


No. 1

Study Report
on
The Project for Supply of
Road Maintenance Equipment
in
The Republic of Zimbabwe

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PREFACE

In response to a request from the Government of the Republic of Zimbabwe, the Government of Japan decided to conduct a basic design study on the Project for Supply of Road Maintenance Equipment and entrusted the Japan International Cooperation Agency (JICA) to conduct the study with the assistance of the Japan International Cooperation System (JICS).

JICA sent to Zimbabwe a study team from October 30 to November 23, 1995.

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 the Republic of Zimbabwe for their close cooperation extended to the team.

February 1996

Kimio Fujita

President

Japan International Cooperation Agency

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Chapter 1 Background of the Project

The primary means of transportation in the Republic of Zimbabwe (simply called Zimbabwe below), an inland country, is road transportation. About 70% of the total population of 10,410,000 live in rural areas. The State Road Network, spreading over the entire country is used for 90% of the transportation of people and 60% of the transportation of goods in the rural areas. Therefore, it is very important to improve the State Road Network and promote social and economic development in the rural areas.

Most of the existing state roads were built more than 20 years ago and are extremely old. The rural state roads have not been maintained sufficiently due to civil wars and chronic deficit financing. For this reason, the roads cannot be used in the rainy seasons, and the transportation of people and goods is restricted due to bad road conditions even in the dry seasons in some areas.

The Zimbabwean government has announced the development of rural regions by expanding the State Road Network as one of the important policies in the Second Five-Year National Development Plan. Based on this plan, the Department of State Roads (DSR), which has jurisdiction over the State Road Network makes periodical road maintenance plans every year. However, 95% of the road maintenance equipment used by the DSR is hired from the Central Mechanical Equipment Department (CMED) and is getting very old. This causes many difficulties in achieving the plan efficiently.

The Zimbabwean government has made a request for the Japanese Government to render a grant aid assistance to procure road maintenance equipment and promote the periodical road maintenance plan.

Chapter 2 Contents of the Project

2.1 Objectives of the Project

The purpose of the periodical road maintenance plan is to maintain the state roads connecting the rural and communal lands and cities. The project supports the maintenance of roads for three years from 1997 to 1999. In the project sites, maintenance of secondary roads and feeder roads (total length: 1,448.2 km), and related works, such as road shoulders and mowing, are scheduled in the five provinces (Mashonaland West, Matabeleland South, Matabeleland North, Mashonaland East and Mashonaland Central) which are given higher priority. Maintenance of road shoulders and related works is planned in the other province (Manicaland, Masvingo and Midlands).

The project is intended to procure the road maintenance equipment required for the maintenance program, reinforce the DSR road maintenance system and improve the State Road Network.

2.2 Basic Concept of the Project

The maintenance project of primary paved roads in the State Road Network, which was assisted by the World Bank, was completed in June, 1995, and is excluded from the scope of this project. The use of equipment procured under the project is restricted to secondary state roads, feeder roads, and shoulders.

Based on the three-year periodical road maintenance plan made by the DSR, the sites have been prioritized as shown in Table 1, with consideration of the total length of roads. The three province (Manicaland, Masvingo and Midland) to which equipment have been procured under the Project for Improvement of Rural Road in 1994 are given lower priority.

Table 1 Priorities of Project Sites

Priority	Site	Road Length
1	MASHONALAND WEST	366.7 km
2	MATABELELAND SOUTH	343.1 km
3	MATABELELAND NORTH	291.3 km
4	MASHONALAND EAST	259.8 km
5	MASHONALAND CENTRAL	187.3 km
SUB TOTAL		1,448.2 km
6	MANICALAND	290.6 km
7	MASVINGO	151.2 km
8	MIDLANDS	111.6 km
TOTAL		2,001.6 km

Note: Priorities 6, 7, and 8: Maintenance of road shoulders only

Heavy equipment and dump trucks (tipper) are determined as initially requested during equipment selection. However, small bulldozers of 80 horse power were deleted from the requested equipment due to lack of sufficient work capability (15m³/h), difficulty in maintaining blade operating equipment, and their inferior mobility to motor graders.

Since the maintenance of road shoulders is important as auxiliary work for periodical road maintenance, all provinces regularly carry out the following; the mowing of shoulders, maintenance of road signs, lining, and gutter cleaning. The mowers, shovels, and drum cans used by workers (who perform work requiring no special skills), cargo trucks (lorry) with high mobility for carrying soil and sand, and pick-up trucks for carrying supervisors and workshop equipment, including hand tools and lubricants, have been added to the list of requested items. In addition, a trailer truck has been added to the list to save fuel cost when moving heavy equipment, reduce the equipment rental charges (about Z\$40 per 1km driving), and repair equipment immediately.

With these additions, systematic road maintenance, quick road

shoulder maintenance, and appropriate on-site guidance can be carried out. Since equipment can be transported to the workshop for repairs which involve the use of oil, illegal disposal of waste oils and parts around road maintenance sites or stockpiles can be prevented.

The numbers of equipment have been determined according to the amount of work for each unit of equipment calculated from the total length of maintenance roads with consideration of the local situation, based on "the Public Works Estimation Standard" of the Ministry of Construction of Japan. The specifications are based on the design concept stated in the next section.

As a result of these considerations, the basic concept of the project is to provide enough equipment to achieve the three-year periodical road maintenance plan of the total road length of 1,488.2 km and maintenance of shoulders of state roads.

The outline of the project is examined and the basic design is made as follows provided that the Grant Aid is extended.

2.3 Basic Design

2.3.1 Design Concept

(1) Design conditions

- 1) Since the sites are in dry areas, the equipment must be dustproof.
- 2) The equipment must conform to the local safety standards.
- 3) The service system of local agents/distributors has been established and there is no problem in supplying parts and giving instructions.
- 4) The equipment must be selected by considering the equipment used by the DSR and its experience.
- 5) Diesel is used as a fuel. (Local gasoline containing ethanol is sold at a cheap price of Z\$3.54 (about 40 yen). However, it may not be used because it is nonvolatile and highly moisture absorbent, and has a negative effect on the fuel lines and engine of equipment.)

