

Fig. 2-2-31 Plan of Access Road

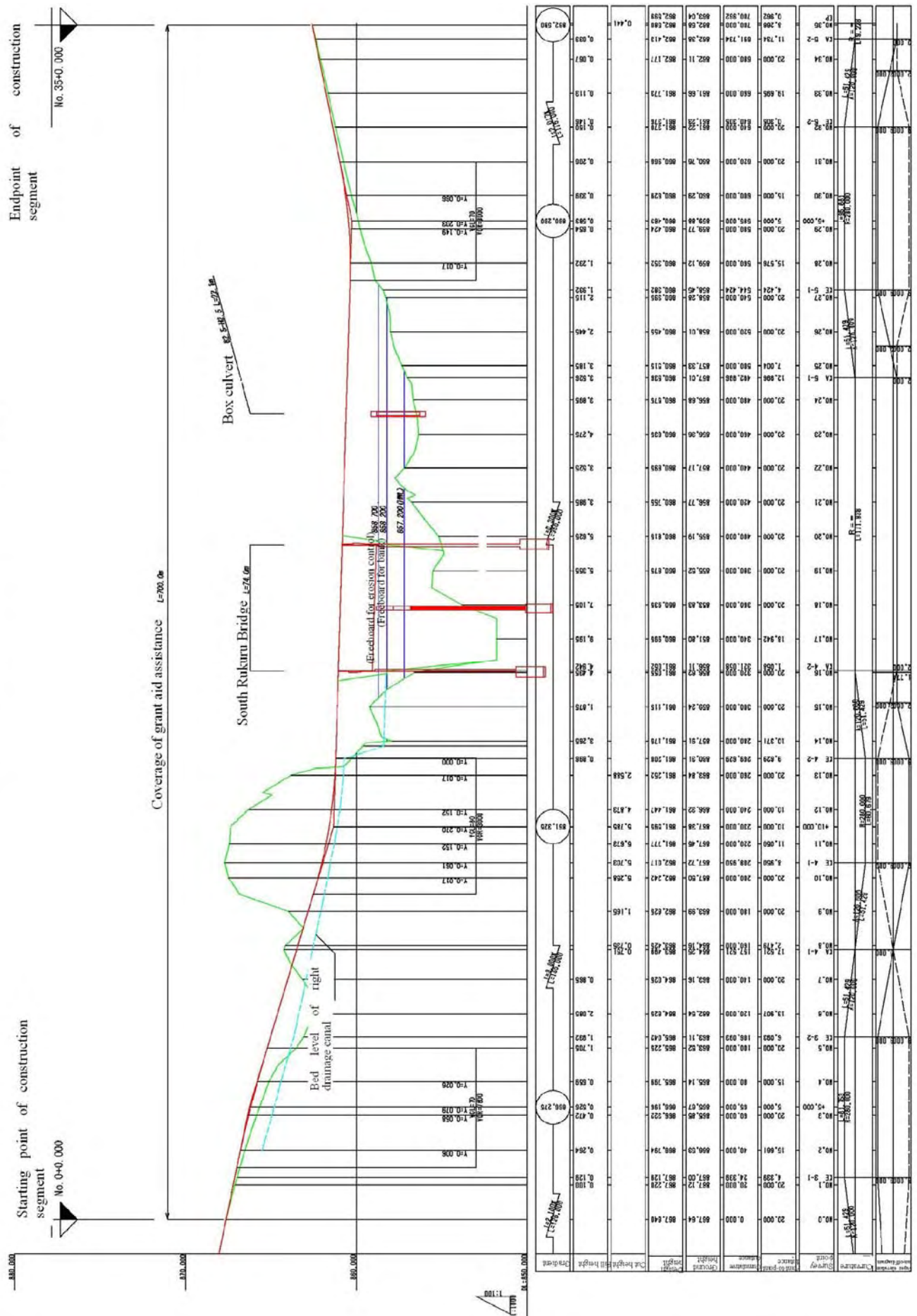


