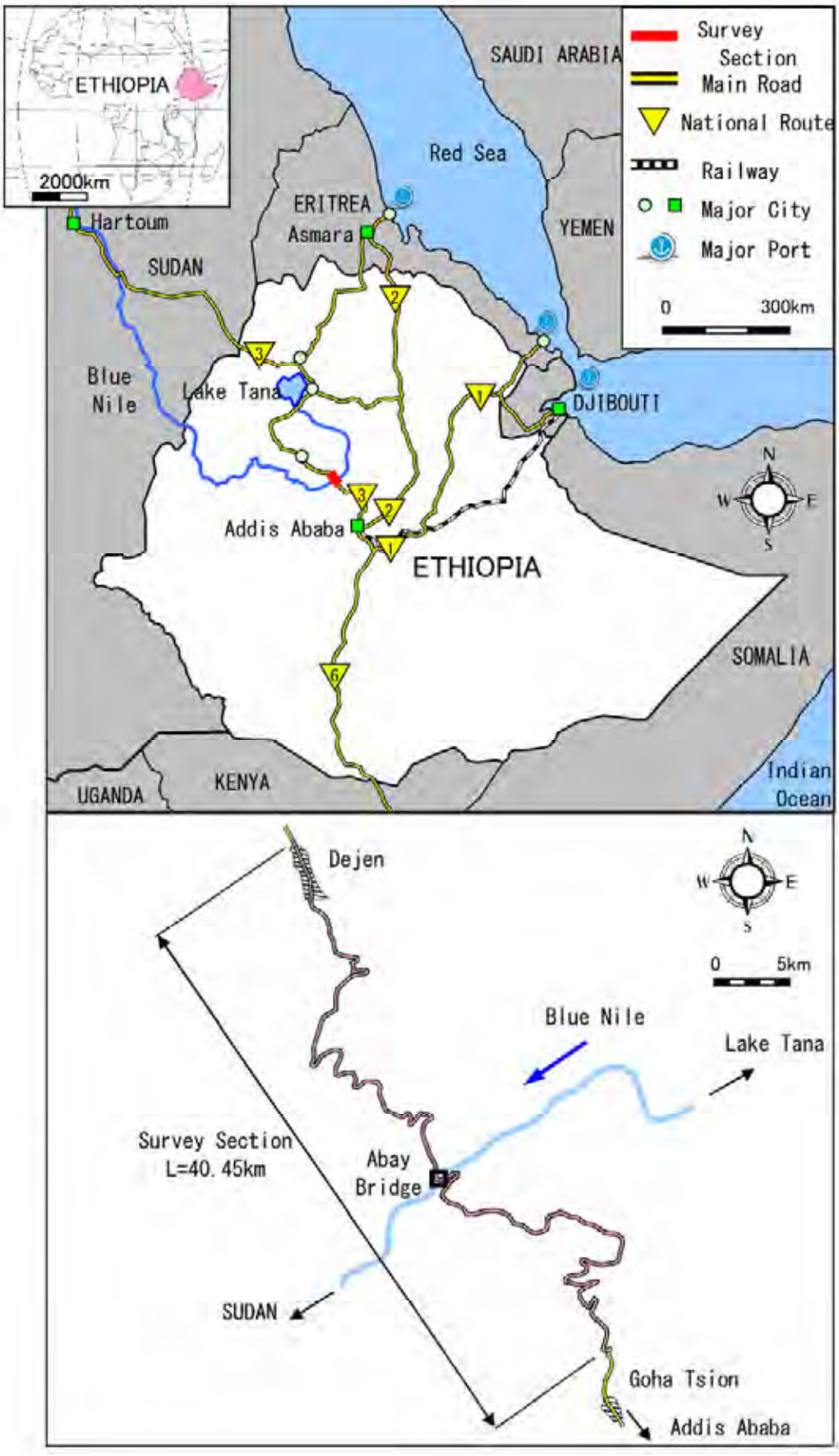
(iii) Contributing to promotion of vital regional economy via creation of employment opportunities by permanently conducting landslide countermeasure works

(3) Recommendations

There are some landslide countermeasure works, such as cutting and embankment works for construction of alternative routes and control works for landslides, which can be put into execution with the current technical capabilities of Ethiopia. However, further technical assistance will be necessary to apply more appropriate design based on well experienced technical view to landslide countermeasure works.

CONTENTS

APPENDICES



Project Area

Image Photo of the Equipment

1-1 Excavator

1-2 Hydraulic Breaker

2 Wheel Excavator

3 Bulldozer

4 Motor Grader

5 Wheel Loader

6 Horizontal Boring Machine

7 Dump Truck

8 Truck Trailer

9 Comperssor (L)

10 Comperssor (S)

11 Crawler Rock Drill

12 Jack Hammer

13 Tire Roller

14 Road Roller

15 Asphalt Finisher

16 Asphalt Distributor

17 Water Tank Truck

18 Truck with Crane

19 Asphalt Plant

20 Hot Mini Mixer

21 Aggregate Plant

22 Pickup Truck

23 Station Wagon

(On-borad Equipment)

24 Mobkle Workshop Van

25 Work shop Equipment

26 Total Station

27 Digital Level

LIST OF FIGURES & TABLES

ABBREVIATIONS

AFDB	African Development Bank
B/A	Banking Arrangements
DAC	Development Assistance Committee
DED	District Engineering Division
DRMC	District Road Management Contractor
EU	European Union
EIA	Environmental Impact Assessment
E/N	Exchange of Notes
ERA	Ethiopian Roads Authority
F/S	*Feasibility Study*
GSE	Geological Survey of Ethiopia
G/A	Grant Agreement
GOJ	Government of Japan
G/A	Grant Agreement
GDP	Gross Domestic Project
GNI	Gross National Income
HIPS	Heavy Debt Poor Country
IDA	International Development Association
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
M/D	Minutes of Discussions
MOME	Ministry of Mines and Energy
MOFED	Ministry of Finance and Economic Development
NGO	Non-governmental Organization
ODA	Official Development Assistance
RRA	Rural Road Authority
RSDP	Road Sector Development Program
T/N	Tender Notice
UN	United Nations
V/C	Verification of Contract
WB	World Bank

CHAPTER 1

BACKGROUND OF THE PROJECT

1-1 BACKGROUND OF THE REQUEST

In Ethiopia, the road administration began with the Imperial Highway Authority (IHA) which was established in 1951. Then in 1978, the Ethiopian Roads Authority (ERA) was established. Following a revision to the authority in 1993, the ERA entrusted the administration concerning local roads to local governments. Currently, it is responsible for drawing up and implementing plans of designing, constructing, and managing and maintaining arterial roads and roads connecting arterial roads. It is this ERA that is in charge of this Project.

A problem in the field of roads in Ethiopia is its low density, and the country has tackled this problem, implementing a Road Sector Development Program (RSDP) with the support of donors, and proceeding with the construction and repair of arterial roads. The RSDP commenced in 1997, saw the completions of Phases I and II in 2002 and 2007, respectively, and is in Phase III at the moment (2007 – 2010). Thanks to this program, the road density of the country increased from 24.1km/1000km^2 in 1997 to 38.6km/1000km^2 in 2007.

Table 1-1 Improvement in Road Density in Each Phase of RSDP in Ethiopia

Year/Other	1997 At the time when Phase I starts	2002 At the time when Phase I ends	2007 At the time when Phase II ends	2010 At the time when Phase III ends (planned)	Average in Africa
Road density (km／1000km^2)	24.1	30.3	38.6	45.7	50.0

Source: "Report on RSDP III", ERA, 2007

As obvious in Table 1-1, road construction and improvement in Ethiopia has been in progress due to the RSDP, though the road density at the time of the completion of Phase III is still below the average in Africa as a whole. In order to improve such situations and build a road network essential for the development of the country, the construction of new roads, as well as the repair and upgrading of existing roads, is a task concerning roads in Ethiopia. Even so, according to a survey on daily traffic of trucks and buses on roads administered by the ERA, the traffic increased by 10.2% per year over 10 years between 1996-2006. In consideration of an expansion in human intercommunication due to population growth in future and an increase in the amount of physical distribution due to economic growth, the traffic volume will inevitably increase, and the need for construction and improvement of roads will also increase for the sake of the socio-economic development of Ethiopia.

The core of the national development plan of the country is a Sustainable Development and Poverty Reduction Program (SDPRP) adopted in September 2002 by IMF and the Boards of Directors of the World Bank. The RSDP is a development plan drawn up in the road sector to achieve the SDPRP targets. It is a comprehensive road development plan including reforms of policies and implementing organizations, and overall plan for the road sector as a whole in Ethiopia, so that all donors are examining their approaches to assistance in accordance with the RSDP. Accordingly, road construction work in Ethiopia is carried out based on the RSDP. Of all the budget of RSDP I and II, 80% or more was spent on the construction and improvement of national roads, and the road development of Ethiopia was improved also due to RSDP I and II. Even so, the priority of the development of arterial roads has still remained low, resulting in a halt of construction of provincial and other roads and thus the low road density. An assistance to construction of national roads will make it possible to redirect the financial funds from national roads to provincial and other roads; and the Japanese aid will contribute to a solution of the problem in the road sector in Ethiopia, that is, the improvement of the road density.

Looking at the industrial structure of Ethiopia from Gross Domestic Product (GDP), primary industry accounts for 43%, secondary industry 13%, and tertiary industry 45% (World Bank, 2008), respectively; and agriculture has a high percentage, as 85% of labor population engage in agriculture. Major agricultural products include barley and wheat, and Ethiopian native teff, corn, and kaoliang for staple foods. GDP, growing at 6% or so on a year-to-year basis around 2000, took a downward turn in 2001 and saw a negative growth in 2002/03. This was directly attributable to droughts and poor rain occurring over a large region of the country in 2000 and 2002. On the other hand, the growth rate turned around and saw an increase of 11.6% compared to the previous year in 2003. This was due to a great rainy season and good harvests of that year. These fluctuations in the growth rate show that the occurrence of droughts is the key issue for the economic development of Ethiopia. The Government of Ethiopia, regarding agriculture as the basis for economic development, sets the agriculture-led industrialization and promotion towards a service economic as the basic economic policies. In this regard, the government regards the development of a road network connecting regions where an agricultural potential is high or industrial development regions to markets as a priority policy to vitalize the Ethiopian economy.

National Route 3 which is on the way between Addis Ababa and Sudan plays a role as an arterial road linking Amhara province, the granary of the country where some 40% of agricultural products are produced, and Addis Ababa, the capital and market. Moreover, as a result of the dispute with Eritrea as stated earlier, Ethiopia now has only one available harbor in Djibouti, so that it has concluded a bilateral commercial agreement with the Government of Sudan, and been working since 2000 on the construction of a road leading to Sudan. Currently, some 80% of crude oil imported from oil-producing Sudan to Ethiopia is transported via Route 3 to areas near Addis Ababa which is one of the major industrial regions, and thus the importance of the route has been rising also as part of an African transcontinental corridor linking Ethiopia and Sudan.

1-2 OUTLINE OF THE REQUEST

As stated in the previous section, National Route 3 which includes the zone subject to this survey is an important route underpinning the social and economic circumstances of Ethiopia. Of the route, the Abay Gorge zone (between Goha Tsion and Dejen) of some 40km in length is located in a deep gorge, suffering from repeated landslides in the rainy season (from June to September). Some landslides are large-scale with 2km in width, jeopardizing the function of the road. As for countermeasures against such landslides, constructors took the responsibility during the construction work for the third arterial road improvement plan, but there is no particular prospect of dealing with persistently frequent landslides. The authorities of Ethiopia, on the other hand, having no appropriate devices or technologies against landslides and thus failing to launch any effective measures, requested Japan in 2008 to provide Grant Aid for surveys on measures against landslides and procurement of necessary equipment. In such circumstances, the Government of Japan, which has supported the construction of main roads of the country via three-round Grant Aid projects, has drawn up a plan for technical cooperation concerning measures against landslides for the purpose of effective use of roads for years to come, and implemented in March 2009 a preliminary survey on the project for measures against landslides in Abay Gorge. The survey found that the progress and scale of landslides were far greater than expected; recommended that emergency actions should be taken to be prepared for the rainy season beginning in June every year; and provided the Government of Ethiopia with a list of matters to work on for the prevention of landslides and alleviation of possible damages in the mid- and long-terms. The survey report also pointed out the shortage and ageing of equipment to be used for countermeasure works against landslides. Accordingly, the authorities of Ethiopia took advantage of a counter part fund (CPF) of a grant aid for increased food production (2KR) to make up for insufficient equipment, made use of rental equipment, and took some measures. In the rainy season in 2009, low rainfall and measures launched by the ERA prevented serious situations. For the rainy season in 2010, ERA will be in charge with rental equipment according to a CPF as in the previous year, and an arrangement has been made, at the same time, that Japanese experts will be dispatched from Japan to support the activities of the ERA. However, since the country has a difficulty, for budgetary reasons, in procuring equipment from 2011 on, the Government of Japan has decided to implement an outline design survey (by Grant Aid) for procurement of equipment. This preliminary survey aims for the development of equipment which is necessary for countermeasure works against landslides and enables the Ethiopian side to put such works into practice on a self-reliant basis.

The following section outlines the contents of equipment requested. In consideration of the contents of equipment requested in 2009, discussions were held concerning short-term landslide countermeasure works which the ERA will carry out in Abay Gorge, and confirmation was made in Minutes of Discussions agreed on December 16, 2009 concerning the contents of equipment subject to procurement under this Project. Table 1-2 shows the differences between equipment initially requested and that finally requested in terms of the contents and quantities. Of 28 items on the table, the quantities of 8 items have decreased, and those of 12 items increased (shaded on the table), and those

of 7 items remained the same. This section gives an account of the items whose quantities have changed (including items to be newly added).

Table 1-2 Comparison of Equipment Initially Requested and That Finally Requested

No.	Name of Equipment	Initially requested Q'ty	Finally requested Q'ty	Increase/decrease
1-1	Excavator	4	2	decreased
1-2	Hydraulic Breaker	0	2	increased
2	Wheel Excavator	0	2	increased
3	Bulldozer	2	2	unchanged
4	Motor Grader	2	2	unchanged
5	Wheel Loader	2	2	unchanged
6	Horizontal Boring Machine	1	1	unchanged
7	Dump Truck	16	14	decreased
8	Truck Trailer	2	1	decreased
9	Compressor(L)	0	1	increased
10	Compressor(S)	2	1	decreased
11	Crawler Rock Drill	0	1	increased
12	Jack Hammer	4	2	decreased
13	Tire Roller	2	1	decreased
14	Road Roller	0	1	increased
15	Asphalt Finisher	0	1	increased
16	Asphalt Distributor	0	1	increased
17	Water Tank Truck	0	1	increased
18	Truck with Crane	0	1	increased
19	Asphalt Plant	0	1	increased
20	Hot Mini Mixer	2	2	unchanged
21	Aggregate Plant	0	1	increased
22	Pickup Truck	2	2	unchanged
23	Station Wagon	2	2	unchanged
24	Mobile Workshop Van	0	1	increased
25	Workshop Equipment	2	1	decreased
26	Total Station	2	2	unchanged
27	Digital Level	2	2	unchanged
28	Power Broom	2	0	decreased

Source: the survey team

The quantities of some items have been revised on the grounds that the results of the field survey

found that the contents of equipment initially requested would not be enough for the implementation of landslide countermeasure works assumed under this Project. Increases and decreases in the number of major equipment will be explained in accordance with the number of equipment on Table 1-2.