The policies of equipment selection, necessity of equipment at each project site and quantities must be determined as follows.

(2) Equipment selection policy

In the five provinces (Mashonaland West, Matabeleland South, Matabeleland North, Mashonaland East and Mashonaland Central), the numbers of equipment were calculated for each province according to the gravel quantity and the excavation and production of each equipment which were obtained based on the total length of the roads to be maintained. In addition, the operating condition of the existing equipment were also considered to calculate the numbers of equipment.

In the above five provinces and the other three provinces (Manicaland, Masvingo and Midlands), and Harare (DSR headquarters), a cargo truck is required as a road shoulder maintenance for each province to transport equipment and materials, judging from the importance of daily and continuous performance of the work. A pick-up truck is required for each of Mashonaland West, Matabeleland North and Harare to supervise work and transport equipment and materials, in view of to the operating condition of the existing equipment.

(3) Standard for gravel volume calculation

The DSR classifies maintenance works into excavation, loading, compression, transportation, filling and leveling of soil/sand/gravel as listed in Table 2, and uses heavy equipment and transportation vehicles for these tasks.

Table 2 Maintenance Work Classification

Category	Work type	Equipment
Regraveling	Excavation, Loading, Dozing, Transportation, Unloading and Surfacing	Bulldozer → Wheel loader → Dump truck → Motor grader
Low-Cost Improvement	Excavation, Loading, Dozing, Transportation, Unloading and Grading	Bulldozer → Wheel loader → Dump truck → Motor grader
Low-Cost Surfacing	Excavation, Loading, Dozing, Transportation, Unloading, Compaction and Grading	Bulldozer → Wheel loader → Dump truck → Motor grader → Water bowser → Road roller

These three categories of work were used to calculate the gravel volume. The DSR already has water bowzers and road rollers for low-cost surfacing and the pretreatment, therefore it is not necessary for these equipment to be supplied.

(4) Gravel volume calculation method and formula

The gravel amount is calculated in volume. The project uses the value of total length of roads to be maintained x road width (6.5 m) x layer depth (0.1 m).

(5) Calculation method and formula of production of each unit of equipment

The production of each unit of equipment was calculated according to the "Public Works Estimation Standard" of the Ministry of Construction of Japan.

Table 3 shows the calculation method and formula of production of each unit of equipment.

Table 3 Calculation method of production for each unit of equipment.

Equipment	Work amount per hour	Summary of values	Work amount for 3 years (3,000 hours)
Bulldozer	$60 \times 2.81 \times 1 \times 0.6 / 1.87 = 54 \text{m}^3$	2.81: Production per cycle 1 : Grade factor 0.6 : Job efficiency 1.87: Cycle time (in minute)	$54 \text{m}^3 \times 3,000 \text{h} = 162,000 \text{m}^3$
Wheel loader	$3600 \times 1.2 \times 1.2 \times 0.5 / 50 = 51 \text{m}^3$	1.2: Production per cycle 1.2: Grade factor 0.5 : Job efficiency 50 : Cycle time (in minute)	$51 \text{m}^3 \times 3,000 \text{h} = 153,000 \text{m}^3$
Dump truck	$4.5 \times 4 = 18 \text{m}^3$	4.5: Body volume 4 : Number of trip	$18 \text{m}^3 \times 3,000 \text{h} = 54,000 \text{m}^3$
Motor grader	$1000 \times 3.7 \times 5 \times 0.1 \times 0.5 / 6 = 88.8 \text{m}^3$	3.7: Effective blade width 5 : Working speed 0.1: Grading depth 0.5: Job efficiency 6 : Average work frequency	$88.8 \text{m}^3 \times 3,000 \text{h} = 266,400 \text{m}^3$

(6) Calculated numbers of equipment

The numbers of equipment are calculated based on the gravel amount and production of each equipment.

Table 4 lists the calculated numbers of equipment for each site and the number of equipment examined in this project.

Table 4 Numbers of Equipment for Each Site

No	Project Site	Length (m)	Gravel (m ³)	BULLDOZER		WHEEL LOADER		MOTOR GRADER		DUMP TRUCK		CARGO TRAILER		PICK-UP		TOTAL (B)
				(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	
1	MASHONALAND WEST	366.7	238,355	1.47	1	1.55	1	0.89	1	4.41	4	1	1	1	1	10
2	MATABELELAND SOUTH	343.1	223,015	1.37	1	1.45	1	0.83	1	4.12	4	1	0	0	0	8
3	MATABELELAND NORTH	291.3	189,345	1.16	1	1.23	1	0.71	0	3.50	4	1	0	1	1	8
4	MASHONALAND EAST	259.8	168,870	1.04	1	1.10	1	0.63	0	3.12	2	1	1	0	0	6
5	MASHONALAND CENTRAL	187.3	121,745	0.75	1	0.79	1	0.45	1	2.25	2	1	0	0	0	6
6	MANYICALAND	290.6	188,890	-	-	-	-	-	-	-	-	1	0	0	1	1
7	MASVINGO	151.2	98,280	-	-	-	-	-	-	-	-	1	0	0	1	1
8	MIDLANS	111.6	72,475	-	-	-	-	-	-	-	-	1	0	0	1	1
9	HARARE (HEADQUARTERS)	-	-	-	-	-	-	-	-	-	-	0	0	1	1	1
TOTAL				5.79	5	6.12	5	3.51	3	17.40	16	8	2	3	3	42

(A) Numbers calculated

(B) Numbers examined

(7)Necessity of equipment for each site

Mashonaland West: Although the calculated number of bulldozers is 1.47, one existing bulldozer can be used to supplement work, thus one bulldozer is required. Since the bulldozers have tracks and are less mobile than vehicles, one trailer truck needs to be procured for this province which has the longest roads to be maintained. The calculated number of wheel loaders required is 1.55, but only one is considered to be required because workers can assist loading. Motor graders are so useful and versatile (gutter cleaning) machines among heavy equipment that they are frequently used in Zimbabwe. One motor grader is required though the calculated number is 0.89. Since there are no existing dump trucks, four dump trucks are required. The operating condition of pick-up trucks is as low as 25% due to lack of parts, thus one pick-up truck is required.