Fig. 2-2-32 Profile of Access Road

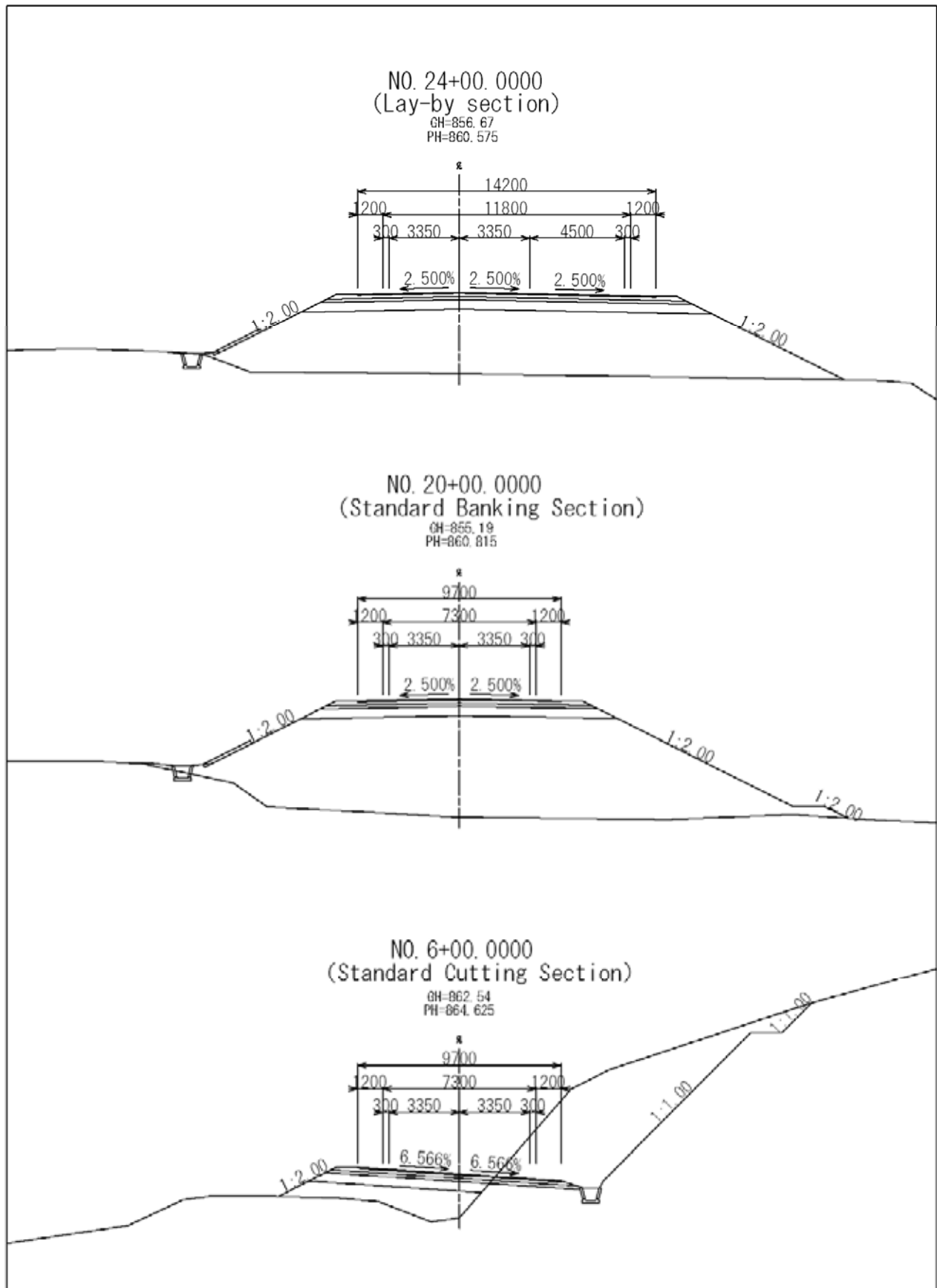
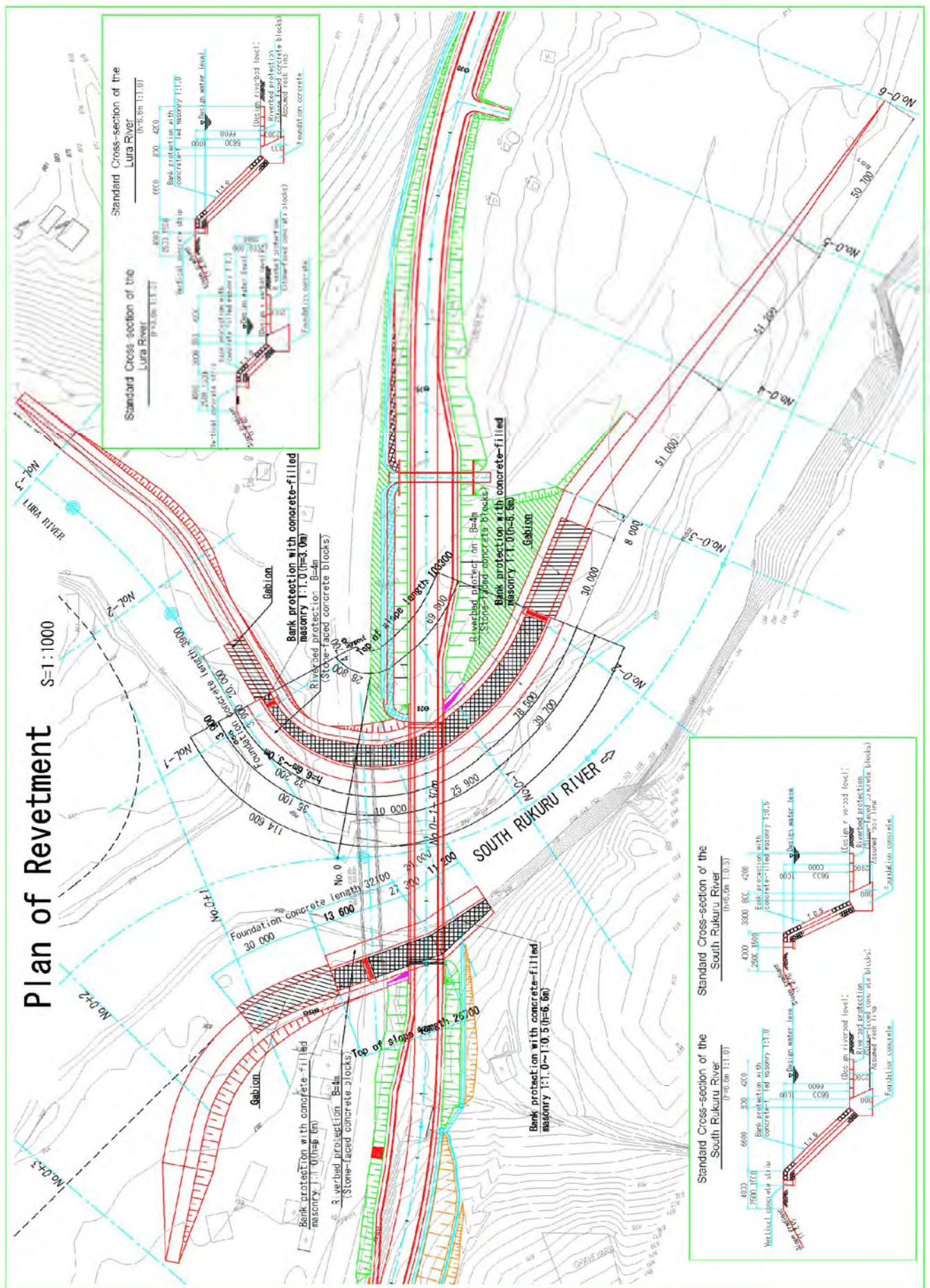