The number of excavators of ItemNo.1-1 was reduced from 4 to 2. The decrease was attributable to the facts that the engineering work for landslide countermeasure works is expected to include the removal of soil and sand on paved roads, and that iron caterpillars could damage the pavement. In order to avoid such undesirable damage, two wheel excavators with wheel tires of Item No.2 were newly included though they were not initially requested. The change in the number was due to the necessary for varied functions depending on situations where the engineering work is to be carried out.

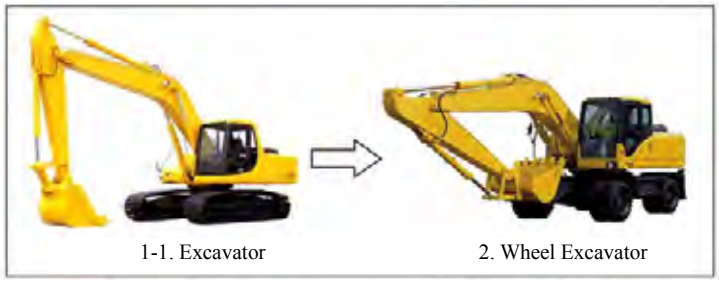


Figure 1-1 Differences between Excavator and Wheel Excavator

Huge bounding stones were observed near the road on site, but no crushing machine which is necessary to crush and remove huge rocks was included in the equipment initially requested. Thus, hydraulic breakers of Item No.1-2 and crawler rock drill of Item No.11 were newly added. At the same time, compressor (L) of Item No.9 which serves as the engine for the crawler rock drill was also included.

Figure 1-2 Huge Rock Contained in Excavated Soil (left)
and Huge Bounding Stone beside Road (right)

Items Nos. 14, 15, 16, 19 and 21 are for road paving work. At the time of the field survey, it was found that it would be necessary to remodel road alignments for landslide countermeasure works and due to geographical constraints of Abay Gorge. For countermeasure works against landslides in such zones, various road construction devices were included, although they were not initially requested.

Figure 1-3 Points where Road Alignments Were Revised (left)
and Points where Revisions of Road Alignments Will Be Needed (right)

The photograph on the left in Figure 1-3 shows the zone where the road slid down the valley, so that the road alignment was revised to the mountainous side during the third arterial road improvement work. The photograph on the right in Figure 1-3 shows the point where road shoulders have moved towards the valley due to landslides. Since it is difficult to deal with landslides on the valley side where there is not enough room, the necessity may arise to move the road alignment to the mountainous side depending on the future progress of landslides. For horizontal boring, a major anti-landslide measure under this Project, the equipment initially requested included the main unit, that is, a horizontal boring machine, only, and any supplementary items necessary for the implementation of the work were not included. Thus, water tank truck of Item No.17 to carry water necessary for excavation to boring sites, and truck with crane of Item No.18 necessary to transport boring equipment were newly added.

Figure 1-4 Bulldozer and Bounding Stone

In passing, where bulldozer of Item No.3is concerned, since bounding stones which the bulldozer pushes are huge as seen in Figure 1-4, the specifications of the bulldozer finally requested were upgraded from those initially requested.

1-3 NATURAL CONDITIONS

The grade of Abay Gorge is extremely precipitous: 154/1000 on the side of Dejen and 178/1000 on the side of Goha Tsion. The areas along the Abay Gorge Road between Goha Tsion and Dejen, including Abay Bridge, are mountainous. The rainy season in the region located in the western part of the country and subject to this survey is in summer between June and September; approximately 88% of the annual rainfall, some 1500mm (average between 1993 and 2002) is concentrated in July, but there

are small rainy seasons in February and March, too. The altitude of Abay Gorge is 1,000 – 2,500m above sea level.

1-4 SOCIAL ENVIRONMENTAL CONSIDERATION

This Project is designed to supply equipment to be used for landslide countermeasure works in a zone within the existing road, and classified as “C” in terms of environmental and social considerations.

A candidate site for plant installation is within the premises where existing facilities are established, so that there is no need of assessment of environmental impact, such as EIA, and that it is possible to use the site with the ERA permission only. It takes a week or so at most for the Planning Department of the ERA to obtain the permission.

CHAPTER 2

CONTENTS OF THE PROJECT

2-1 BASIC CONCEPT OF THE PROJECT

The overall goal of this Project is to secure stable traffic in Ethiopia, and the project purpose is to improve the ability to prevent and deal with landslides. The overall goal coincides with the target of the Road Sector Development Program (RSDP), which is the overall plan of the road sector of the country. In RSDP III (2007-10), 80% or more of the budget is spent on the improvement of national roads, of which 60% or more is spent on repair and improvement of existing national roads. RSDP III aims, as a result of these operations, to make the proportion of paved roads in good conditions at 82%. Meanwhile, this Project will contribute to securing stable traffic on National Route 3 by procuring equipment to put the landslide countermeasure works into practice. This will assist the development of a road network of the country which the RSDP, the overall plan, also aims at.

The preparatory survey report (October 2009) has extracted, 60 points which are considered to be hazardous in the zone between Goha Tsion and Dejen. The report has also extracted 12 priority points out of the 60 points in consideration of the urgency and technical possibility of implementation of countermeasure works against landslides.

Table 2-1 Twelve High Priority Points concerning Landslide countermeasure works

No	Location	Type of damage	No	Location	Type of damage
1.	0+700-0+800	Slope failure	7.	27+500-27+800	Landslide
2.	0+800-1+100	Landslide	8.	28+100-28+600	Landslide
3.	2+600-3+100	Landslide	9.	30+800-31+000	Landslide
4.	4+800-5+200	Landslide	10.	31+200-31+820	Landslide
5.	5+200-5+500	Landslide	11.	33+500-33+600	Landslide
6.	21+850-22+100	Landslide	12.	33+700-33+900	Landslide

Source: Preparatory Survey Report on Project for Landslide countermeasure works in Abay Gorge (October, 2009)

At the same time, the report gives the following recommendation concerning long-term countermeasure works against landslides in the remaining 48 points:

Recommendation concerning Long-Term Countermeasures against Landslides

The landslide action plan recommends the following engineering works concerning long-term countermeasure works against landslides in various areas:

(1) Steel pipe piling and anchor work; (2) installation of safety barriers against fall of rocks; (3) steel pipe piling and work for collecting well; and (4) investigation of mechanism of landslides. In order to engage in these works, it is necessary to bring relevant machines from Japan. At the same time, it seem almost impossible to put them into practice unless some aids are obtained concerning contractors and administrators, as well as the expenses of work.

Source: Preparatory Survey Report on Project for Landslide countermeasure works in Abay Gorge (October, 2009)

Landslide countermeasure works are roughly classifiable into control works and restraining works: the former aims to halt or slow down landslide activities by altering geography, the conditions of groundwater and various other natural conditions, and the latter aims to halt part or whole of landslide activities by constructing certain structural objects and making use of the restraint force of the objects. Either way, for full-scale implementation of landslide countermeasure works, it is necessary to conduct detailed surveys (field exploratory investigation, ground extension and tilt observations, boring surveys, etc.); analysis of the findings on such surveys; and selecting and implementing appropriate landslide countermeasure works based on the results of the analyses. In Ethiopia, the experience of execution of the full-scale landslide countermeasure up to now is a little, and both of technologies and experience is insufficient. Based on the above-mentioned, Japan plan to improve the survey-ability for landslide by the development study type technical cooperation, and plan improve the execution-ability for landslide countermeasure works by this grant aid project, equipment supply,. Each those projects produce a synergy effect by providing multilayered assistance, and the aim of projects is that Ethiopia comes to be able to execute early and secure landslide countermeasure independently. In this project, it is expected to improve the equipment necessary for landslide countermeasure.

2-2 OUTLINE DESIGN OF THE JAPANESE ASSISTANCE

2-2-1 Design Policy

(1) Basic Policy

The operations related to short-term landslide countermeasure works to be carried out by the ERA in accordance with this Project are classifiable into the following groups:

(i) Engineering work: construction of temporary alternative routes; banking for collapsed roads; cutting, embankment and soil removal works as control works for landslides; and removal work of fallen soil and sand
(ii) Work to recover road surface: paving of temporary alternative routes; and recovery of damaged road beds and surfaces
(iii) Horizontal boring work: groundwater drainage works as control works for landslides
(iv) Support work: transportation of heavy machineries and boring machines; repair of equipment on site and repair factories; patrols and surveying; and transportation of workers.

For these works related to landslide countermeasure works, the equipment plan will be put into practice so as to secure stable traffic volumes – the essence of the road function– with limited budgets and personnel of the ERA.

The existing equipment which the ERA owns is exclusively used for the maintenance of roads which the authority is responsible for, and cannot be used for landslide countermeasure works. Thus, it is necessary to supply new equipment other than the existing one under this plan, and the components of equipment will be planned so as to make it possible to implement landslide countermeasure works with the equipment to be newly procured only.

The specifications of individual pieces of the equipment will be examined in accordance with the equipment requested; and in consideration of appropriate work capability in relation to the work required, the balance of work capability within each work unit of the equipment, the availability of equipment in Ethiopia, and other factors.

The units of the equipment for each work operation will be examined in accordance with the following policies.

(i) Engineering Work:
Removal of soil and sand falling on the road surface, and banking for collapsed roads should be conducted urgently to secure passage of vehicles. Where such work is found to be necessary, it is considered to be necessary to secure passage of vehicles in the shortest possible time.

In line with this, in order to make it possible to establish a system which can respond to emergency situations at any time, and to conduct recovery work at more than one point where landslides have occurred during, for example, the rainy season, a total of two units of equipment for civil engineering will be supplied to the both sides of Abay Gorge, that is, one each in Goha Tsion and Dejen.

(ii) Work to Recover Road Surface:
Work to recover road surface is classifiable into two in terms of the size: relatively large-scale work includes the construction of temporary alternative routes and the recovery of damaged road surfaces, where recovery work is conducted on tens to hundreds of meters in width, whereas relatively small-scale work includes recovery work for frequent potholes and cracks, where recovery work is conducted on several square meters only.

It is planned to supply one unit of equipment in the Project as a whole for large-scale recovery work since it is less frequent. Small-scale recovery work, on the other hand, is required more often on a daily basis on both sides of the gorge, so that it is planned to supply two unites.

(iii) Horizontal Boring Work:
Although horizontal boring work is urgently required, it is planned to supply one unit only on the grounds that the expected workload is limited, and that the technical assistance and other supports will be necessary so as for the responsible ERA to conduct the work on its own accord.

(iv) Support Work:
Since transportation of heavy machineries and boring machines, equipment to be used for repair on site can be conducted and used for any operations in the Project as a whole, it is planned to supply one unit of such equipment. In the same fashion, it is planned to supply equipment for repair are repair factories to the workshop of the Muketuri section which is in charge of Abay Gorge. As for equipment related to patrols and surveying, and transportation of workers, it is planned to supply two units on the grounds that the related work must be conducted on a daily basis on both sides of the gorge.

Where the number of equipment in each work is concerned, the Muketuri section which is in charge of Abay Gorge has few pieces of equipment, and those at hand are constantly used for routine maintenance work of the road under its administration, so that it is difficult to make use of them for this Project. Similarly, the equipment held by the Alemgena DRMC, the superior organization, is exclusively used for the maintenance of the roads which other sections are in charge of, and thus cannot be used for this Project.

The equipment subject to this Project is to be used for countermeasure works against unforeseeable landslides, thus ought to be available at any time near the site.

Therefore, this equipment plan will not incorporate any road maintenance equipment which the

implementing organization currently possesses, but organize anti-landslide work with equipment to be procured in this Project only. The number of pieces of equipment will be determined according to this policy.

(2) Policy Concerning Natural Conditions

The natural conditions in the region where the target roads are located are as follows:

- Temperature: 6.4℃ – 35.2℃
  (Basic design study report on the project for rehabilitation of trunk road III)
- Altitude: 1,000 – 2,500m
- Rainfall: approx. 2,000mm/year (during the rainy season in June to September)

Since the equipment will be used in the mountainous place at the highest altitude of 2,500m, it is possible that some items may not be able to demonstrate rated power due to incomplete combustion caused by insufficient air supply to the engines, or may produce white smoke due to considerable emission gas. Thus, as for specifications of engines, items equipped with engines of high output power will be selected among those with the similar operational capability, and certain measures for high altitudes such as adoption of superchargers (turbo engines) will be examined.

(3) Policy Concerning the Maintenance Capacity of the Implementing Organization

The ERA, the implementing organization, will be responsible for management of the equipment to be procured under this Project. It has experienced in using universal machines out of those to be procured, and thus will be able to operate them on its own accord with only normal instructions of start-up maneuvering and operations. As for the horizontal boring machine, however, since it has no experience, it is planned to secure operational skills with the technical assistance via a technical project, etc., together with the normal instructions of start-up maneuvering and operations.

The equipment to be procured will be maintained and managed by three repair organizations affiliated to the ERA as shown in the following table.

Table 2-2 Organizations in Charge of Maintenance and Management

Repair organization	Contents of Service
Workshop of the Muketuri Section	Routine check and maintenance, and simple repair
Workshop of the Alemgena DRMC	Repair of medium − large-scale malfunction
Central Workshop of the ERA	Repair of large-scale malfunction, and overhaul

Where maintenance and management of equipment is concerned, a hierarchized system has been established within the executing agency in accordance with the size and capability of workshops, as shown in the table. As for facilities and technologies for maintenance and management, on the other hand, the workshop of the Alemgena DRMC and the central workshop of the ERA are of excellence and seem to be able to deal with almost any repair. However, there is not enough workshop equipment and tools in the workshop in the Muketuri section which will be in charge of routine maintenance and management work of the equipment procured: there is concern that, under the current situations, if any equipment breaks down, it is always necessary to transfer it to the workshop of the Alemgena DRMC for repair.

The large heavy machinery among the equipment to be procured under this Project cannot be transferred so easily even if it breaks down on site. For prompt work for landslide countermeasure works, it has to be repaired at the earliest possible time on site. Thus, for prompt repair on site, this equipment plan examines the necessity for procuring a mobile repair vehicle equipped with repair tools, a hydraulic crane, etc.

At the same time, for a better operation rate, it is more desirable, if possible, for the Muketuri section to deal with medium-scale breakdowns, rather than transferring defective equipment to the distant workshop of the Alemgena DRMC. In line with this, it is planned to procure workshop equipment and tools to the workshop of the Muketuri section. This will improve the routine maintenance and management, and have a positive impact on prevention of accidental breakdowns of equipment on site.

(4) Policy Concerning Setting the Grades of Equipment

The basic specifications of the equipment to be procured will be examined in consideration of the operations, and maintenance check, and in reference to the specifications of equipment widely used in Ethiopia and those of equipment which the executing agency owns and thus the personnel are familiar with. At the same time, it is also taken into account whether the work intensity and capability is appropriate in relation to the work required, and whether the balance of work capability within each work unit of the equipment is made.