Matabeleland South: Two existing bulldozers can be used to perform auxiliary work, so one more bulldozer is required. Since there is no wheel loader, one is required. One motor grader is required for the same reason as for Mashonaland West. The calculated number of dump trucks is 4.12, but four dump trucks are considered required because the number of trips can be adjusted.

Matabeleland North: One existing bulldozer can perform auxiliary work, so one more bulldozer is required. Since four motor graders are in use, no motor grader is required. Since there is no wheel loader nor pick-up truck, one each are required.

Mashonaland East: Since there is no bulldozer, one bulldozer is required as calculated. No motor grader is considered since two motor graders are in use. Since two dump trucks are in use, two more are required. This province has a well-organized workshop with a large storage area, thus one trailer truck is required to transport heavy equipment.

Mashonaland Central: One bulldozer is required as calculated. Since there is no wheel loader, one wheel loader is required. Since the operation rate of the motor grader is about 10%, one motor grader is required. The operation rate of dump trucks is about 65%, which is higher than that for the other provinces, so two dump trucks are considered necessary though the calculated number is four.

The above five states, Manicaland, Masvingo and Midlands:

One cargo truck is required for each province because it is frequently used to transport equipment and materials to maintain road shoulders.

Harare (DSR headquarters):

Two pick-up trucks are now in use, but one more pick-up truck is necessary to supervise work and transport equipment and materials more efficiently.

2.3.2 Basic Design

(1) Equipment plan

The main specifications, quantities, and purpose of each equipment are as follows:

Table 5 Equipment Plan

No	Equipment	Specification	Qty	Purpose
1	Bulldozer	Fly wheel power 225HP-230HP, diesel engine, straight tilt dozer, 3 shank ripper	5	excavation, dozing
2	Wheel Loader	Fly wheel power minimum 109HP, diesel engine, minimum 1.6m ³ bucket volume	5	excavation, loading
3	Motor Grader	Fly wheel power 124HP-135HP, diesel engine, 3-shank ripper	3	grading, surfacing
4	Dump Truck	Diesel engine, approx 4.6m ³ body volume	16	transportation of gravel
5	Cargo Truck	Diesel engine, maximum pay load minimum 4.5tons, towing hook equipped	8	transportation of equipment and materials
6	Trailer Truck	Diesel engine, maximum pay load 30 tons, with low bed	2	transportation of heavy equipment
7	Pick-Up	Diesel engine, maximum pay load minimum 1ton, 2WD single cabin	3	transportation and supervising

(2) Specifications of equipment

Bulldozer: The horse power must be 225 to 230 HP to perform excavation and dozing efficiently on hard grounds. The bulldozer must be the tilt-blade type that has the blade with different right and left heights with respect to the horizontal surface of the track frame. It has a ripper to reduce compression and increase work efficiency. A decelerator pedal is added to improve operation. The bulldozer has a ROPS canopy (rollover protection structure) to assure safety in case of rollover. To improve the durability of the engine, the cooling system has a corrosion filter. The rate of spare parts is 10% of the CIF price, and the cutting edges that can be locally purchased are not included. The quantities of filters, V belts, hydraulic hoses, seals, O ring kits and starter parts are considered.

Wheel loader: The wheel loader must have a general bucket with teeth to load rocks and gravel. It has a ROPS canopy to assure safety in case of rollover. It is the Z bar link type with a high digging operation. The dumping clearance is 2.6 m or more to load onto dump trucks. The rate of spare parts is 10% of the CIF price, and the teeth that can be locally purchased are not included. The quantities of filters, V belts, hydraulic hoses, seals, O ring kits, and starter parts are considered.

Motor grader: The motor grader must have a three-shank ripper to perform graveling/surfacing on hard grounds. The frame can be locked with a lock pin, rigid type, to improve operability for driving. A water separator is added to the fuel system to improve durability of

the fuel injection system.

It has a blade slip clutch or a shear pin to protect the mold board. It has a ROPS canopy to assure safety in case of rollover. The rate of spare parts is 10% of the CIF price, and the cutting edges that can be locally purchased are not included. The quantities of cables, filters, V belts, hydraulic hoses, seals, O ring kits, brake linings and starter parts are considered.

Dump truck: The dump truck with a right-hand steering wheel is used to transport gravel (4x2). Since the wheel loader used to load gravel has a bucket capacity of 1.6 m³, the capacity of the vessel of the dump truck must be filled with three loads. The height of the vessel is determined by the loading height (about 2,600 mm) of the wheel loader. The maximum load is calculated by assuming that the specific gravity of gravel per m³ is about 1.6 tons. Dump trucks with a vessel capacity of 4.6 m³ or more, a vessel height of 2,300 mm or less, and the maximum payload of 7,000 to 8,500 kg are considered. Seat belts are equipped as safety parts. The rate of spare parts is 10% of the CIF price. In particular, PTO shafts, cables, hydraulic pump parts and hub bearings are considered.

Cargo truck: The cargo truck with a right-hand steering wheel is used to transport road equipment and materials (4x2). The maximum payload is 4,500 kg or more. It is the full trailer type and a tractor hook, air, and electrical components are added to the rear of the frame. It is equipped with a large battery. Seat belts are equipped as safety parts. A lubricating pump, a grease pump and a manual pump

are provided so that the DSR can maintain the trucks. The rate of spare parts (including tools) is 15%.

Trailer truck: The trailer truck with a right-hand steering wheel is the semi trailer type (6/4) that carries 30-ton class heavy equipment. The maximum engine output is 281 HP or more. The trailer (low bed) has electric divices, brake and loading lamp. Seat belts are equipped as safety parts. Parts are made compatible by sharing truck rear axle parts (hubs, bearings, brake shoes, brake chambers, etc.) with the trailer undercarriage components. The rate of spare parts of trucks is 8%, and the rate of spare parts of trailers is 2%.