Fig. 2-2-33 Standard Cross-section







## 2-2-4 Implementation Plan

### 2-2-4-1 Implementation Policy

Assuming that the Project will be implemented within the framework of Japan's grant aid assistance, the following points are considered in the work policy.

- ① To help vitalization of local economy, creation of employment opportunities, and promotion of technology transfer, this project will be implemented utilizing locally-available engineers, workers, materials, and equipment as much as possible.
- ② We request the Malawian side to secure the land needed for the implementation of this project (relocation of houses and expropriation of land) before the beginning of this project at the expense of the Malawian side.
- ③ We request the Malawian side to provide tax exemption regarding all customs duties, domestic taxes, value added taxes, etc. relating to this project, including the procurement and importation of materials and equipment relating to works.
- ④ We ask the Malawian side to provide convenience concerning the country entry and exit of persons relating to the implementation of this project.
- ⑤ We ask the Malawian side to ensure smooth and safe passage of construction-related vehicles using existing Rukuru Bridge.
- ⑥ During the implementation of foundation works, reliable performance of work will be ensured through confirmation of actual geological conditions and execution of careful supervision including the confirmation of bedding surface for spread foundation.
- ⑦ Practical and reliable work plans will be developed considering rainfall patterns and water level changes and using appropriate and reasonable work methods.
- ⑧ Proposals regarding the methods and timing of maintenance and repair after completion of work, as well as proposals regarding operational issues, will be made. As part of this endeavor, this project will include reinforcement of non-structural measures such as training of Malawian engineers taking charge of future maintenance.

### 2-2-4-2 Implementation Conditions

#### (1) Safety during construction period

To ensure safety during construction period, attention will be paid mainly to the following points.

Because the entrance/exit used by construction-related vehicles will be the intersection with the existing Main Road 1, which is an international trunk road with heavy traffic of large vehicles, we will station security guards at the entrance/exit and request for the placement of traffic police officers.

Because the construction will involve activities in the river, a system for adequate river water monitoring and communication will be established to ensure safety against accidents due to river water rise.

#### (2) Environmental protection during construction period

To ensure environmental protection during construction period, attention will be paid mainly to the following points.

The generation of suspended particulate matter from the operation of construction-related vehicles will be minimized using water spraying, speed restriction, etc.

Noise and vibration from construction machines will be minimized by avoiding work in early morning and night hours.

River water pollution due to the inflow of muddy water resulting from substructure construction and other construction work in the river will be addressed by measures such as the provision of reserve tanks and pumps.

The slope surfaces of embankment and cut sections will be treated with protective measures such as block sodding.

**(3) Compliance with labor standards**

The constructor will conform to the current construction-related laws and regulations of Malawi and respect appropriate labor conditions and customs relating to employment for the purpose of preventing conflicts with workers and securing safety.

**(4) Maximum utilization of the dry season**

In performing pier foundation excavation work in the river, the cost of water cut-off work varies greatly depending on the time in the year. For this reason, the water cut-off work for the pier foundation construction in this project is planned for execution during the dry season aiming at cost reduction. Therefore, bidding documents need to contain sufficient description of these conditions so that they are communicated completely to bidders and the constructor needs to be instructed to maximize the operation during the dry season in actual execution of work.

**(5) Situations concerning customs clearance**

Because Malawi is an inland country without port facilities in the country, all construction materials and equipment procured from Japan or a third country will be transported via the neighboring Republic of South Africa. Therefore, construction plan needs to be developed sufficiently considering the time needed for transportation, unloading, customs clearance procedures, etc.

**(6) Emphasis on concrete quality control**

The main works in this project are the works on A1 abutment, P1 pier, and A2 abutment in substructure construction and the works on concrete girders in superstructure construction. This means that the main works are concrete works. Therefore, constructions need to be executed with the highest priority placed on concrete quality control including the management of materials such as aggregates, sand, water, and cement, specifications for concrete mixing plants, specifications for concrete transportation, management of concrete placing, curing management.

### 2-2-4-3 Scope of Works

If and when this grant-aid project is implemented, the scope of works to be conducted by the governments of Japan and Malawi will be as outlined below.