There are no particular laws or regulations in Ethiopia concerning emission gas of construction equipment and vehicle engines. However, it is planned to supply equipment with engines complying with the regulations of countries where the equipment is procured, and suitable for the degree of refining of fuels used in Ethiopia.

(5) Matters Concerning Procurement Methods

The equipment subject to procurement is roughly classifiable into five groups: (i) construction heavy machineries; (ii) wheeled equipment; (iii) horizontal boring machine; (iv) plant equipment; and (v) other instruments. If the lot splitting is conducted when placing orders for equipment to be procured,

care will be taken concerning the maintenance and management, and convenience of procuring spare parts so as to allocate machines and instruments in the same classification in the same lot as possible, and to procure such spare parts from the same suppliers.

At the same time, this Project aims to deliver the equipment as early as possible, no later than May 2011 so as to deal with possible landslides to occur during the rainy season starting in June of that year. To meet this delivery deadline, where excavators, wheel loaders and other mass-produced equipment are concerned, it is planned to procure equipment of manufacturer-based standard specifications to shorten the delivery time.

As for plant equipment, since it requires the installation after the delivery to the site, the overall work schedule will be adjusted so that the actual delivery will be made prior to other equipment, and that the delivery period will coincide with that of other equipment if possible.

2-2-2 Basic Plan

(1) Overall Plan

The operations related to short-term landslide countermeasure works to be carried out by the ERA in accordance with this Project are classifiable into the following groups:

(i) Engineering work: construction of temporary alternative routes; banking for collapsed roads; cutting, embankment and soil removal works as control works for landslides; and removal work of fallen soil and sand
(ii) Work to recover road surface: paving of temporary alternative routes; and recovery of damaged road beds and surfaces
(iii) Horizontal boring work: groundwater drainage works as control works for landslides

For these works related to landslide countermeasure works, this Project will, via the procurement of equipment and the implementation of machine work, enable to secure stable traffic volumes – the essence of the road function – with limited budgets and personnel of the ERA.

In addition, the support work will be conducted for smooth implementation of the works above:

(iv) Support work: transportation of heavy machineries and boring machines; repair of equipment on site and repair factories; patrols and surveying; and transportation of workers

The following are operation items and notes to remember for each work:

1) Engineering Work

Construction of temporary alternative routes and banking for collapsed roads
* Plans of construction of temporary alternative routes and banking (examinations of route selection and the amount of soil leveling)
* Ground excavation and crushing of bedrocks → dozing → compaction / loading of soil and sand → transport → banking → compaction
Particular attentions need to be paid to drawing up appropriate plans, preparation of capability of excavation and crushing in response to diversified mountainous geography, and to choosing the large heavy machines and vehicles capable of handling the large amount of soil.

Cutting, embankment and soil removal works as control works for landslides
* Plans of cutting, filling and removal (examinations of route selection and the amount of soil leveling)
* Ground excavation and crushing of bedrocks → loading of soil and sand → transport → banking / banking and excavation → loading of soil and sand → transport, and removal of soil and sand
Particular attentions need to be paid to drawing up appropriate plans, preparing the capability of excavation and crushing in response to diversified mountainous geography, and to choosing the large heavy machines and vehicles capable of handling the large amount of soil.

Removal works of fallen soil and sand
* Crushing of huge rocks and dozing → excavation and loading of soil and sand → transport, and removal of soil and sand
* Plans for removal of soil and sand (examinations of sites where soil and sand is removed)
Particular attentions need to be paid to preparing the capability of crushing huge rocks, and to choosing the large heavy machines and vehicles capable of promptly handling the large amount of soil. It is also necessary to determine sites where soil and sand is removed in consideration of the impact of landslides.

2) Work to Recover Road Surface

Paving of temporary alternative routes; and recovery of damaged road beds and surfaces
* Production of crushed stone (roadbed and asphalt aggregates) and production of asphalt mixture
* Leveling of roadbed materials → compaction → leveling of asphalt mixture → initial surface compaction → finishing surface compaction
* Road surface patching (to prepare for potholes and cracks)
Particular attentions need to be paid to securing of the required aggregates and asphalt mixture, and a set of equipment whose specifications are suitable for the scale of paving.

3) Horizontal Boring Work

Groundwater drainage works as control works for landslides

* Boring plan (examinations of locations, depth of drilling holes, diameters of strainer pipes, the number of holes, and drainages)
* Transport of boring materials and equipment → installation → drilling → installation of strainer pipes → treatment of drainage water
Particular attentions need to be paid to drawing up a meticulous boring plan and to procuring a horizontal boring machine, and materials and other equipment whose drilling capability is suitable for the plan.

4) Support Work

Transportation of heavy machines and boring machines
* Loading equipment → transportation → unloading equipment
Particular attentions need to be paid to weight and size of the equipment to be procured for safe loading and transportation.

Repair of equipment on site and repair factories
* (Transfer →) repair of equipment (→ transfer)
Particular attentions need to be paid to installing tools and machinery that can repair small- to large-sized procured equipment on site and selecting vehicles with high mobility (4WD, etc.) that can quickly travel on poor roads.

Site patrol and surveying
Particular attentions need to be paid to procuring vehicles (4WD, etc.) capable of running on rough roads other than paved ones, and carrying the necessary number of personnel and measuring equipment. As for the measuring equipment, both the ordinary total station and digital level are required.

Transportation of workers
Particular attentions need to be paid to procuring vehicles (4WD, etc.) capable of running on rough roads other than paved ones, and carrying the necessary number of personnel.

(2) Determining the Equipment Content

Table 2-3 below shows a list of equipment corresponding to each work type discussed above.

Table 2-3 Equipment Configuration by Work Type

Work	Work type	Units of equipment
Engineering Work	Construction of temporary alternative routes Banking for collapsed roads	Excavator, Hydraulic Breaker (Attachment) Wheel Excavator, Bulldozer Wheel Loader, Dump Truck Crawler Rock Drill, Jack Hammer Air compressors (Large) and (Small)
	Cutting, embankment and soil removal works as control works for landslides	
	Removal works of fallen soil and sand	
Work to Recover Road Surface	Paving of temporary alternative routes Recovery of damaged road beds and surfaces	Aggregate Plant, Asphalt Plant Hot Mini Mixer Dump Truck, Motor Grader Asphalt Distributor Asphalt Finisher, Road Roller Tire Roller, Water Tank Truck
Horizontal Boring Work	Groundwater drainage works as control works for landslides	Horizontal Boring Machine, Supplementary equipment for boring Water Tank Truck
Support Work	Transportation of heavy machines	Truck Trailer
	Transportation of boring machines	Truck with Crane
	Repair of equipment on site and repair factories	Mobile Workshop Van, Workshop Equipment
	Site patrol and surveying Transportation of workers	Pickup Truck Station Wagon

(3) Basic Specification of Each Equipment Item

We considered basic equipment specifications based on the design policy of this Project and the standard specifications listed in the cost estimation standards for pavement/civil works projects set by the Ministry of Land, Infrastructure, Transport and Tourism while taking into account the specifications and popularity of the existing equipment in Ethiopia. As a result, we came up with the basic equipment specifications that were deemed appropriate and shown in Table 2-4.

Table 2-4 Basic Specifications of Equipment (draft)

Work	Equipment	Subject work / Reasons for selection	basic specifications(draft)
Engineering work	Excavator	Ground excavation, loading of soil and sand, crushing of mass of rock / Locally popular model suitable to handle large amount of earth	Bucket capacity: 1.4m^3
	Hydraulic Breaker (Attachment)	Crushing of mass of rock / Suitable for specifications of excavators	Weight: 1,200kg
	Wheel Excavator	Ground excavation and loading of soil and sand on road / Standard specifications of manufacturer	Bucket capacity: 0.8m^3
	Bulldozer	Dozing / Locally popular model suitable to handle large amount of soil	Weight: 38ton, U-shaped blade, and multi-shank ripper
	Wheel Loader	Loading of soil and sand, and rocks / Locally popular model suitable to handle large amount of soil	Bucket capacity: 3.0m^3
	Dump Truck	Locally popular model suitable to handle large amount of soil / Locally popular model suitable to handle large amount of soil	Loading capacity: 15ton
	Crawler Rock Drill	Drilling of bedrock and huge rocks to crush / Standard specifications of manufacturer	A grade of bore diameter φ65, rod length 3,000mm, and air consumption 16m^3/min
	Jack Hammer	Drilling of bedrock and huge rocks to crush / Standard specifications of manufacturer	Weight: 18kg
	Air Compressor(L)	Air supply for engine of crawler rock drill / Necessary air volume for crawler rock drill	Output: 140kw
	Air Compressor(S)	Air supply for engine of Jack Hammer / Necessary air volume for Jack Hammer	Output: 62.5kw
Work to recover road surface	Aggregate Plant	Production of aggregates for asphalt mixture and materials of roadbed / Suitable for the capability of asphalt plant	Production capacity: 35t/h Particle size 0-5-13-20-40mm (4 kinds)
	Asphalt Plant	Production of asphalt mixture / Suitable for capability of paving work (finisher)	Production capacity: 35t/h
	Hot Mini Mixer	Production of small amount of asphalt mixture / Suitable for patching size	4,000kg/h, and mobile type
	Dump Truck	Transport of asphalt mixture and materials of roadbed / Vehicle also used for civil engineering work	Loading capacity:15ton
	Motor Grader	Leveling of materials of roadbed, and shaping of road shoulder / Width of road, and general specifications of manufacturer	Blade width: 3.7m
	Asphalt Distributor	Spreading of prime coat prior to paving / Length of roads subject to work, and general specifications of manufacture	Tank capacity: more than 6,000Lit
	Asphalt Finisher	Leveling of asphalt mixture / Paving of roads of 3.5 − 4.0m in width	A grade of paving width 4.5m, crawler mounted type, and propane gas
	Road Roller	Compaction of roadbed materials, and initial surface compaction of asphalt pavement / Locally popular mode, and general specifications of manufacture	Weight: 8.5-13ton
	Tire Roller	Finishing surface compaction of asphalt pavement / Locally popular model, Standard specifications of manufacturer	Weight: 8-10ton
	Water Tank Truck	Water supply to rollers, etc. / Capacity of tank for rollers, etc.	Tank capacity: more than 8,000Lit
Horizontal boring work	Horizontal Boring Machine	Drainage boring work / Standard specifications of manufacturer	Bore diameter φ133, and crawler mounted type
	Supplementary Equipment for Boring	Drainage boring work / Standard specifications of manufacturer	A set of equipment required for horizontal work
	Horizontal Boring Machine	Water supply for boring work / Necessary amount of water supply, and vehicle also used for recovering work of road surface	Tank capacity: more than 8,000

Work	Equipment	Subject work / Reasons for selection	basic specifications(draft)
Support Work	Truck Trailer	Transport of large heavy machines / Maximum weight: approx. 38t (bulldozer)	Loading capacity: 40ton, flatbed/low-floor
	Truck with Crane	Transport of small equipment (for patching) / Weight of patching equipment: approx. 3.5t	Loading capacity:10ton, crane boom with 2.9 or higher
	Mobile Workshop Van	Repair of equipment on site / Equipped with tools for repair of equipment on site	4WD aluminum van equipped with crane, instruments and tools
	Workshop Equipment	Repair of equipment at workshop in charge of site / Suitable for routine maintenance and repair of simple malfunctions	Hydraulic press, garage jack, small compressor, tool set, etc.
	Pickup Truck	Site patrol and surveying / Transport of personnel and equipment for observation of displacement of landslides	4WD, and double cabin
	Station Wagon	Transport of operators and workers / Capacity of accommodating necessary number of passengers and running on rough roads	4WD, and capacity of 7 or more passengers
	Total Station	Measuring of displacement of landslides and road alignments / Standard specifications of manufacturer	Precision of angle measurement: 3" or lower
	Digital Level	Measuring of displacement of landslides and road heights / Standard specifications of manufacturer / Standard specifications of manufacturer	Precision of height: 1.0mm or lower, and precision of distance: ±0.1%×Dm or lower

(4) Determining the Quantity of Equipment Needed

1) Civil Engineering Work

In order to make it possible to establish a system which can respond to emergency situations at any time, and to conduct recovery work at more than one point where landslides have occurred during, for example, the rainy season, a total of two units of equipment for civil engineering will be supplied to the both sides of Abay Gorge, that is, one each in Goha Tsion and Dejen.

The necessary volume of civil engineering work is set as follows in accordance with past experiences of the executing agency.

Excavation, loading, transportation and disposal of soil and sand generated by a landslide in size: depth: 5m, height: 5m, length: 30-50m (ave. 40m).

Thus, the volume of civil engineering work will be: 5m×5m×40m÷2＝500m3

According to past experiences, this volume of civil engineering work is approximately 1 day (6-hour operation) if an excavator of 1.4m^3 is used. This is equivalent to the standard operation time of the excavator of 1.4m^3 shown in the estimation standards for civil engineering work of the Ministry of Land, Infrastructure, Transport and Tourism of Japan, and thus is considered appropriate.

The number (1 unit) of dump trucks for transportation of soil and sand is calculated in the following manner.

* Daily work amount of excavation and loading of excavator (1.4m^3): 500m^3
(Estimation standards for civil engineering work of the Ministry of Land, Infrastructure, Transport and Tourism)
* Daily amount of transportation per 100m^3 of dump truck (15t capacity)
The average distance of transportation of soil and sand is set at some 8.5km (distance of 20km on one side of the gorge minus the distance which seems unsuitable to dispose soil and sand – 1.5km on the town side and 1.5km on the riverside. That is, 17km, which is divided into halves) Then, since the distance of transportation 8.5km or shorter takes 2.3 days (estimation standards for civil engineering work of the Ministry of Land, Infrastructure, Transport and Tourism), the days required for transportation per 100m^3 of the dump truck (15t capacity) planned to be procured can be calculated at some 1.5 days.
Therefore, the number of dumps necessary for the work amount of excavator for loading will be:
500m^3 trucks per day / 100m^3 per truck x 1.5 day / trucks = 7.5 trucks ≒ 7 trucks

Since the unit number is 2, the total number to be procured will be 7 trucks x 2 = 14. It is planned to procure 14 dump trucks in this Project.

This will enable transportation of soil and sand corresponding to the daily work amount of excavator (1.4m^3).

A bulldozer will be needed to engage in dozing soil and sand, and bounding stones. According to expected size of bounding stones (125m^3) and the local familiarity, a bulldozer of 38t capacity will be procured.

Where crawler rock drills and jack hammers to drill bedrocks and huge rocks before crushing them are concerned, the former is used for holes 2m or more in depth, and the latter for holes 2m or less in depth. Since drilling work is not so frequent as other types of work, it is planned to procure one unit each, and, if necessary, the operation of equipment will be conducted. However, since jack hammers are small instruments and easily exhausted, two hammers will be procured for one unit in consideration of work efficiency and the need for backups.