Pick-up truck: The pick-up truck, used to transport road equipment and supervise the site, has a right-hand steering wheel, a single cabin, rear-wheel drive and a diesel engine (displacement: 2,100 cc or more). The maximum payload is 1,000 kg or more. Seat belts are equipped as safety parts. The rate of spare parts is 10% of the CIF price. Brake pads, shoes, V belts, hub seals, and axle bearings, which are frequently replaced, are considered.

The bodies and cabins (including accessories, such as canopies and blades) of the above equipment must be painted in DSR designated yellow or golden yellow.

Table 6 lists the calculated rates of spare parts per service time with respect to the CIF price of the main units of heavy equipment as the basis of calculation of quantities of spare parts. When the service time is 1,000 hours, the three models

have a few items, and only quick service, such as oil filter replacement, can be carried out. Except for factory failures or quality problems caused by misuse of the operator, the manufacturer warrants the quality (warranty period: about 1 year /1,000 to 1,500 hours), and the equipment can be serviced free of charge, assuming that the agent/distributor has the ability to do so.

Therefore, the spare parts are provided for the equipment service time of 2,000 to 3,000 hours in the project (the equipment service time is 1,000 hours per year, and three years of the project are considered). The rate of spare parts is determined to be 10% of the CIF price for the following reasons:

- 1)The DSR can maintain equipment after the warranty period of the manufacturer.
- 2)Necessary parts are added by excluding the manufacturer's recommended parts not required for the DSR.
- 3)It allows for differences because there are variations in the main unit CIF prices and parts prices by some manufacturers.

Table 6 Hourly Recommended Spare Parts of Heavy Equipment

Equipment	Usage (hour)	Parts Cost (x1000yen)	No of Items	Spare Parts Detail
Wheel Loader	1000	186	47	Teeth, O ring, Pin
	2000	662	111	Filter, nozzle, seal, O ring, hose
	3000	998	156	Filter, nozzle, seal, O ring, electrical parts
	5000	2250	349	Filter, nozzle, seal, O ring, electrical parts, engine overhauling kit, sensor
Bulldozer	1000	251	18	Filter, cutting edge, pin
	2000	648	59	O ring, seal, nozzle, pin, cutting edge
	3000	1131	102	Filter, nozzle, seal, O ring, electrical parts, pin, cutting edge
	5000	4914	374	Filter, nozzle, seal, O ring, electrical parts, engine overhauling kit
Motor Grader	1000	173	30	Filter, cutting edge, pin
	2000	575	118	Filter, nozzle, seal, O ring, electrical parts
	3000	1010	161	Filter, nozzle, seal, O ring, electrical parts, bearing
	5000	2121	322	Filter, nozzle, seal, O ring, electrical parts, engine overhauling kit, hose, pin, cutting edge

* Vehicle data is unknown.

(3) Local agents/distributors of Japanese manufacturers

The DSR requests for high-quality equipment made by a Japanese or other manufacturer that has established a service system in Zimbabwe to supply parts. Several Japanese manufacturers provided heavy equipment under grant aid projects and have a service and parts supply system. Some Japanese manufacturers are producing vehicles at knockdown plants in Zimbabwe and South Africa, so the service and parts supply system has been well established. According to the Zimbabwean import of trucks and buses (1993), the market share Japanese trucks and buses is outstanding, accounting for 95%. This is advantageous in the procurement of parts.

(4) Procurement of equipment from the third countries and local procurement

The possibilities of procurement of equipment from the third country and local procurement were investigated. The motor graders may be procured from the third country and trailer and pick-up trucks may be procured locally.

Motor grader: The motor graders of the same type as considered in the project are manufactured by knockdown in South Africa (20 per month) and can be procured. About 100 motor graders were imported to Zimbabwe. The percentage of local procurement of the motor grader components is about 20% and they are of high quality. The components meet South African arrangements and the front axle bushes are extended to endure severe use. The after-sales service is provided by an agent of the manufacturer in Zimbabwe and a parts supply system has been well established.

Trailer truck: The trailer truck of the same type as considered in the project is manufactured by knockdown in Zimbabwe and can be procured. Its quoted price is lower than that of a Japanese trailer truck, and the quality and the service and parts supply system are good. It is worth consideration in the project, but its delivery may be uncertain. The DSR owns no trailer truck, but used one hired from a private company. Thus there is no problem if they acquire a new one.

Pick-up truck: 500 to 700 pick-up trucks of the same type as considered in the project are manufactured by knockdown in Zimbabwe every year and are available. The percentage of local procurement of

the components (glass, tires, sheets, and cables) is about 20% and the main parts are imported from other countries, and are of high quality. The factory has a claim feedback system and the assembly lines are managed properly. The number of the pick-up trucks of the same type, now in use in the local market, has already reached about 5,000. Thus, service system and parts supplies by the agents are stable.

Chapter 3 Implementation Plan

3.1 Implementation Plan

3.1.1 Implementation Schedule

Table 7 shows the implementation schedule.

Table 7 Implementation Schedule

		1	2	3	4	5	6	7	8	9	10	11	12
S C H E D U L E	DETAILED DESIGN (4.6 month)	SITE SURVEY											
			TENDER										
				EVALUATION & CONTRACT									
	PROCUREMENT				MANUFACTURING & PROCUREMENT								
										TRANSPORTATION			
											SITE INSPECTION		

3.1.2 Obligations of recipient country

When a grant aid assistance is implemented, the government of the recipient country is required to take the following measures:

- 1) to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and inland transportation of the products purchased under the Grant Aid.

2) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the goods and services under the Verified Contracts.

3) to accord Japanese nationals whose services may be required in connection with the supply of the goods and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

4) to open an account in an authorized foreign exchange bank in Japan and to issue an Authorization to Pay.