Table 2-2-31 Scope of Works to Be Conducted by the Governments of Japan and Malawi

Japanese side	Malawian side
<ul style="list-style-type: none"> <li>▪ Replacement of South Rukuru Bridge (bridge length 74 m) and construction of 626-m access road, bank protection, riverbed protection, etc., which comprise assistance project works indicated in the Basic Plan.</li> <li>▪ Removal of existing deposits of boulders, driftwood, etc. prior to substructure construction works.</li> <li>▪ Construction and demolishing of temporary facilities (materials and equipment yards, offices, etc.)</li> <li>▪ Measures to ensure safety of work and safety of general traffic passing through the construction area during work period.</li> <li>▪ Measures to prevent environmental pollution due to work during work period.</li> <li>▪ Procurement, importation, and transportation of construction materials and equipment indicated in Materials and Equipment Procurement Plan. Re-exportation to the procurement source country in the case of imported equipment.</li> <li>▪ Development of working design and bidding documents, and contract documents, assistance in bidding, and supervision of work execution indicated in Work Supervision Plan, including the supervision of environmental management plans.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expropriation of land needed for this project, demolishing of affected facilities and houses, and smooth relocation of inhabitants.</li> <li>▪ Gratuitous provision of land for temporary facilities needed for this assistance project.</li> <li>▪ Issuance of IDs to construction-related personnel and stickers to construction-related vehicles.</li> <li>▪ Provision of waste disposal sites needed for this assistance project.</li> <li>▪ Surveillance of general construction sites during construction.</li> <li>▪ Supervision by the Malawi Government Officials during construction.</li> <li>▪ Withdrawal of the existing bridge.</li> <li>▪ Exemption from customs duties, domestic taxes, other charges in the tax system, etc. imposed by the government of Malawi.</li> <li>▪ Provision of convenience for the entry, staying, etc. of Japanese and third country citizens relating to this assistance project.</li> <li>▪ Payment of bank charges (opening of bank account (B/A), procedures regarding Authority to Pay (AP)).</li> </ul>



#### **2-2-4-4 Consultant Supervision**

##### **(1) Basic policy for Consultant supervision services**

Assuming that this project will be implemented within the framework of Japan's grant-aid assistance, the following points are listed as the basic policy for Consultant supervision services.

Because the quality of works greatly affects the service life and durability of completed facilities, Consultant supervision will be performed placing the highest priority on quality supervision.

Particular attention will be paid to concrete works, foundation works, and the works performed in the river including bank protection and riverbed protection works.

Second to quality supervision, emphasis is also placed on work progress supervision, safety supervision, and payment supervision.

For the purpose of accomplishing these tasks, joint on-site inspection and regular meetings will be held by the constructor and the consultant at weekly intervals to identify problems and discuss corrective measures.

In addition, regular meetings of the representatives from the clients (MOTPI and RA), the constructor, and the consultant will be held on a monthly basis to identify problems and discuss corrective measures.

Local engineers will be employed as inspectors for the purpose of facilitating technology transfer regarding work supervision techniques including the methods for quality supervision, work progress supervision, safety supervision, etc.

The instructions to constructors, the records of all meetings, the reports to clients, etc. will be archived and reported in documents.

##### **(2) Consultant supervision services of the consultant**

The following outlines the main tasks contained in the consultant contract.

##### **1) Bidding document preparation phase**

The consultant performs working design of each facility according to the results of the Outline Design Study Report. Next, the consultant prepares work contract documents and obtains the approval of MOTPI of Malawi's government regarding the following products.

- Design report
- Design drawings
- Bidding documents.

##### **2) Work bidding phase**

Under the assistance of the consultant, MOTPI selects a contractor holding Japanese nationality by means of open bidding. The agent selected by the government of Malawi involved in the open bidding and the subsequent work contracting shall be a person holding total authority for giving approval regarding work contract. The consultant assists MOTPI and RA concerning the following services.

- Bidding announcement
- Preliminary qualification screening
- Bidding and bidding evaluation.