Table 2-5 Quantity of Equipment Needed for Civil Engineering Work

Equipment	Specifications	Qty.
Excavator	Bucket capacity: 1.4m^3	2
Hydraulic Breaker (Attachment)	Weight: 1,200kg	2
Wheel Excavator	Bucket capacity: 0.8m^3	2
Wheel Loader	Bucket capacity: 3.0m^3	2
Bulldozer	Weight: 38ton, Ripper mounted	2
Dump Truck	Loading capacity: 15ton	14
Crawler Rock Drill	A grade of bore diameter φ65, rod length 3,000mm, and air consumption 16m^3/min	1
Jack Hammer	Weight: 18kg	2
Air Compressor(L)	Output: 140kw	1
Air Compressor(S)	Output: 62.5kw	1

2) Work to Recover Road Surface

Work to recover road surface is classifiable into two in terms of the size: relatively large-scale work includes the construction of temporary alternative routes and the recovery of damaged road surfaces, where recovery work is conducted on tens to hundreds of meters in width, whereas relatively small-scale work includes recovery work for frequent potholes and cracks, where recovery work is conducted on several square meters only.

It is planned to supply one unit of equipment in the Project as a whole for large-scale recovery work since it is less frequent. Small-scale recovery work, on the other hand, is required more often on a daily basis on both sides of the gorge, so that it is planned to supply two unites.

The number of dump trucks necessary to supply asphalt mixture to the paving site is calculated in the following manner.

Time required to load asphalt mixture: approx. 20 minutes (including waiting time)
Round trip for transportation: approx. 40 minutes = [20km (average round-trip distance) / 30km/h (average speed)] x 60min.
Time required to supply asphalt mixture: 15 minutes
Total time required for loading to supply: 55 minutes
Volume of mixture carried per dump truck: approx. 16.4t/h = (60mm / 55min) x 15t (capacity)
Average work amount of asphalt finisher:

Approx. 35.7t/h = 80m/h (work speed) x 3.75m (width of pavement) x 0.05m (thickness of pavement) x 2.381t/m^3 (as specific gravity)

Therefore, the necessary number of dump trucks will be:

35.7t/h / 16.4t/truck hour = 2.2 trucks

Since dump trucks to be procured for civil engineering work will be used also for this operation, no dump trucks will be procured exclusively for road recovery work.

In addition, since the average work amount of asphalt finisher is 35.7t/h, and in accordance with the general specifications of asphalt plant, it is planned to set the production capacity at 35t/h.

An aggregate plant serves to supply materials to an asphalt plant, and has to have the capacity at least equivalent to that of the asphalt plant so as not to cause material shortage, but to have materials in stock all the time. In this plan, the operation time of the aggregate plant is set at 1.5 times longer (8 hrs/day) than that of the asphalt plant in accordance with the judgment that the longer operation time will make it possible to keep the materials in stock. Thus, it is planned to have an aggregate plant of the same capacity, 35t/h, as the asphalt plant.

As for hot mini mixers, road recovery work is required constantly on both sides of the gorge, it is planned to procure 2 units.

Motor graders, on the other hand, are likely to be needed for fairing work of the surface of road bed in the civil engineering work, apart from road surface recovery work, and also for the work to form road shoulders as routine road maintenance work; therefore, it is planned to procure 2 units.

Table 2-6 Quantity of Equipment Needed for Work to Recover Road Surface

Equipment	Specifications	Qty.
Aggregate Plant	Production capacity: 35t/h Diameter of particles produced: 0-5-13-20-40mm (4 types)	1
Asphalt Plant	Production capacity:35t/h	1
Hot Mini Mixer	4,000kg/h, and mobile type	2
Motor Grader	Blade width: 3.7m	2
Asphalt Distributor	Tank capacity: more than 6,000Lit	1
Asphalt Finisher	A grade of paving width 4.5m, crawler mounted type, and propane gas	1
Road Roller	Weight: 8.5-13ton	1
Tire Roller	Weight: 8.0-10ton	1
Water Tank Truck	Tank capacity: more than 8,000Lit	1

3) Horizontal Boring Work

Where the horizontal boring work for drainage is concerned, since the expected workload is limited, and the technical cooperation and other supports will be necessary so as for the responsible ERA to conduct the work on its own accord, it is planned to supply one unit only. No water tank truck will be supplied exclusively for this work, but the vehicles for road surface recovery work will be used.

Table 2-7 Quantity of Equipment Needed for Horizontal Boring Work

Equipment	Specifications	Qty.
Horizontal Boring Machine	Bore diameter φ133, and crawler mounted type A set of supplementary equipment	1

4) Support Work

Since transportation of heavy machineries and boring machines, equipment to be used for repair on site can be conducted and used for any operations in the Project as a whole, it is planned to supply one unit of such equipment. In the same fashion, it is planned to supply equipment for repair are repair factories to the workshop of the Muketuri section which is in charge of Abay Gorge. As for equipment related to patrols and surveying, and transportation of workers, it is planned to supply two units on the

grounds that the related work must be conducted on a daily basis on both sides of the gorge.

Table 2-8 Quantity of Equipment Needed for Support Work

Equipment	Specifications	Qty.
Truck Trailer	Loading capacity:40ton, flatbed/low-floor	1
Truck with Crane	Loading capacity:10ton, crane boom of 2.95t×5m or higher	1
Mobile Workshop Van	4WD aluminum van equipped with crane, repair instruments and tools	1
Workshop Equipment	Hydraulic press, garage jack, small compressor, repair tools, etc.	1
Pickup Truck	4WD, and double cabin	2
Station Wagon	4WD, and capacity of 7 or more passengers	2
Total Station	Precision of angle measurement: 3" or lower A set of reflection targets	2
Digital Level	Precision of height: 1.0mm or lower, and precision of distance: ±0.1%×Dm or lower A set of barcode staffs	2

(5) Equipment to be Procured

Equipment to be procured as a result of examinations shown above are listed in Table 2-9.

Table 2-9 Equipment to be Procured (draft)

Equipment	Specifications	Qty.
Excavator	Bucket capacity: 1.4m^3	2
Hydraulic Breaker (Attachment)	Weight: 1,200kg	2
Wheel Excavator	Bucket capacity: 0.8m^3	2
Wheel Loader	Bucket capacity: 3.0m^3	2
Bulldozer	Weight: 38ton, and multi-shank ripper	2
Dump Truck	Loading capacity: more than 15ton	14
Crawler Rock Drill	A grade of bore diameter φ65, rod length 3,000mm, and air consumption 16m^3/min	1
Jack Hammer	Weight: 18kg	2
Air Compressor (L)	Output: 140kw	1
Air Compressor (S)	Output: 62.5kw	1
Aggregate Plant	Production capacity: 35t/h Diameter of particles produced: 0-5-13-20-40mm (4 types)	1
Asphalt Plant	Production capacity: 35t/h	1
Hot Mini Mixer	4,000kg/h, and mobile type	2
Motor Grader	Blade width: 3.7m	2
Asphalt Distributor	Tank capacity: more than 6,000Lit	1
Asphalt Finisher	A grade of paving width 4.5m, crawler mounted type, and propane gas	1
Road Roller	Weight: 8.5-13ton	1
Tire Roller	Weight: 8.0-10ton	1
Water Tank Truck	Tank capacity: more than 8,000Lit	1

Equipment	Specifications	Qty.
Horizontal Boring Machine	Bore diameter φ133, and crawler mounted type	1
Truck Trailer	Loading capacity: 40ton flatbed/low-floor	1
Truck with Crane	Loading capacity:10ton, crane boom of 2.95t×5m or higher	1
Mobile Workshop Van	4WD aluminum van equipped with crane, repair instruments and tools	1
Workshop Equipment	Hydraulic press, garage jack, small compressor, repair tools, etc.	1
Pickup Truck	4WD, and double cabin	2
Station Wagon	4WD, and capacity of 7 or more passengers	2
Total Station	Precision of angle measurement: 3" or lower	2
Digital Level	Precision of height: 1.0mm or lower, and precision of distance: ±0.1%×Dm or lower	2

2-2-3 Reference Drawing

In this Plan, the asphalt plant and the aggregate plant will require installation work among the equipment to be procured.

Figures 2-1 and 2-2 show reference drawings of the asphalt plant and the aggregate plant, respectively.

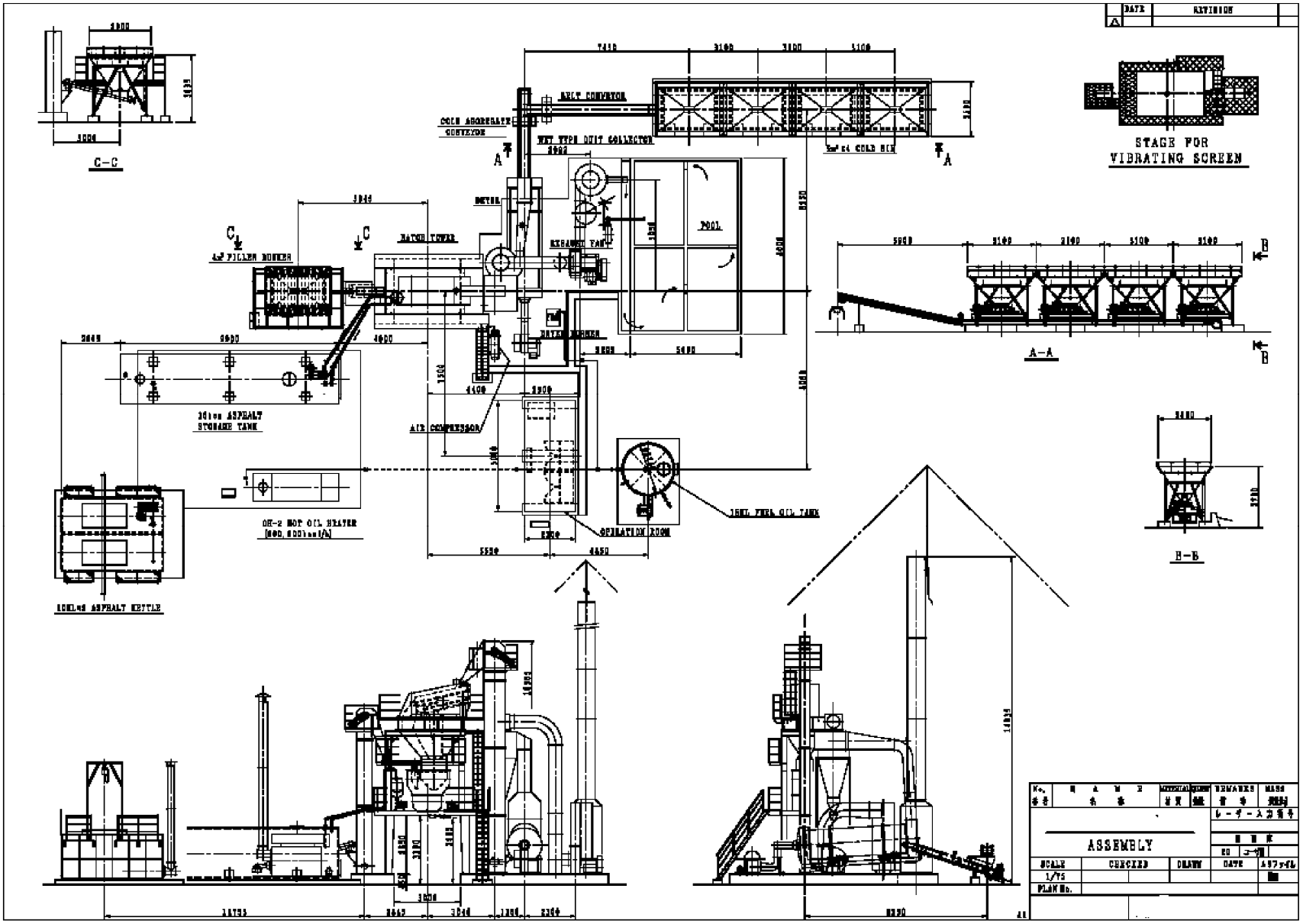


Figure 2-1 Reference Drawing of Asphalt Plant

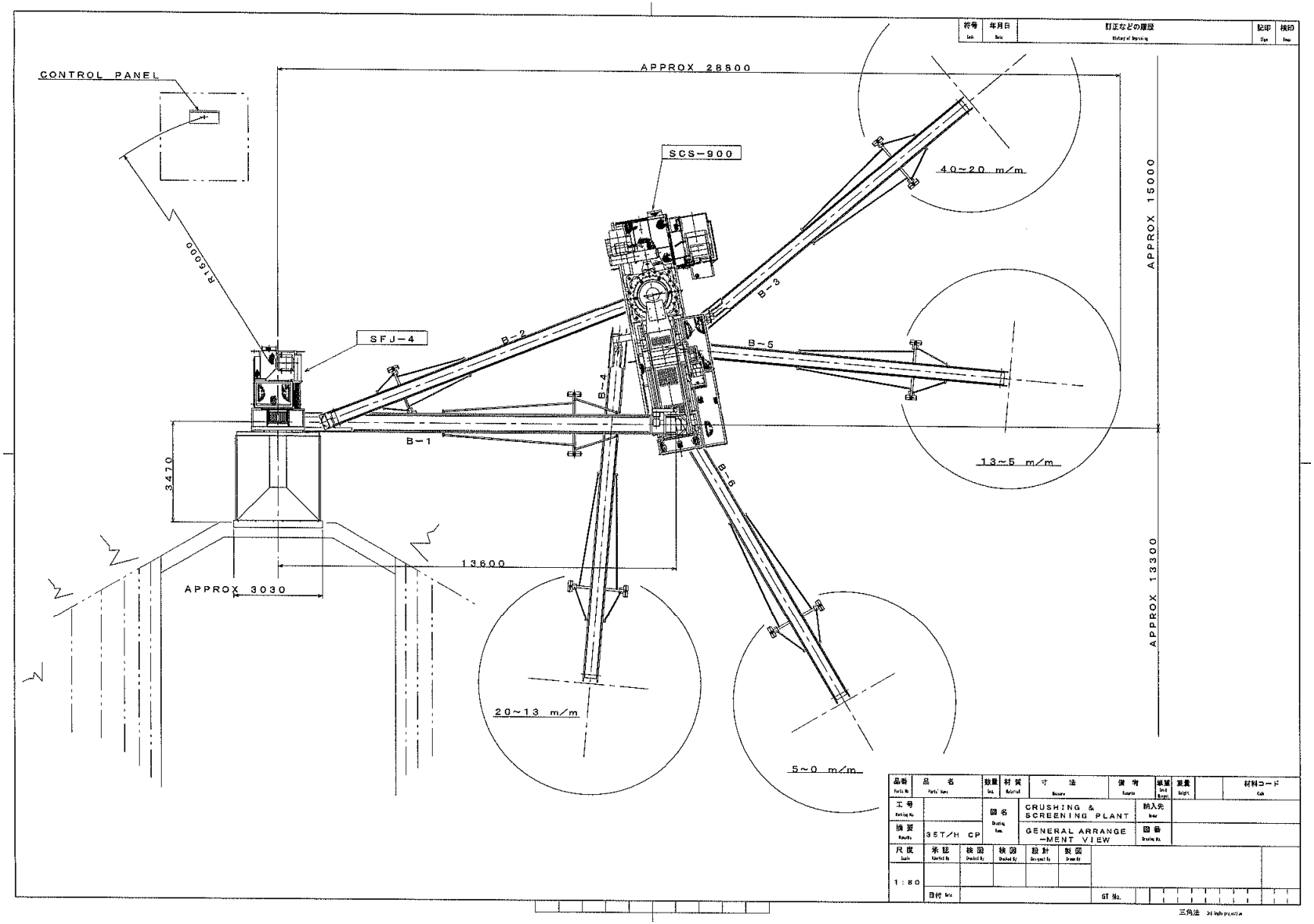


Figure 2-2 Reference Drawing of Aggregate Plant

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Project Implementation Structure

Figure 2-3 below shows how the organizations in Japan and Ethiopia related to one another when this Project is implemented according to the framework of Japan's Grant Aid.