3.2 Maintenance Plan

As the DSR comes to own more equipment as a result of the project, it needs to increase the equipment management cost and determine the annual budget for increasing nine maintenance staff (one for each province and one for the headquarters). The annual equipment management cost calculated from the Japanese "Construction Machine Depreciation Manual" for the current situation in Zimbabwe is 45,498,600 yen (about Z\$415 million) as shown in Table 8. It is about 2% of the 1995 DSR annual road maintenance budget and does not seem to affect the DSR operations.

Table 8 Operation and Maintenance Costs

No.	Cost Item	Amount (yen)
1	Management	3,884,000
2	Maintenance/Repair	6,392,600
3	Personnel	3,240,000
4	Spare Parts	8,008,000
5	Fuel	23,311,000
6	Oil and Lubricants	663,000
	Total	45,498,600

The method used to calculate the above costs is described below.

(1) Management Cost

The management cost includes such expenses as taxation and levies, insurance premiums, storage cost and administration cost, etc. and is calculated by multiplying one-percent of each vehicle cost by the number of vehicles. Table 9 shows the breakdown of the management cost.

Table 9 Breakdown of Management Cost

Equipment	Basic Price (1,000yen)	Rate of Annual Management Cost	Number of Vehicle	Management Cost (1,000yen)
Bulldozer	26,900	1%	5	1,345
Motor Grader	15,500	1%	3	465
Wheel Loader	10,000	1%	5	500
Trailer Truck	15,000	1%	2	300
Dump Truck	6,060	1%	16	969.6
Cargo Truck	3,340	1%	8	267.2
Pick-up	1,240	1%	3	37.2
Total	-	-	42	3,884

Note: The basic price is the standard price of equipment based on standard specifications. The annual management cost rate is the percentage of equipment rented by the government free of charge.

(2) Maintenance Cost

The maintenance cost covers all expenses required to repair and maintain the equipment in proper operational order but excludes the operation expenses. Table 10 shows the breakdown of the maintenance cost.

Calculation equation

Basic price x maintenance/repair rate x number of vehicles - spare parts cost/10 (expected service length:10 years)

Table 10 Breakdown of Maintenance Cost

Equipment	Basic Cost (1000yen)	Maintenance /Repair Rate(%)	Number of Equipment	Cost of Provided Spare Parts (1000yen)	Service Length	Total Cost (1000yen)
Bulldozer	26,900	27	5	15,870	10	2,044.5
Motor Grader	15,500	47	3	4,176	10	1,767.9
Wheel Loader	10,000	21	5	4,036	10	646.4
Trailer Truck	15,000	21	2	4,051	10	224.9
Dump Truck	6,060	25	16	7,892	10	1,634.8
Cargo Truck	3,340	20	8	5,055	10	28.9
Pick-up	1,240	25	3	478	10	45.2
Total	-	-	42	-	-	6,392.6

Note: The maintenance repair rate is calculated according to the Construction Machine Depreciation Manual, assuming that the service life is 10 years. The supply parts cost is based on the estimated price.

(3) Personnel Cost

$$30,000(\text{yen}) \times 9(\text{Person}) \times 12 \text{ months} = 3,240,000(\text{yen})$$

(4) Expendable Parts Cost

Of the many expendable parts, the cost of tyres is singled out here because of the high degree of correlation between tyre wear and the operation rate and also because of the nature of the replacement/repair work which does not require highly professional skills. Table 11 shows the expendable parts (tyre) cost by vehicle type.

Table 11 Breakdown of Expendable Parts (Tyre)

Vehicle Type	Cost per Vehicle (1000yen)	Number of Vehicle	Management Cost (1000yen)
Dump Truck	210	16	3,360
Cargo Truck	146	8	1,168
Trailer Truck	210	2	3,360
Pick-up	40	3	120
Total	-	28	8,008

Note: The cost of tyres for the wheel loaders is not included here because their removal and fitting requires special skills.

(5) Fuel Cost

Table 12 shows the breakdown of the fuel consumption and cost.

Calculation equation

Fuel consumption by each vehicle x estimated horse power x annual operation hours (1,000 hours) x number of vehicles/equipment x local price of gas oil

Table 12 Breakdown of Fuel Consumption and Cost

Equipment	Fuel Consumption Rate (litre/PS.hour)	Horse Power (PS)	Annual Hours of Operation	Number of Equipment /Vehicle	Annual Consumption (litres)
Bulldozer	0.133	224	1,000	5	148,960
Motor Grader	0.081	130	1,000	3	31,590
Wheel Loader	0.115	110	1,000	5	63,250
Trailer Truck	0.56	320	1,000	2	358,400
Dump Truck	0.04	225	1,000	16	144,000
Cargo Truck	0.04	186	1,000	8	59,520
Pick-up	0.04	80	1,000	3	7,200
Total Fuel Consumption				42	812,920
Total Cost	812,920 × Z\$ 2.68 / litre = 23,311,000 (yen)				

(6) Oil and Lubricant Cost

Here, only the cost of engine oil is calculated in the following manner.

Calculation equation

Engine oil cost

= quantity of engine oil required per vehicle x frequency of oil replacement x number of vehicles x price of engine oil

Table 13 shows the breakdown of the engine oil consumption and cost.

Table 13 Breakdown of Engine Oil Consumption and Cost

Equipment	Capacity of Engine Oil (litres)	Replacement Frequency	Number of Vehicles	Total (litres)
Bulldozer	20	5	5	500
Wheel Loader	20	5	5	500
Motor Grader	20	3	3	300
Trailer Truck	20	2	2	80
Dump Truck	20	2	16	640
Cargo Truck	10	2	8	160
Pick-up	5	2	3	30
Engine Oil Consumption	-			2,210
Total Cost	2,210 × 300 yen / litre = 663 (1000yen)			

Chapter 4 Project Evaluation and Recommendations

4.1 Project Effect

The Zimbabwean government considers maintenance of the State Road Network to promote social and economical development of rural areas as one of the important policies in the Second Five-Year National Development Plan. The DSR makes periodical road maintenance plans every year and is doing its utmost to maintain the state roads of the total length of 1,448.2 km in the next three years.