##### **3) Consultant supervision phase**

Following the conclusion of the work contract between the constructor selected by bidding and MOTPI as the representative of the government of Malawi, the consultant gives the constructor the order to start Consultant work and begins Consultant supervision services. In Consultant supervision services, the consultant reports the progress of work directly to MOTPI, the Japanese Embassy to Malawi, and JICA, and also sends monthly reports via mail to other stakeholders as needed. As the Consultant supervision services to the constructor, the consultant performs office works concerning work progress, quality, safety, and payment, as well as it provides technical improvements and proposals relating to works.

The consultant performs defect inspection 1 year after the completion of Consultant supervision, and this marks the completion of consultant services.

### **(3) Personnel plan**

The personnel and their roles needed in detailed design, work bidding, and Consultant supervision phases are as follows.

#### **1) Detailed design phase**

- Chief: Performs overall supervision of technical aspects and service coordination in the detailed design phase and serves as the main contact for client relations.
- Bridge Engineer (Superstructure): Performs on-site study, structural calculation, preparation of design drawings, and calculation of quantities concerning superstructure design.
- Bridge Engineer (Substructure): Performs on-site study, structural calculation, stability calculation, preparation of design drawings, and calculation of quantities concerning substructure design.
- Road Engineer: Performs road design including definitive calculation of road alignment, determination of standard cross-section, slope treatment works, road drainage design, preparation of design drawings, and calculation of quantities.
- River Engineer: Performs on-site study, structural calculation, stability calculation, preparation of design drawings, and calculation of quantities concerning river structures.
- Work Plan & Cost Estimation: Performs preparation of work plans and cost estimation using design quantities and unit prices of works from the output of detailed design.
- Bidding Documents: Performs preparation of bidding documents.

#### **4) Work bidding phase**

The consultant assists MOTPI in the finalization of preliminary qualification screening documents and bidding documents, execution of preliminary qualification screening, and work bidding evaluation.

- Chief: Supervises the above consultant services throughout the bidding process.
- Bridge Engineer: Performs approval of bidding documents and assists in bidding evaluation.

#### **5) Work supervision phase**

- Chief: Supervises consultant services in work supervision as a whole.
- Stationed Engineer: Performs overall control of on-site work supervision, reporting of work progress to relevant Malawian organizations, and coordination.
- Structural Engineer: Takes charge in revision of work plans for bridge and bank protection works, supervision of concrete works and superstructure PC stressing, etc. In addition, the Structural Engineer confirms foundation bedding surfaces identified after excavation in foundation works and takes charge of on-site adjustment of foundation works whenever needed.

### 2-2-4-5 Quality Control Plan

The following Table shows the quality control plan in this project.

Table 2-2-32 List of Quality Control Items (Draft)

Item			Test Method	Frequency of Test
Subgrade (macadam)	Blended material		Liquid limit, plasticity index (<sieve No. 4)	For each blend
			Particle-size distribution (blending)	"
			Aggregate abrasion loss test	"
			Aggregate density test	"
			Maximum dry density (compaction test)	"
	Laying		Density test (compaction rate)	Once/day
Prime coat / tack coat	Material	Bituminous material	Quality certificate	For each material
			Application amount	Per 500 m <sup>2</sup>
Asphalt	Material	Bituminous material	Quality certificate, ingredient analysis table	For each material
			Aggregates	Particle-size distribution (blending)
		Water absorption		For each material
		Aggregate abrasion loss test		"
	Blending test		Stability	For each blend
			Flow value	"
			Porosity	"
			Aggregate porosity	"
			Tensile strength (indirect)	"
			Residual stability	"
			Design asphalt amount	"
			Laying	
	Rolling temperature	For each transport		
	Marshall test	About once/day		
	Concrete	Material	Cement	Quality certificate, chemical & physical test results
Water			Ingredient test result	For each material
Admixture			Quality certificate, ingredient analysis table	For each material
Fine aggregates			Oven dry density	For each material
			Grain size distribution, fineness modulus	"
			Percentages of clay lumps and soft particles	"
Coarse aggregates			Oven dry density	For each material
			Flake content	"
			Particle-size distribution (mix)	"
			Sodium sulfide diagnosis (missing mass)	"
At the time of blend test		Compressive strength test	For each blend	
At the time of laying		Slump	Once/batch	
		Temperature	Once/day	
Strength		Compressive strength test (7 days, 28 days)	Once/day or = 50 m <sup>3</sup>	
Steel bars	Material		Quality certificate, tensile test result	For each lot
Structural steel	Material		Mill sheet	For each lot
Coating	Material		Quality certificate, ingredient table	For each lot
Bearing	Material		Quality certificate, strength test result	For each lot
Lighting equipment	Material		Quality certificate, strength test result	For each lot