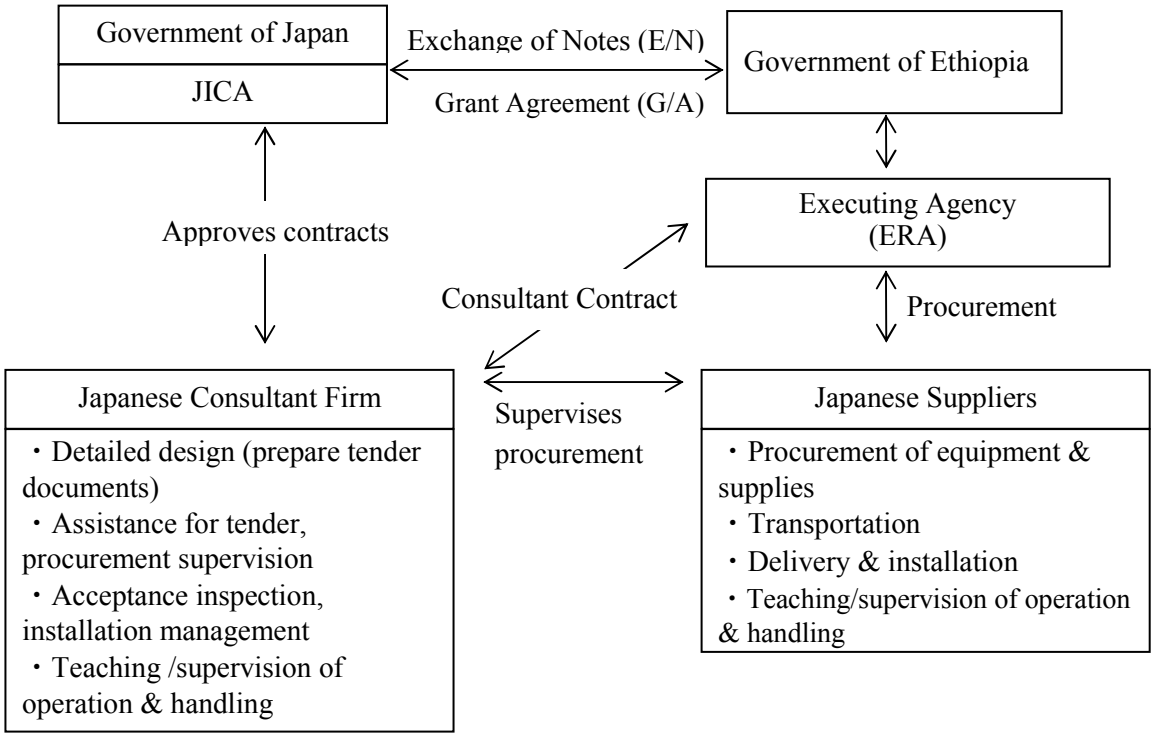


Figure 2-3 Relationships of Organizations Engaged in Project Implementation

In accordance with the Grant Aid framework of the Japanese Government, a Japanese consulting firm will take charge of detailed design and supervision of procurement process, and equipment will be procured mostly from Japanese corporations.

(2) Ethiopian Side

The executing agency of this Project on the Ethiopian side is the Ethiopian Roads Authority (ERA). And it is the Alemgena DRMC and its subordinating organization, Muketuri section that are responsible for operation, maintenance and management of equipment to be procured under the executing agency. Responsible organizations on the Ethiopian side at each implementing stage are listed in Table 2-10.

Table 2-10 Responsible Organizations on the Ethiopian Side at Each Stage

Implementing stage	Responsible organization
Exchange of Notes (E/N), Grant Agreement (G/A)	Ministry of Finance and Economic Development (MOFED)
Procurement, delivery and installation of equipment	Engineer Control Bureau, Ethiopian Roads Authority (ERA)
Landslide countermeasure works	Ethiopian Roads Authority (ERA), Alemgena DRMC, and Muketuri section

(3) Consultant

After the signing of E/N and G/A, ERA will immediately conclude a consultant contract with a Japanese consulting firm. The contracted consultant will be responsible for providing engineering services with regard to the preparation of detailed design and tender documents, assistance for the tender procedure, and supervision of procurement until the handover of equipment under this Project.

(4) Equipment Supplier

Successful bidders that meet the criteria for quality and specifications in an open competitive tender for pre-qualified suppliers will sign a contract with ERA with regard to the supply of equipment selected for this Project.

2-2-4-2 Implementation Conditions

The procured equipment will be seaborned from Japan or a third country and discharged at Djibouti Port of Djibouti, neighboring country of Ethiopia to undergo customs clearance. Then the goods will travel inland through Ethiopia and be delivered to their respective destinations as specified below

- Equipment and spare parts, except for plant equipment, will be delivered to material yards of the ERA in Addis Ababa.
- Plant equipment will be delivered to the construction site of the plant in Abay Gorge.

After the delivery of equipment to the designated places, the supplier will test run each and every equipment item to ensure that they operate properly before handing them to ERA. Immediately following the handover, the supplier will teach ERA personnel how to operate, handle, inspect, and maintain the equipment.

2-2-4-3 Scope of Works

The Japanese side will bear all costs associated with equipment procurement, including the transportation cost to the delivery sites and unloading fees. The Ethiopian side will exempt the imported equipment from customs duty and any other taxes. Table 2-11 below shows the obligations of each side.

For asphalt and aggregate plants, the two countries will divide the responsibilities as follows:

- The Ethiopian side will bear land acquisition, ground leveling, foundation/retaining wall works and works for securing primary power and water supply and drainage to the plant.
- The Japan side will bear installation works.
- The Ethiopian side will bear removal and relocation of the existing buildings which interfere in installation of procured equipment.

The Japanese side will present to the Ethiopian side the following documentation in advance:

- Plant floor plan
- Plant foundation drawing
- Schematic diagram of water supply and drainage
- Required electric power energy

Table 2-11 Obligations of the Japanese and Ethiopian Governments

Contents of work		Responsible side		Remarks
		Japan	Ethiopia	
Procurement, delivery and installation of equipment	* Procurement of equipment for landslide countermeasure works	○		
	* Marine transportation	○		
	* Landing procedures	○		
	* Land transportation	○		
	* Tax exemption and customs clearance		○	Ethiopia
	* Inland transportation	○		Equipment other than plant equipment: one designated place in Addis Ababa Plant-related equipment: individual installation places
	Securing of land and foundation work for sites of asphalt mixture plant and aggregate plant		○	
	Supply of electricity and water necessary for asphalt mixture plant and aggregate plant		○	
	Installation of asphalt mixture plant and aggregate plant	○		

Contents of work		Responsible side		Remarks
		Japan	Ethiopia	
Landslide countermeasure works	Work for landslide countermeasure works		○	
	Operation and management of asphalt mixture plant and aggregate plant		○	
	Maintenance and management of equipment		○	

2-2-4-4 Consultant Supervision

(1) Detailed Design

After the signing of E/N and G/A, the Japanese Consultant will conclude a consulting contract with the Ethiopian Government and supervise the procurement work according to the framework of Japan's Grant Aid and within the scope stipulated in E/N. It is important for the Consultant to perform its duties based on thorough understanding of the background of this Project, as well as how and why the content of the basic design was determined.

(2) Procurement Supervision

The procurement supervision work consists mainly of the following:

- Discussion and confirmation with the Ethiopian side
- Review of equipment specifications
- Preparation of tender documents
- Explanation and approval by the Ethiopian side on the tender documents
- Assistance for tendering (public announcement, provision of tender document, execution of tender, evaluation of tender)
- Assistance for contract (negotiation, witness of contract, verification of contract)
- Confirmation of the issuance of order sheets for the equipment
- Factory inspection, inspection before delivery
- Pre-shipment inspection (committed to the third party)
- Discussion with the Ethiopian side (delivery/installation schedule, customs clearance, initial instruction procedure)
- Supervision of installation work
- Final inspection and handover
- Witness of instruction of operation and inspection/maintenance

2-2-4-5 Quality Control Plan

In order to verify if the equipment to be procured is meeting the quality standards and specifications set forth in the contract, the following inspections will be conducted at each stage of the procurement work:

- Confirmation of contents of equipment order sheets issued by the supplier
- Factory inspection and inspection before delivery in the manufacturing plant
- Pre-shipping inspection
- Inspection at plant installation
- Inspection at handover of equipment

2-2-4-6 Procurement Plan

(1) Spare Parts and Guarantees

In recent years, distributors of manufactures of vehicles and heavy machines are beginning to be established in Ethiopia, so that it is becoming possible to procure spare parts from such distributors. Even so, it takes several months for them to procure spare parts after placing an order since they imports the spare parts by sea. At the same time, while the payments for spare parts requires U.S. dollars, the country is short of the currency, so that it is getting more difficult to make payments even if the distributors purchase import spare parts. In these circumstances, the ERA has established a system whereby most of spare parts for the equipment owned are produced at their central repair plant.

As for equipment to be procured, too, it is necessary for the ERA to make arrangements, in the long run, to either procure spare parts via its own distributors or produce spare parts themselves. However, since the equipment to be procured is used for landslide countermeasure works which are somewhat urgent, spare parts will be also procured urgently. Thus, it is planned in this equipment plan to supply spare parts which need be replaced regularly with new ones, as well as consumable supplies, with an eye for the operation for the coming three years or so. It is planned to monitor the operations for the first three years after the procurement, to understand the frequency of exchanging spare parts at the ERA side, and then establish a system to procure new spare parts in advance via distributors or its own production.

Where the product guarantee is concerned, it is planned to grant one-year manufacturers' guarantees for one year after the delivery so as to deal with initial failure or other malfunctions under normal circumstances.

(2) Country of Origin

In the executing agency, products made in Japan, Europe, the U.S.A., Brazil and China are widely used. As for those made in Brazil, a world leading manufacturer of construction equipment produces some part of equipment, such as bulldozers and motor graders which are widely used in Ethiopia.

Repair work of National Route No. 3 including Abay Gorge conducted via Japan's Grant Aid was launched by Kajima Corporation, a Japanese construction company, and thus a majority of machines used for construction work were made in Japan. The ERA has learnt and highly values the basic capability and durability of the Japanese products. Moreover, in Ethiopia, products of Europe and America, which are geographically closer, are also frequently seen.

As for pickup trucks which are subject to the procurement in this Project, most of Japanese vehicles seen the country are manufactured in Thailand.

Accordingly, construction equipment and vehicles subject to the procurement plan in this Project will be procured in third-party countries, such as those in Europe (EU countries and DAC members), Brazil and Thailand, and made by world leading manufacturers whose products have the same qualities for sure as Japanese products. As for surveying equipment, however, Japanese leading manufacturers have shifted their production plants to China, and their products are sold worldwide including Ethiopia. Thus, it is considered that there is no particular problem with the quality, the procurement from products in China will be also taken into account.

(3) Delivery Route

Where the delivery route of equipment procured in Japan is concerned, it seems to be the best – in terms of safety, time, cost and other aspects – to transport the articles by sea, land them in the Djibouti harbor in the neighboring Djibouti, and transport them by land to Addis Ababa.

It seems the best, as for articles to be procured in Europe, too, to transport them by sea, land them in the Djibouti harbor, and transport them by land to Addis Ababa.

However, the facilities of the Djibouti harbor are relatively small and thus are easily overcrowded; that is, it takes time for the harbor procedures, landing, and other businesses, and it is likely to cause a delay in the delivery. The choice of a carrier (depending on the timing of arrival in Djibouti) is an extremely important factor for observance of the delivery time.

2-2-4-7 Operational Guidance Plan

(1) Plan for Test Run and Adjustment

In time for the arrival of the equipment, the supplier will dispatch engineers to test run and make

adjustments on the procured equipment to make sure that they operate properly. Although this Project plans to procure 27 different types of equipment from a number of suppliers, two engineers will be sufficient with each taking charge of multiple equipment models, including guidance on initial and on-going operation.

(2) Guidance Plan for Initial and On-going Operation, etc.

Guidance for initial and on-going operation teaches how to operate the equipment and conduct daily inspections. Since the executing agency has been using Japanese-made equipment and has general technical knowledge of equipment operation, the guidance will focus on unique maneuvers and inspection procedure required for each equipment model. As for the schedules, guidance will be given as the equipment concerned has been delivered to the site. A half to a whole day will be allocated to each item other than plant equipment, whereas 3 days or so will be allocated to the instructions concerning the aggregate plant, and 5 days or so concerning the asphalt plant.

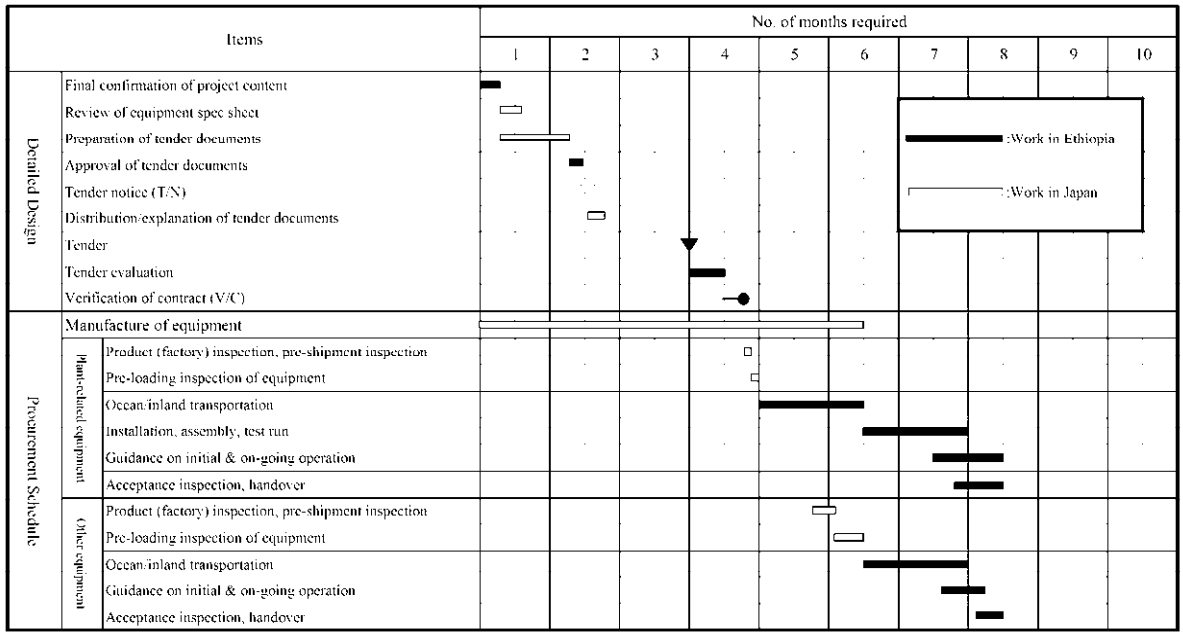
2-2-4-8 Soft Component (Technical Assistance) Plan

No soft component will be implemented in this Project.