This project is based on the three-year periodical road maintenance plan (1997 to 1999) and promotes efficient road maintenance by procuring necessary road maintenance equipment. It is expected to produce favorable effects on rural residents, therefore it is appropriate to offer a grant aid assistance to the project.

This project is expected to give the following benefits to residents:

This project provides the DSR with road maintenance equipment to promote maintenance of secondary roads and feeder roads and maintain the roads that connect the rural and communal lands and cities. In addition, it is expected to contribute to implementation of the local development plan and resettlement plan to share farm lands fairly.

Maintenance of the State Road Network activates distribution of people and merchandise between the rural areas and cities, encourages economic activities, stabilizes prices, and facilitates access to local educational and medical institutions.

By improving the shoulders of the roads in all the provinces, the vision of drivers is improved and accidents due to the sudden appearance of animals on roads can be prevented. Accidents are also prevented when pedestrians walk on the road shoulders, thus increasing safety (30,248 accidents occurred in 1994).

When the road surfaces are improved, the wear of the undercarriage and chassis parts of vehicles and transportation costs can be reduced.

4.2 Recommendations

There is no problem in the implementation setup of the Zimbabwean side for this project. The project can be carried out more effectively and smoothly by improving the following items:

- 1) The DSR trains operators to the appropriate method of using equipment by itself or in cooperation with the agent of the manufacturer.
- 2) The agent of the manufacturer supports the DSR supervisors and workshop staff in maintenance and management of equipment on a regular basis.
- 3) The DSR trains engineers, gives incentive to them to discourage them from working for private companies, establishes a equipment maintenance and management system, and stabilizes the equipment operation rate.
- 4) The DSR is responsible for management and maintenance of the equipment and the allocation of required personnel and budget for maintenance and management.

[Appendices]

1. Member List of the Survey Team

(1) Mr. Takefumi MAYUMI
(Road Construction)

Japan International
Cooperation System

(2) Ms. Chizuki OIZUMI
(Procurement and Estimation)

Japan International
Cooperation System

2. Survey Schedule

No.	DATE	ITINERARY	STAY
1	Oct.30 (Mon)	Narita (NH201) - London	London
2	Oct.31 (Tue)	London (UM725) ---	-
3	Nov. 1 (Wed)	--- 0605 Harare Courtesy call to Japanese Embassy, Ministry of Transport & Energy, Dept. of State Roads (DSR)	Harare
4	Nov. 2 (Thu)	Discussion with DSR	Harare
5	Nov. 3 (Fri)	Site Survey (Midlands)	Harare
6	Nov. 4 (Sat)	Discussion with DSR	Harare
7	Nov. 5 (Sun)	Inner meeting	Harare
8	Nov. 6 (Mon)	Survey on Local Manufactures/Distributors	Harare
9	Nov. 7 (Tue)	Site Survey (Manicaland)	Harare
10	Nov. 8 (Wed)	Discussion with DSR	Harare
11	Nov. 9 (Thu)	Discussion with DSR	Harare
12	Nov.10 (Fri)	Signing of Minutes of Discussion	Harare
13	Nov.11 (Sat)	Discussion with DSR	Harare
14	Nov.12 (Sun)	Inner meeting	Harare
15	Nov.13 (Mon)	Survey on Local Manufactures/Distributors	Harare
16	Nov.14 (Tue)	Survey on Local Manufactures/Distributors	Harare
17	Nov.15 (Wed)	Site Survey (Mashonaland East)	Harare
18	Nov.16 (Thu)	Discussion with DSR	Harare
19	Nov.17 (Fri)	Report to Japanese Embassy	Harare
20	Nov.18 (Sat)	Inner meeting	Harare
21	Nov.19 (Sun)	Harare(UM763) - Johannesburg	JHB
22	Nov.20 (Mon)	Report to Japanese Embassy in South Africa	JHB
23	Nov.21 (Tue)	Survey on Local Manufactures/Distributors	JHB
24	Nov.22 (Wed)	Johannesburg (SQ405) - Singapore	-
25	Nov.23 (Thu)	Singapore (SQ012) - Narita	

3. List of Party Concerned

(1) Ministry of Transport and Energy

Mr. P. Kodzwa Permanent Secretary

(2) Department of State Roads

Mr. Nelson Kudenga Director
Mr. John Makadho Deputy Director Operations
Mr. Musharo Deputy Director Planning
Mr. Samuel T. Murimba Chief Engineer Planning
Mr. Francis Hwekwete Chief Engineer Maintenance
Mr. Victor Magaya Engineer, Labour-Based
 Deve't Unit, Maintenance Br
Mr. Maxwell Chaka Engineer, Labour-Based
 Deve't Unit, Maintenance Br
Mr. Asfaw Kindanu Advisor on Intermediate Technology
Mr. Tetsuo Yamane JICA Expert
Mr. G. N. Pfachi Provincial Road Engineer
 Mashonaland East (Harare)
Mr. B. M. Mushavi Provincial Road Engineer
 Mashonaland Central (Harare)
Mr. Ian C. Cannell Provincial Road Engineer
 Midlands (Gweru)
Mr. G. Nhemachena Provincial Road Engineer
 Matabelbeland North
Mr. Edward Chidziya Resident Engineer, CU 1
 Manicaland (Mutare)

(3) Embassy of Japan in Zimbabwe

Mr. Haruo Okamoto Minister
Mr. Hironobu Yasumura Counselor
Mr. Yasuo Shoji First Secretary

(4) Embassy of Japan in South Africa

Mr. Hideaki Harada First Secretary

(5) Local Manufacturere and Distributors in Zimbabwe

Mr. Eric Bowes	Marketing Executive Willowvale Mazda Motor
Mr. Edwin Sagomba	Sales Representative Gov't Zemco CAT
Mr. Issac Munetsi	Salesman, Nissan Zimbabwe
Mr. Shepherd Masiyakurima	Salesman, Nissan Zimbabwe
Mr. John Saunders	Director, Plant & Equipment (Komatsu Distributor)
Mr. Wayne Roselt	Sales, TANDEM/SCANIA
Mr. Stuart German	Sales Representative Amtec Motors
Ms. Nicci Macklin	Nissan Sales Quest Motor
Mr. Dave Pichanick	Marketing Director BELL PTA

(6) Local Manufacturere and Distributors in South Africa

Mr. Jim B. Monachino	Country Manager Caterpillar Overseas S.A.
Mr. H.B. (Henri) van derWalt	Managing Director Barlows Equipment Manufacturing Co SA
Mr. Norman Murison	Customer Services Manager Barlows Equipment Manufacturing Co SA

Minutes of Discussions
on
the Study on the Project
for
Supply of Road Maintenance Equipment
in
The Republic of Zimbabwe

In response to a request from the Government of the Republic of Zimbabwe, the Government of Japan has decided to conduct a Study on the Project for Supply of Road Maintenance Equipment (herein after referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Republic of Zimbabwe a Study Team which is scheduled to stay in the country from November 1 to November 19, 1995.