2-2-4-9 Implementation Schedule

This Project will be implemented in accordance with the Grant Aid framework of the Japanese Government in the schedule shown in Table 2-12 below.

Table 2-12 Project Implementation Schedule



2-3 OBLIGATIONS OF RECIPIENT COUNTRY

If this Project is implemented through Japan's Grant Aid, the Government of Ethiopia will be responsible for the following matters:

(1) Matters to Be Borne concerning Procurement of Equipment

Land acquisition for the asphalt plant and the aggregate plant; land preparation; and implementation of foundation and retaining wall works
Implementing the work related to distribution of electric power, water supply and drainage necessary for the operation of the asphalt plant
To bear commissions to the Japanese foreign exchange bank for its banking services, based upon the Banking Arrangement (B/A).
To provide facilities for Japanese personnel in entering and staying in Ethiopia and visiting relevant government agencies to perform their duties under the Project.
To exempt Japanese nationals and corporations engaged in the Project from custom duties and other internal taxes.
To ensure exemption of preparation documents needed for customs clearance for the equipment under the Project.
Making arrangements for budgets related to custom duties concerning procurement of equipment
To secure the necessary personnel and obligations at the execution of the guidance for initial operation, inspection and maintenance.
To bear all expenses, other than those covered by the Japan's Grant Aid, necessary for the Project.

(2) Matters to Be Born concerning Events after the Procurement

Conducting operations of landslide countermeasure works. And making arrangements for necessary budgets and personnel securement.
Making appropriate and effective use of, and maintaining and managing equipment to be procured.

2-4 PROJECT OPERATION PLAN

If equipment is going to be procured through this Project, the Ethiopian side will need to deploy sufficient personnel in time for the delivery of the equipment to the designated places so that they can learn how to operate and maintain each equipment model from the engineers dispatched from Japan at the time of operation guidance.

Also, ERA has already promised in writing that it would allocate sufficient personnel and funds to perform landslide countermeasure works using the equipment to be procured by this Project.

2-5 PROJECT COST ESTIMATION

2-5-1 Initial Cost

(1) Cost borne by the Government of Japan

The Project will be implemented in accordance with the Japan's Grant Aid scheme and the cost will be determined before concluding the Exchange of Note (E/N) for the Project.

(2) Cost borne by the Government of Ethiopia

Item	Cost	
	10 thousand birr	million yen
Foundation works	44.8	3.3
Various taxes on equipment to be procured	2,656.8	194.0
B/A fees	1.2	0.9
Total	2,702.8	198.2

For the implementation of this Project, the Ethiopian side will bear a total of xxx Birr. The Ethiopian financial authority acknowledges that various taxes on equipment to be procured (xxx Birr) will be funded by extraordinary budgets**.**

(3) Parameters of Cost Estimation

Time of cost estimate: November 2009
Exchange rate: 90.87JPY/USD
7.302JPY/Ethiopian Birr (ETB)
Procurement period: Implementing design and procurement of equipment will be as shown in implementing schedules.
Others: This plan will be put into execution in accordance with the grant aid system of the Government of Japan

2-5-2 Operation and Maintenance Cost

The estimated cost of fuel and oil needed to operate the equipment after their introduction is 5,354,000 Birr (about 39,100,000 yen) per year as shown in Table 2-13. The estimated cost of maintenance and repair of the equipment after their introduction is 3,918,000 Birr (about 28,610,000 yen) per year. The estimated number of drivers, operators and workers newly necessary for the equipment to be procured is 80 persons, so that the annual labor cost is estimated at approximately 3,84 0,000 Birr (approx. 28,040,000 yen).

Accordingly, the operation and maintenance cost of equipment procured which ERA is to bear totals 13,112,000 Birr (approx. 95,750,000 yen). This total amount is some 0.1% of the annual budget of the ERA. However, since the ERA annual budget has grown by 14 – 62% in the past five years, it seems possible for the organization to earmark the budget for the operation and maintenance cost.

Table 2-13 Estimated Fuel and Oil Cost (newly required cost)

No.	Equipment	Spec. (kw)	Qty.	Working hour		Fuel consumption		
				(h/day)	(day/year)	(L/h・unit)	(L/year・unit)	(L/year)
1-1	Excavator	164.0	2	6.2	130	29.0	23,374.0	46,748.0
1-2	Hydraulic Breaker	—	2	4.8	70	—	—	—
2	Wheel Excavator	104.0	2	6.2	130	18.0	14,508.0	29,016.0
3	Wheel Loader	156.0	2	4.6	140	24.0	15,456.0	30,912.0
4	Bulldozer	208.0	2	6.9	120	36.0	29,808.0	59,616.0
5	Dump Truck	153.0	14	6.2	140	13.0	11,284.0	157,976.0
6	Crawler Rock Drill	—	1	4.8	100	—	—	—
7	Jack Hammer	—	2	4.8	80	—	—	—
8	Air Compressor(L)	140.0	1	4.8	100	26.0	12,480.0	12,480.0
9	Air Compressor(S)	59.0	1	4.8	80	11.0	4,224.0	4,224.0
10	Aggregate Plant	134.0	1	8.0	240	23.0	44,160.0	44,160.0
11	Asphalt Plant	120.0	1	3.6	190	23.0	15,732.0	15,732.0
12	Hot Mini Mixer	13.5	2	3.6	190	2.2	1,504.8	3,009.6
13	Motor Grader	115.0	2	5.6	180	12.0	12,096.0	24,192.0
14	Asphalt Distributor	156.0	1	4.8	110	14.0	7,392.0	7,392.0
15	Asphalt Finisher	39.0	1	4.8	140	5.9	3,964.8	3,964.8
16	Road Roller	56.0	1	5.2	140	6.0	4,368.0	4,368.0
17	Tire Roller	71.0	1	4.8	140	7.1	4,771.2	4,771.2
18	Water Tank Truck	199.0	1	4.6	150	8.0	5,520.0	5,520.0
19	Horizontal Boring Machine	81.0	1	4.8	100	12.0	5,760.0	5,760.0
20	Truck Trailer	382.0	1	6.2	110	29.0	19,778.0	19,778.0
21	Truck with Crane	130.0	1	6.2	180	6.6	7,365.6	7,365.6
22	Mobile Workshop Van	170.0	2	6.2	180	10.0	11,160.0	22,320.0
23	Workshop Equipment	13.5	2	3.6	190	2.2	1,504.8	3,009.6
24	Pickup Truck	65.0	2	6.2	180	3.1	3,459.6	6,919.2
25	Station Wagon	80.0	2	6.2	180	4.9	5,468.4	10,936.8
26	Total Station	—	2	—	—	—	—	—
27	Digital Level	—	2	—	—	—	—	—
	Total							530,170.8

Conditions in the cost estimate;

Fuel consumption is based on the "Depreciation Calculation Table for Construction Equipment, Etc." (Japan Construction Mechanization Association)

Cost of diesel fuel: 10Birr/Litter＝73.02yen/Litter

Cost of oil: 1% of fuel cost

1Birr＝7.302yen

Fuel cost (annual)	530,171L×10Birr / L＝5,301,710Birr	aprrox.38,710,000yen
Oil cost (annual)	5,301,710Birr×1%＝53,017Birr	aprrox.390,000yen
Total	5,354,727Birr	approx.39,100,000yen

2-6 OTHER RELEVANT ISSUES

In implementing this Project through Japan's Grant Aid, the Ethiopian side needs to perform its obligations without delay according to the division of responsibilities defined earlier.

Matters which could have an impact on the smooth implementation of operations subject to this cooperation project, and thus should be noted are classified in terms of arrival time of equipment, that is, short-, mid- and long-terms.

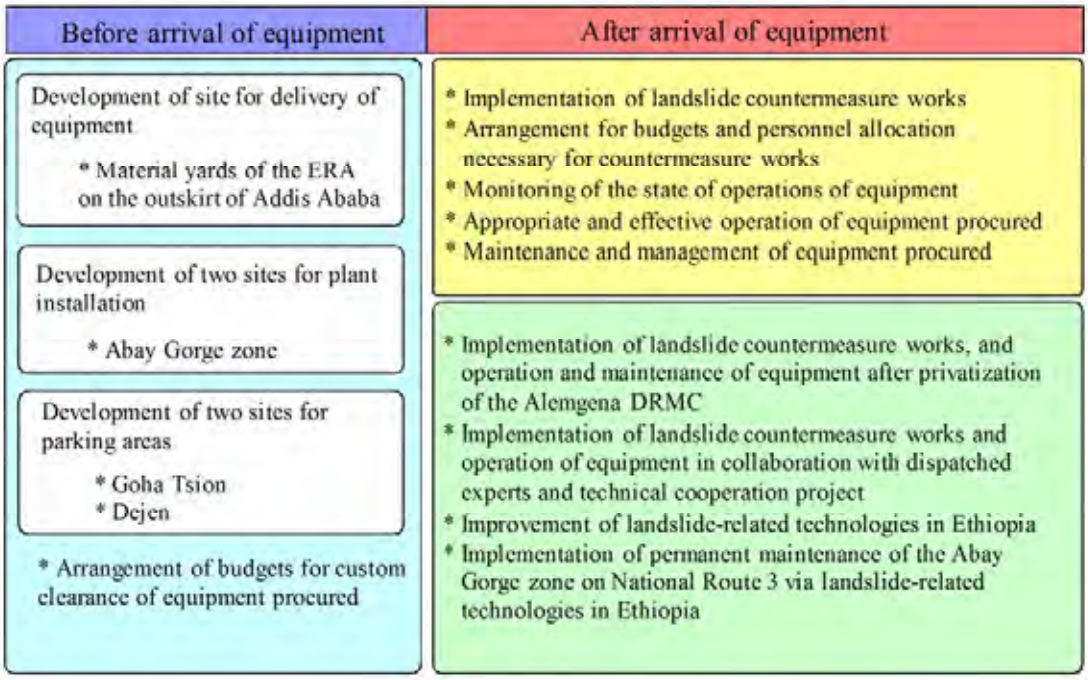


Figure 2-4 Matters to Be Noted

As for "monitoring of the state of operations of equipment" in these matters, for the purpose of understanding the state of operation of the equipment to be procured, the implementing organization will record the monthly state of operations in the designated equipment monitoring sheets, and submit them to the JICA Office in Ethiopia on an annual basis.

The Ethiopian Roads Authority, the executing agency, has experienced in the repair of National Route 3 via three-round Grant Aid Projects, and has no particular difficulty in handling this Project; it is considered that there will be no problem in implementing this Project.

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

3-1 PROJECT EFFECT

(1) Present State and Problems

A problem of Abay Gorge was, as shown in ①, Figure 3-1, the decrepit Abay Bridge which was built in 1948 and regarded as a bottleneck of National Route 3. However, the problem was resolved in 2009, when a new Abay Bridge, in ②, was constructed via Japan's Grant Aid.

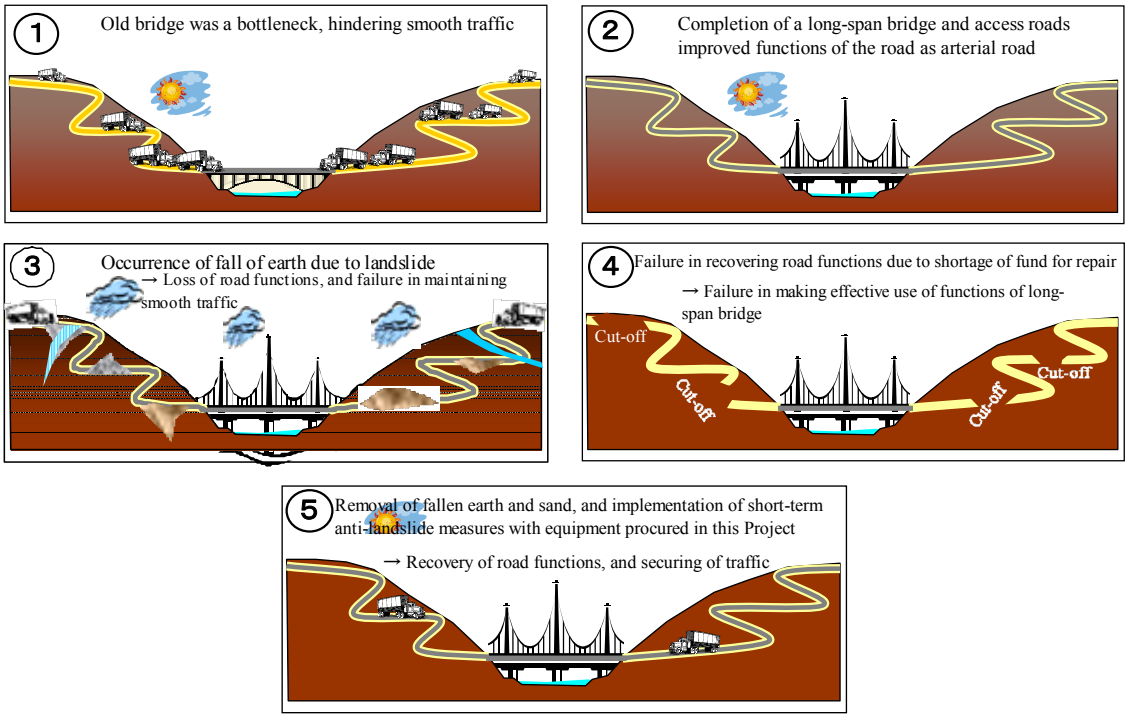


Figure 3-1 Problem of Abay Gorge

However, the route subject to this project passes through a precipitous mountainous zone which is vulnerable to landslides as in ③, and, in fact, a landslide occurred during the construction work. The traffic was secured during the construction work since the constructor, Kajima Corporation, took the responsibility. But now that the construction work was completed, there is no particular prospect of dealing with landslides at the moment. Thus, there is concern that an event shown in ④ could occur.

(2) Actions in the Grant Aid Project

In such circumstances, Japan will implement this Project as shown in ⑤, Figure 3-1, so as to understand the circumstances of the regions in question and sustain the effect of the Grant Aids which

Japan has already provided. The effects of this latest Project are to make it possible to sustain the function of National Route 3 on the self-reliant efforts of Ethiopia itself. Table 3-1 summarizes the effects of this Project.