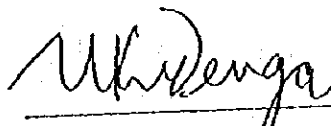
The team held a series of discussions with the concerned officials of the Government of the Republic of Zimbabwe, and conducted a field survey.

As a result of discussions and field survey, both sides agreed to recommend the main items described in the attached sheets to the respective governments.

Harare, November 10, 1995



Mr. Takefumi MAYUMI
Leader
Study Team
Japan International
Cooperation Agency



Mr. Nelson Kudenga
Director
Department of State Roads
Ministry of Transport & Energy

ATTACHMENT

1. OBJECTIVE

The objective of the Project is to provide road maintenance equipment which are essential for road maintenance activities in order to sustain the road condition, hence to contribute to socio-economical development in Zimbabwe.

2. PROJECT IMPLEMENTING AGENCY

The implementing agency is the Department of State Roads (DSR) under the Ministry of Transport and Energy

3. PROJECT SITE

The proposed sites of the Project have been prioritized as follows through a series of discussions, and a map of the sites is shown in Annex 1.

- Priority
- 1: Mashonaland West
 - 2: Matabeleland South
 - 3: Matabeleland North
 - 4: Mashonaland East
 - 5: Mashonaland Central
 - 6: Manicaland
 - 7: Masvingo
 - 8: Mindlands

4. MAJOR ITEMS REQUESTED BY THE ZIMBABWEAN SIDE

As a result of the series of discussions, the items shown in Annex 2-1 are requested by the Zimbabwean side and the priority of the items are shown in Annex 2-2.

However, the final component of the Project will be decided after further studies.

5. JAPANESE GRANT AID PROGRAMME

The Zimbabwean side has understood the system of Japanese Grant Aid Programme explained in Annex 3.

6. FURTHER SCHEDULE OF THE STUDY

The team will proceed to further studies in Japan.

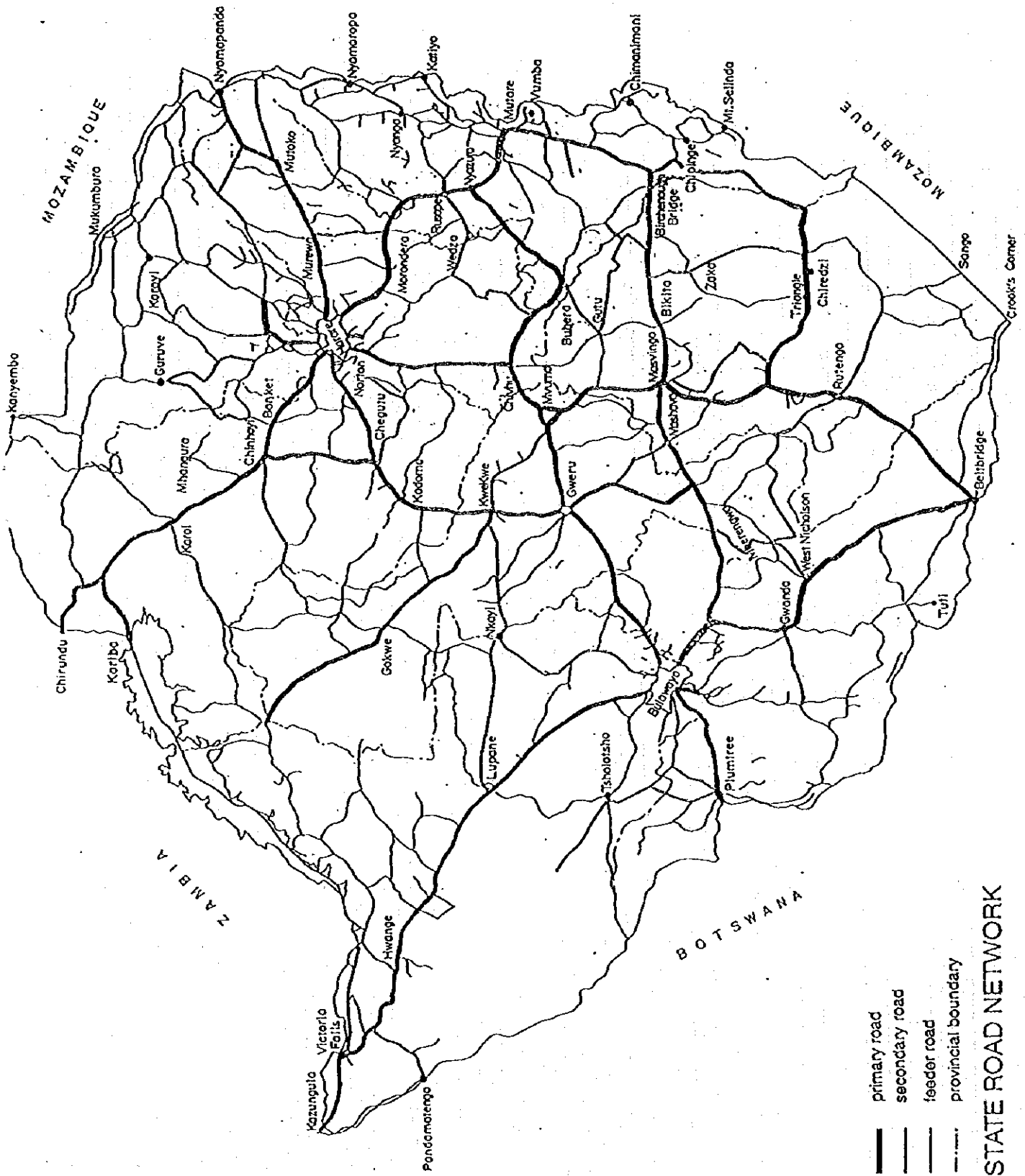
J. M. S.
MC

7. OTHER RELEVANT ISSUES

- 1) The Zimbabwean side will allocate the necessary budget and personnel for execution of the Project.
- 2) Although DSR has been sub-contracting some of its road maintenance services under current structural changes, Maintenance Units of DSR, which are directly in charge of road maintenance, shall remain under DSR, which shall have the ownership of the equipment purchased under the Grant Aid.
- 3) DSR will maintain and use the equipment purchased under the Grant Aid properly and effectively, and shall assign the necessary staff members for operation and maintenance of the equipment as well as to bear all the expenses other than those to be borne by the Grant Aid.

J. M. M.
MC

Annex 1 Proposed sites of the Project



J. May
W.

Annex 2-1 List of requested items

1. Bulldozer Max engine power 168-171 kw, straight tilt dozer with 3-shank Rippers and Rops Canopy
2. Motor Grader Max engine power 93-101 kw, 3.7 m blade, right type frame with Rippers and Rops Canopy
3. Wheel Loader Water-cooled engine, max engine power 82 kw or more, 1.6 m³ or more Bucket and Rops Canopy
4. Lorry Tipper (Dump Truck) Max engine power 141-156 kw, payload 7,000 kg or more, vessel volume 4.6 m³ or more, forward control 4/2
5. Lorry (Cargo Truck) Pay load 4.75 ton or more, flat body, forward control 4/2, brake and electrical connection
6. Horse (Trailer Head) Max engine power 210 kw or more enough for towing Low Bed loaded 30 ton heavy equipment, brake and electrical connection to Low Bed
7. Low Bed (Trailer) Carrying for 30 ton heavy equipment, 2 or 3 axle with brake system, flat bed type
8. Pick-up Truck 4WD, Single cab / 2WD

J. May
WC

Annex 2-2 Priority of requested items

No.	Province	Priority		Dozer		Loader		Grader		Tipper		Lorry		Horse+Bed		Pick-up		Sub-Total	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1	Mashonaland West	1	2	1	2	1	1	4	5	1	1	1	1	1	1	1	1	10	13
2	Matabeleland South	1	1	1	1	1	1	4	5	1	2	0	0	0	0	0	0	8	11
3	Matabeleland North	1	1	1	1	0	1	4	5	1	2	0	1	1	1	1	1	8	12
4	Mashonaland East	1	1	1	1	0	0	2	2	1	2	1	1	1	1	0	1	6	8
5	Mashonaland Central	1	1	1	1	1	1	2	2	1	2	0	0	0	0	0	0	6	8
6	Manicaland	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	2
7	Masvingo	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	2
8	Midlands	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	2
9	DSR Head Office	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
	Total	5	6	5	6	3	4	16	19	8	12	2	3	9	42	59			

J. M...

APPENDIX 1

JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid Program is executed by the following procedures:

- Application (request made by a recipient country)
- Study (Preliminary Study and Basic Design Study conducted by JICA)
- Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet of Japanese Government)
- Determination of Implementation (Exchange of Notes between the both Governments).
- Implementation (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grant Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency)

Secondly, JICA conducts the Study (Basic Design Study), using a Japanese consulting firm. If the background and objective of the requested Project are not clear, a Preliminary Study is conducted prior to Basic Design Study.

Thirdly, the Government of Japan appraises the Project to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted to the Cabinet for approval.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Contents of the Study

(1) Contents of the Study

The purpose of the Study (Preliminary Study/Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

- ① to confirm background, objectives, benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation,
- ② to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,
- ③ to confirm items agreed on by both parties concerning a basic concept of the project,
- ④ to prepare a basic design of the Project,
- ⑤ to estimate cost involved in the Project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the Project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized in Exchange of Notes.

(2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is (are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is proceeded.

(3) Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of project formulation & preparation as mentioned above.

A result of the Study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process (appraisal and approval).

It should be noted that at the stage of Preliminary Study, neither the Government of Japan, nor JICA, nor the Study team make any commitment concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

(2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant etc. are confirmed.

(3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within a single fiscal year, all procedures such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s), and making final payments to them must be completed.

(4) Under the Grant, in principle, goods and services to be purchased should be of origins of Japan or the recipient country.

When the two Governments deem it necessary, the Grant may be used for the purchase of goods, services, or both from a third country(ies).

However, the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

(5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to the Japanese tax payers.

(6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

- ① to secure land necessary for the sites of the Project and to clear and level the land prior to commencement of the construction work,
- ② to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,
- ③ to secure buildings prior to the installation work in case the Project is providing equipment,
- ④ to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and inland transportation of the products purchase under the Grant Aid,
- ⑤ to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the goods and services under the Verified Contracts,
- ⑥ to accord Japanese nationals whose services may be required in connection with the supply of the goods and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchase under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

(8) Re-export

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

(9) Banking Arrangement (B/A)

The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.

The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

Major Undertaking to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot	●	
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct the buildings	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site		●
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.		●
13	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.		●

APPENDIX 2

LIST OF REQUESTED ITEMS

<u>ITEM</u>	<u>UNITS</u>
1. Bulldozer 80HP, 6.3T, Power-Angletilt Dozer	8
2. Bulldozer 225HP, 22T, Straight-tilt Dozer, Ripper	8
3. Wheel Loader 110HP, 1.7 m3 Bucket	8
4. Motor Grader 135HP, 3.7 m Blade, Scarifier	8
5. Lorry tipper 5 m3	32

JICA