Table 3-1 Project Effect

Present conditions and problems	Solutions to be offered by the Project	Direct effect and degree of impact	Indirect effect and degree of impact
The Abay Gorge zone on National Route 3 completed in December 2009 passes through areas vulnerable to landslides, and in fact various disasters such as landslides, slope failure, falling rocks, and debris floods. Despite all this, the Ethiopian Roads Authority (ERA) which is responsible for road construction, and maintenance and management of existing roads and the Alemgena District Road Management Contractor (DRMC) which is in charge of the zone in question have sufficient equipment to be used for countermeasure works against frequent landslides in the zone.	Procurement of equipment for landslide countermeasure works	Landslide countermeasure works along National Route 3 of Abay Gorge section will start about 4.5 hours earlier than that of the present condition.	(i) Realizeing stable oil transportation from Sudan, and contributing to the maintenance of a stability of the Ethiopia economy (ii) Contributing to development of technologies concerning landslide countermeasure works in Ethiopia (iii)Contributing to promotion of vital regional economy via creation of employment opportunities by permanently conducting landslide countermeasure works

Rental equipments for landslide countermeasure works along National Route 3 in Abay Gorge section are available in the outskirts of Addis Ababa. Those equipments need to transport between Addis Ababa and Abay Gorge with a distance of about 200km taking about 5 hours approximately. However, the equipment procured under this project will set both Abay Gorge section at Goha Tsion and Dejen so that the time for transportation will shorten from the present about 5 hours to about 0.5 hours in the future. Then, landslide countermeasure works in the section will start about 4.5 hours earlier than before.

(3) Direct Effects and Extent of Improvement

Landslide countermeasure works along National Route 3 of Abay Gorge section will start about 4.5 hours earlier than that of the present condition.

(4) Indirect Effects and Extent of Improvement

(i) Realizing stable oil transportation from Sudan, and contributing to the maintenance of a stability of the Ethiopian economy

(ii) Contributing to the development of technologies in Ethiopia concerning landslide countermeasure works

(iii) Contributing to promotion of vital regional economy via creation of employment opportunities by permanently conducting landslide countermeasure works

3-2 RECOMMENDATIONS

(1) Obligation of Reporting after Procurement of Equipment

Since the equipment to be procured under this Project will be stationed on a permanent basis in Goha Tsion and Dejen in the Abay Gorge zone, where there have been no equipment of the organization, the Alemgena District Road Management Contractor (DRMC) affiliated to the ERA is required to secure new personnel and budget. Where personnel are concerned, the Alemgena training center for construction equipment is properly operated, so that the center is likely to secure the necessary workforce. The required budget, on the other hand, is some 0.1% of the annual budget, thus will be able to be earmarked without any difficulties. At the same time, since the equipment to be procured is to be used for landslide countermeasure works which Ethiopia is not familiar with, the ERA and the Alemgena DRMC are required to make effective use of the equipment by committing themselves to acquisition of technical skills involved in the plan for landslide countermeasure works and the operation of equipment through experts to be dispatched, the survey-type technical cooperation development project which will be soon available in parallel with this Project and related to land-slides occurring in the Abay Gorge.

(2) Technical Support to ERA

There are some landslide countermeasure works, such as cutting and embankment works for construction of alternative routes and control works for landslides, which can be put into execution with the current technical capabilities of Ethiopia. However, further technical assistance will be necessary to apply more appropriate design based on well experienced technical view to landslide countermeasure works.

APPENDICES

1. Member List of the Survey Team
2. Survey Schedule
3. List of Parties Concerned in the Recipient Country
4. Minutes of Discussions
5. Monitoring Sheet

APPENDIX 1

MEMBER LIST OF THE SURVEY TEAM

1) Field Surveys

	Name	Job title	Affiliation
1	Mr. Umenaga Satoshi	Team Leader	Director, Transportation and ICT Division 3 Transportation and ICT Group Economic Infrastructure Department, JICA
2	Mr. Yokoi Hiroyuki	Coordinator	Transportation and ICT Division 3 Transportation and ICT Group Economic Infrastructure Department, JICA
3	Mr. Kono Takuji	Chief Consultant/ Landslide Management	Katahira & Engineers International
4	Mr. Kobayashi Kiyohito	Equipment Planner	Katahira & Engineers International
5	Mr. Tamaki Takakazu	Procurement Planner/ Cost Estimator	Katahira & Engineers International
6	Mr. Yamaguchi Shinji	Operational Coordinator	Katahira & Engineers International

APPENDIX 2

SURVEY SCHEDULE

1) Field surveys (May 10 2009 to June 15 2009)

	Day		JICA		Consultant			
			Leader Umenaga Satoshi	Coordinator Yokoi Hiroyuki	Chief Consultant Kono Takuji	Equipment Planner Kobayashi Kiyohito	Procurement Planner / Cost Estimator Tamaki Takakazu	Operational Coordinator Yamaguchi Shinji
1	Dec 8	Tue	*other project*		Tokyo→Hong Kong: CX505 Hong Kong			
2	Dec 9	Wed	*other project*		→Dubai: CX745 Dubai→Addis Ababa: EK723			Nairobi→ Addis Ababa: ET800
			【15:00～】Meeting w/JICA Ethiopia Office					
3	Dec 10	Thu	*other project*	【10:00～】Meeting w/Alemgana DRMC				
				【14:00～】Site survey & Meeting w/Alemgana Training & Testing Center				
				【16:00～】Site survey at Alemgana Central Workshop →Meeting w/Alemgana DRMC				
4	Dec 11	Fri	*other project*		【10:00～】Site survey at Muketuri section office			
			【16:00～】Meeting and Discussion w/ERA					
5	Dec 12	Sat	Site survey at Muketuri section office and Abay Gorge					
6	Dec13	Sun	*other project*		Site survey at and Abay Gorge			
7	Dec 14	Mon	【10:00～】Meeting and Discussion w/ERA about M/D					
			【16:00～】Meeting and Discussion w/ERA about equipment list					
8	Dec 15	Tue	*other project*		【9:30～】Site survey at Central Warehouse and Central Garage			
					【PM】Data Compiling			
9	Dec 16	Wed	*other project*		Data Compiling			
			【15:00～】Signing M/D (ERA)					
10	Dec 17	Thu	【13:30～】Report to EOJ 【16:00～】Report to JICA office		Data Compiling			
11	Dec 18	Fri	Addis Ababa		【10:00～】Meeting w/Alemgana 【13:30～】Meeting w/ERA	Data Compiling	【10:00～】Meeting w/Alemgana DRMC 【13:30～】Meeting w/ERA	Data Compiling
12	Dec 19	Sat	→Dubai: EK724 Dubai→Kansai: EK316 Kansai→Haneda: JL188		Data Compiling			
13	Dec 20	Sun			Data Compiling			
14	Dec 21	Mon			Addis Ababa→Dubai: ET602 Dubai			Addis Ababa→ Nairobi: ET801
15	Dec 22	Tue			→Hong Kong: CX746 Hong Kong→Tokyo: CX504			

APPENDIX 3

LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY

Ethiopia Roads Authority

Mr. Zaid Wolde Gabriel	Director General
Mr. Masfin Haile	Deputy Director General
Mr. Afework Bezulph	Executive assistance & Advisor to D.G.
Mr. Haddis Tesfaye	Highway Engineer
Mr. Ato Bekele Negussie	Planning & Programming Division Manager
Mr. Nebyou Endale Negash	Alemgena DRMC District Manager
Mr. Demelash Gebre Mariam	Alemgena DED Manager
Mr. Hailu Chekun	Training and Testing Chief
Ms. Mamona Belay	Muketuri Section Engineer II
Mr. Mohamed Sied	Muketuri Section Foreman
Mr. Gekachew Assefa	Industrial Section Head
Mr. Haile Michael Marean	Procurement Service

APPENDIX 4

MINUTES OF DISCUSSIONS

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT FOR OPERATION AND MAINTENANCE OF TRUNK ROAD: GOHA TSHION – DEJEN (EQUIPMENT SUPPLY) IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

In response to a request from the Government of the Federal Democratic Republic of Ethiopia (hereinafter referred to as "Ethiopia"), the Government of Japan decided to conduct a Preparatory Survey on the Project for Operation and Maintenance of Trunk Road: Goha Tsion-Dejen (Equipment Supply) (hereinafter referred to as "the Project") and entrusted the survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Ethiopia the Preparatory Survey Team for the Field Survey (hereinafter referred to as "the Team"), which is headed by Mr. Satoshi Umenaga, Director, Transportation and ICT Division 3, Economic Infrastructure Department, JICA, and is scheduled to stay in the country from December 8th to 21st, 2009.

The Team held discussions with the officials concerned of the Government of Ethiopia and conducted a field survey at the Project sites.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Addis Ababa, December 16, 2009

梅永 悟

Satoshi Umenaga
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Zaid Woldu Gabriel
Director General
Ethiopian Roads Authority
Federal Democratic Republic of Ethiopia

Witnessed by

Tilahun Tadesse
Bilateral Cooperation Sub Process Owner
Ministry of Finance and Economic Development
Federal Democratic Republic of Ethiopia

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the smooth flow and safety of transport on the A3 trunk road between Goha Tshion and Dejen in Abay Gorge through the procurement of equipment.

2. Project Site

The site is Abay Gorge between Goha Tshion and Dejen on the A3 trunk road shown in Annex-1.

3. Responsible and Implementing Organizations

The responsible ministry is the Ministry of Works and Urban Development.
The implementing organization is the Ethiopian Roads Authority (ERA).
The organization chart of the implementing organization is shown in Annex-2

4. Items requested by the Government of Ethiopia

After discussions with the Team, both sides confirmed that the items requested by the Ethiopian side were shown in Annex-3.

JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

5-1. The Ethiopian side understands the Japan's Grant Aid Scheme and necessary measures to be taken by the Government of Ethiopia. The Team explained the procedures for the Project described in Annex-4, 5.

5-2. The Ethiopian side will take the necessary measures, as described in Annex-6 for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

6-1. The Team will proceed with further studies in Ethiopia until December 21, 2009.

6-2. JICA will prepare the draft report and the draft equipment specification in English and send them through JICA Ethiopia office in order to confirm the contents of them by the Ethiopian side in the middle of March, 2010. In response to submission of the

draft report, the Ethiopian side will submit the confirmation letter to JICA Ethiopia office within a week after the receipt of the report.

6-3.If the contents of the report are accepted in principle by the Government of Ethiopia, JICA will complete the final report and send it to the Government of Ethiopia by July, 2010.

7. Other Relevant Issues

7-1.The Ethiopian side shall secure enough budget and personnel necessary for the operation and maintenance of the facilities implemented by the Project, including the periodical maintenance work after delivery of equipment.

7-2.Both sides confirmed that the tender documents including equipment specification should never be duplicated or released to any third parties before the signing of all the Contract(s) for the Project.

7-3.Both sides confirmed that the Alemgena District Road Management Contractor (DRMC) will remain to be the governmental organization under ERA and to be the entity for maintenance of the road and procured equipment for the Abay River Gorge, even if it is planned to be separated from ERA in the course of Business Process Reengineering in Ethiopia.

7-4.Both sides confirmed that the Ethiopian side would establish the depot for procured equipment both at Goha Tsion side and Dejen side.

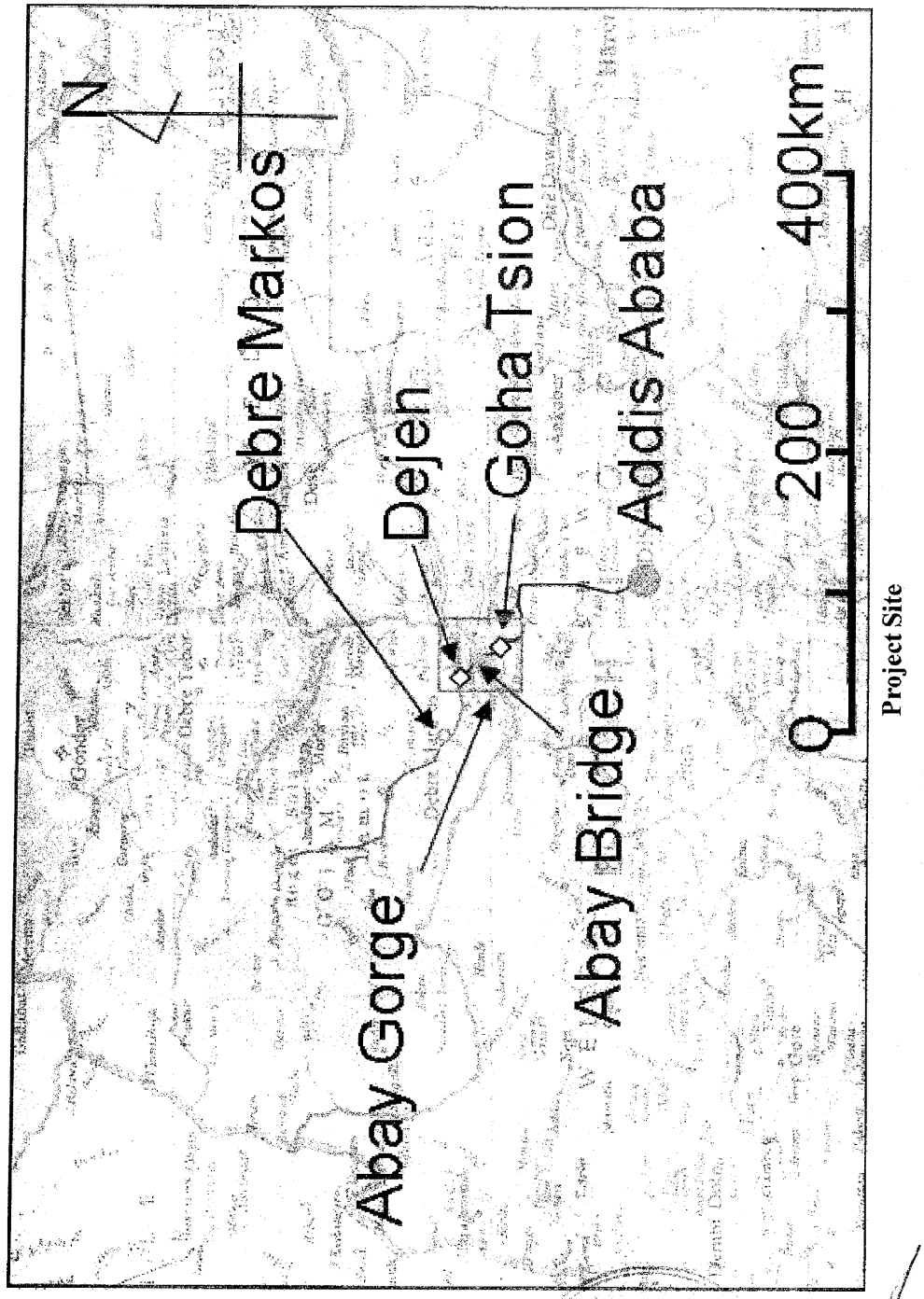
7-5.Both sides confirmed that the delivery site of equipment would be Addis Ababa except the crushing plant and the asphalt plant which would be delivered, installed and conducted an initial operation test at the working site.

7-6.The Ethiopian side shall undertake necessary preparation works to install the crushing plant and the asphalt plant in Abay River Gorge such as clearance of the site, construction of the foundation, etc.

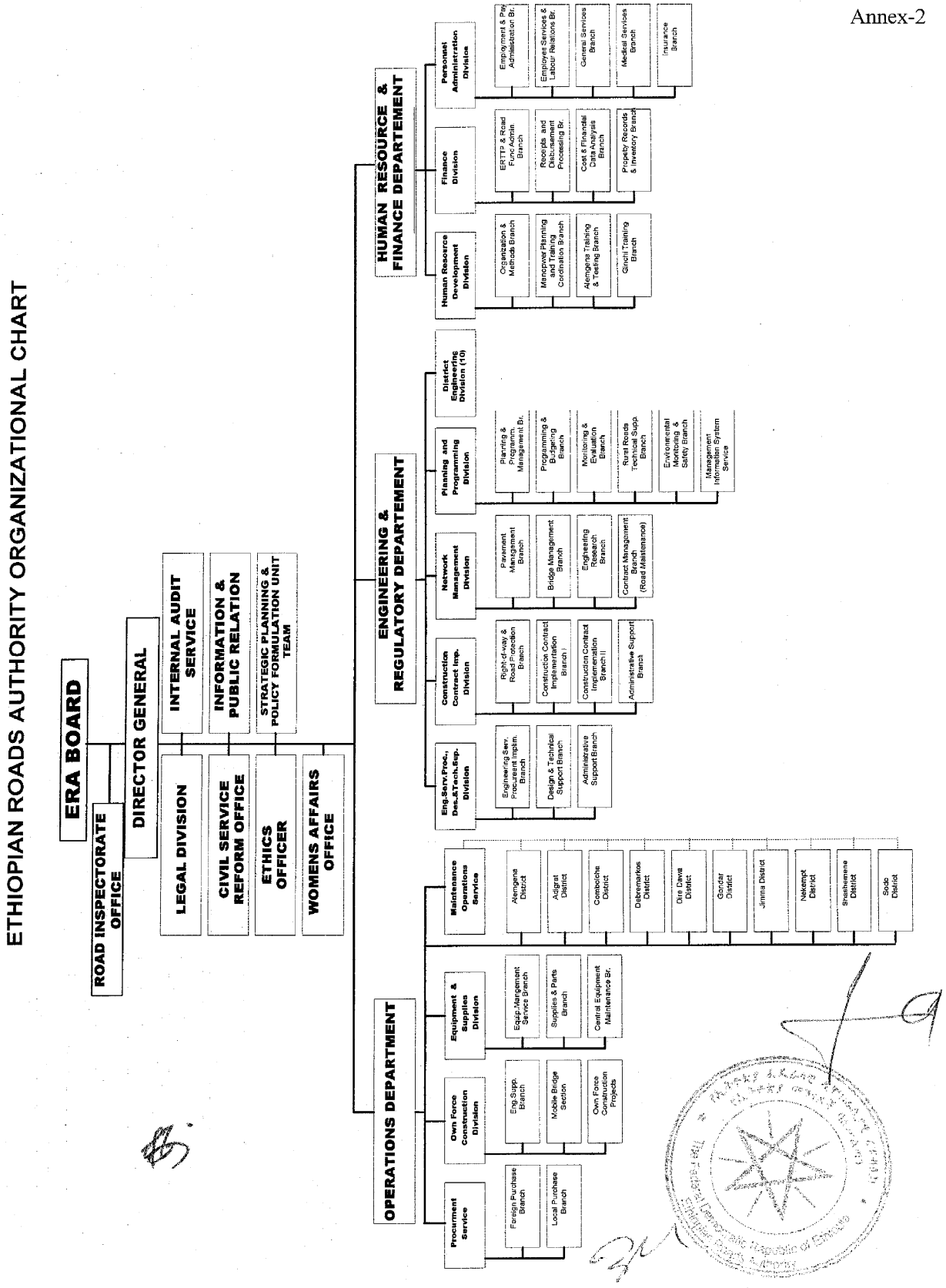
7-6.Both sides agreed that the Ethiopian side would submit a monitoring sheet for procured equipment to JICA Ethiopia office every year for at least three years after procurement. The proposed monitoring sheet shall be shown in the draft report.

Annex-1 Project Site
Annex-2 Organization Chart (ERA)
Annex-3 Equipment List
Annex-4 Japan's Grant Aid
Annex-5 Flow Chart of Japan's Grant Aid Procedures
Annex-6 Major Undertakings to be taken by Each Government

Annex-1


N
Debre Markos
Dejen
Goha Tsion
Addis Ababa
Abay Gorge
Abay Bridge
0
200
400km
Project Site

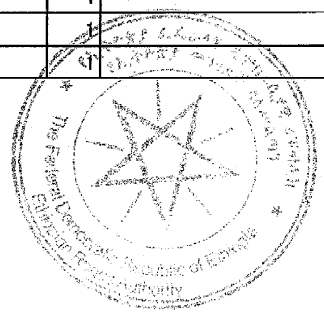
Annex-2


ETHIOPIAN ROADS AUTHORITY ORGANIZATIONAL CHART
ERA BOARD
ROAD INSPECTORATE OFFICE
DIRECTOR GENERAL
LEGAL DIVISION
INTERNAL AUDIT SERVICE
CIVIL SERVICE REFORM OFFICE
INFORMATION & PUBLIC RELATION
ETHICS OFFICER
STRATEGIC PLANNING & POLICY FORMULATION UNIT TEAM
WOMENS AFFAIRS OFFICE
OPERATIONS DEPARTMENT
ENGINEERING & REGULATORY DEPARTEMENT
HUMAN RESOURCE & FINANCE DEPARTEMENT
Procurment Service
Foreign Purchase Branch
Local Purchase Branch
Own Force Construction Division
Eng.Supp. Branch
Mobile Bridge Section
Own Force Construction Projects
Equipment & Supplies Division
Equip.Mangement Service Branch
Supplies & Parts Branch
Central Equipment Maintenance Br.
Maintenance Operations Service
Alemgena District
Adigrat District
Combolcha District
Debremarkos District
Dire Dawa District
Gondar District
Jimma District
Nekempt District
Shashemene District
Sodo District
Eng.Serv.Proc., Des.&Tech.Sup. Division
Engineering Serv. Procurement Implm. Branch
Design & Technical Support Branch
Administrative Support Branch
Construction Contract Imp. Division
Right-of-way & Road Protection Branch
Construction Contract Implementation Branch I
Construction Contract Implementation Branch II
Administrative Support Branch
Network Management Division
Pavement Management Branch
Bridge Management Branch
Engineering Research Branch
Contract Management Branch (Road Maintenance)
Planning and Programming Division
Planning & Programm. Management Br.
Programming & Reporting Branch
Monitoring & Evaluation Branch
Rural Roads Technical Supp. Branch
Environmental Monitoring & Safety Branch
Management Information System Service
District Engineering Division (10)
Human Resource Development Division
Organization & Methods Branch
Manpower Planning and Training Coordination Branch
Alemgena Training & Testing Branch
Ginchi Training Branch
Finance Division
ERTTP & Road Func.Admin Branch
Receipts and Disbursement Processing Br.
Cost & Financial Data Analysis Branch
Property Records & Inventory Branch
Personnel Administration Division
Employment & Pay Administration Br.
Employee Services & Labour Relations Br.
General Services Branch
Medical Services Branch
Insurance Branch

Annex-3

Equipment List

No.	Item	Spec.	Qty.	Purpose
1	Excavator with Hydraulic Breaker	200kw, Bucket 1.4m^3	2	excavating and loading of landslide
2	Wheel Excavator	0.8m^3	2	excavating and loading of landslide
3	Bulldozer	300HP, Weight 37ton	2	dozer working of landslide
4	Motor Grader (one with Front Blade)	155HP, Blade 3.7m	2	reshaping roadbed and base course
5	Front End Loader (Wheel Loader)	178HP, Bucket 3.0m^3	2	loading of landslide
6	Horizontal Boring Machine	ϕ 133	1	horizontal boring for drainage boring
7	Dump Truck	10m^3, 15ton	14	hauling of landslide
8	Lowbed (Truck Trailer)	40ton	1	conveyance of heavy equipment
9	Compressor (L)	140kw	1	Air supply for Crawlwe Rock Drill
10	Compressor (S)	62.5kw	1	Air supply for Jack Hammer
11	Crawler Rock Drill	Rod 3,000mm, Air 16m3/min	1	drilling of Large lock
12	Jack Hammer	18kg	2	drilling of small lock
13	Numatic Roller (Tire Roller)	8.5-13ton, 70.5kw	1	compaction of asphalt surface
14	Road Roller	8-10ton	1	compaction of asphalt surface
15	Asphalt Finisher	4.5m	1	asphalt paving
16	Asphalt Distributor	6,000Lit	1	asphalt paving
17	Asphalt Plant	35ton/h	1	mix of hot asphalt concrete
18	Hot Mini Mixer	2-4m^3/h	2	mix of hot asphalt concrete
19	Crushing Plant	35ton/h	1	making aggregate
20	Small Vehicle (Pick-up)	4WD, Double Cab	2	road patorol and survey
21	Small Vehicle (Station Wagon)	4WD, 7passengers	2	transportation of operators
22	Water Tank Truck	8,000Lit	1	water supply for roller, boring machine
23	Truck with Crane	10ton	1	carry of boring machine accessories
24	Total Station		2	survey of landslide
25	Digital Level		2	survey of landslide
26	Mobile Workshop		1	maintenance of equipment on sites
	Mechanic Tool Box Set (L)	144items	1	on bord equipment
	Mechanic Tool Box Set (S)	44items	1	on bord equipment
	Air Compressor Stationary	2.2kw	1	on bord equipment
	Bench Vice	100mm	1	on bord equipment
	Welding Generator	30-280A	1	on bord equipment
	Hydraulic Crane	3ton	1	on bord equipment
	Oxy-Acetyl, Welding / Cutting Outfit		1	on bord equipment
	Lubricating Equipment		1	on bord equipment
	Electric Equipment		1	on bord equipment
27	Maintenance Equipment		1	for workshop
	Mechanic Tool Box Set (L)	144items	1	
	Mechanic Tool Box Set (S)	44items	1	
	Air Compressor Stationary	2.2kw	1	
	Hydaulic Press with Accessories	55t	1	
	Floor Jack Light and Heavy	5, 15ton	1	
	Bench Vice	100mm	1	
	Welding Generator	30-280A	1	



Annex-4

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

・Preparatory Survey
- The Survey conducted by JICA

・Appraisal &Approval
-Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet

・Authority for Determining Implementation
-The Notes exchanged between the GOJ and a recipient country

・Grant Agreement (hereinafter referred to as "the G/A")
-Agreement concluded between JICA and a recipient country

・Implementation
-Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.

- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment

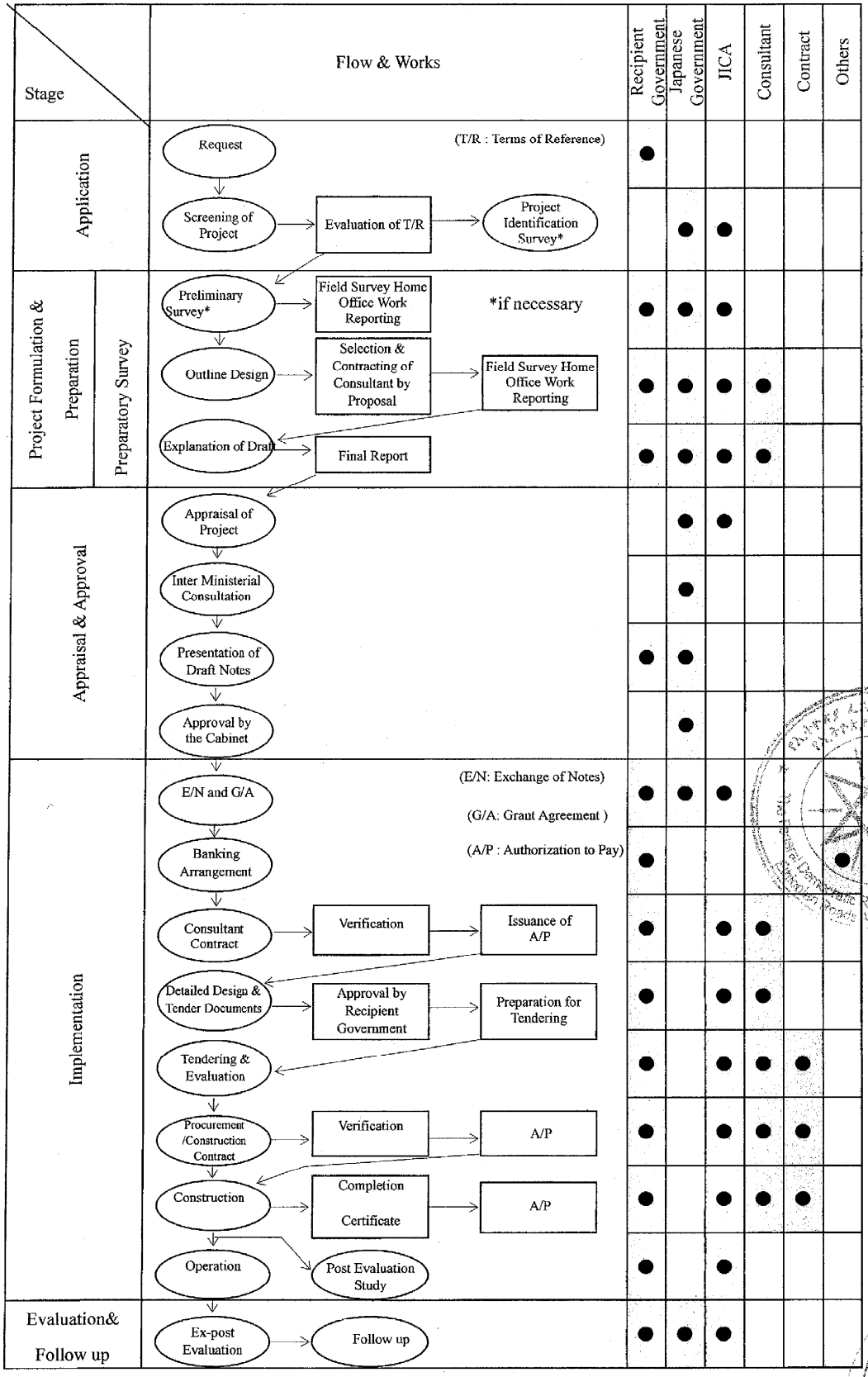
commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

Annex-5

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Annex-6

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country		
	1) Marine (Land and Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the place of disembarkation in Ethiopia		●
	3) Internal transportation from the place of disembarkation to the delivery site in Addis Ababa	●	
2	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
4	To ensure that the products be maintained and used properly and effectively for the implementation of the Project		●
5	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
6	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

APPENDIX 5

Monitoring Sheet

Monitoring Sheet for the Procured Equipment

ERA should make Monitoring Sheet in order to report the operation status and result of the procured equipment to JICA Ethiopia office.
Term: After hand over up to at least three years.
Timing: Once a year

Machinery Inventory (example)

Year 2012

Machinery Name **Excavator**

Remarks Procured by Japanese Grant Aid

Serial No. XXX-XXXXXX

Construction Site / Workshop	Station No.	Jan.	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Abay Gorge	20.000-20.150	■	removal of land slide										
Abay Gorge	17.200-17.280		■■■	removal of land slide									
Workshop				■ periodical maintenance									
Abay Gorge	23.750-24.850			■■■■■■			construction of diversion						