## 2-2-4-6 Material and Equipment Procurement Plan

### (1) Procurement of construction materials

Locally produced materials are sand, aggregates, substrate materials, timber, etc., and other items will be imported.

The policy for material procurement is as follows.

If there is an imported product that is supplied constantly to the market and has adequate quality, procure such product.

Products that cannot be procured locally will be procured from Japan or a third country. The source of procurement will be determined comparing price, quality, time needed for customs clearance, etc.

The following Table shows the possible procurement sources of main construction materials.

Table 2-2-33 Possible Procurement Sources of Main Construction Materials

Item	Source			Reason for choosing procurement from Japan
	Local	Japan	Third country	
PC steel		○		Not marketed in the country. Although procurement from a neighboring third country is possible, specifications may not be satisfied.
Steel handrail		○		Because handrails are highly visible to users, products from a neighboring third country may result in uneven quality and inferior workmanship.
Steel for temporary works		○		Leased products that cannot be procured locally will be procured from Japan.
Rubber bearing		○		Not marketed in the country. Although procurement from a neighboring third country is possible, quality of material (rubber) is uneven and specifications of this project may not be satisfied.
Shape steel		○		Not marketed in the country. Although procurement from a neighboring third country is possible, specifications may not be satisfied.
Bituminous material	○			
Aggregate	○			
Asphalt bituminous material	○			
Portland cement (blended cement)	○			
Expansion device		○		Not marketed in the country. Although procurement from a neighboring third country is possible, quality of material is significantly uneven and specifications of this project may not be satisfied.
Cement additive		○		Procured from Japan considering quality.
Steel bars			○	Scarcely marketed in the country. Procured from South Africa considering quality and supply quantities.
Timber for formwork	○			
Diesel oil	○			
Gasoline	○			
Bridge deck waterproof materials		○		Procurement from local sources and neighboring countries is difficult. When used locally, these are usually imported from Japan, Europe, or the US.



## (2) Construction machines

Construction machines related to road construction can be procured within Malawi. However, Machines for bridge manufacture and placement cannot be procured within Malawi, and need to be procured from Japan or a third country such as South Africa. Because there is no ready-mixed concrete plant in Malawi, a concrete plant will be established in the camp yard to ensure efficient quality control of concrete.

The following Table shows the possible procurement sources of main construction machines and the reasons for choosing procurement from Japan.

Table 2-2-34 Possible Procurement Sources of Main Construction Machines

Type	Specifications	Source			Reason for choosing procurement from Japan
		Local	Japan	Third country	
Bulldozer	15t	○			
Backhoe	0.6m <sup>3</sup>	○			
Dump truck	10t	○			
Wheelloader	1.2m <sup>3</sup>	○			
Truck crane	20 t			○	
Crawler crane	60~80 t		○		Procured from Japan because local procurement is difficult and leasing from a third country (South Africa) is impossible.
Motor grader	3.1m	○			
Road roller	10-12 t	○			
Tire roller	8-12 t	○			
Vibrating roller	0.8-1.1 t	○			
Tamper	60-100kg		○		Procured from Japan because local procurement is difficult and leasing from a third country (South Africa) is impossible.
Large breaker (attachment)	1,300kg			○	
Concrete plant	0.5m <sup>3</sup>	○	○		Procured from Japan because local procurement is difficult and leasing from a third country (South Africa) is impossible.
Road sprinkler	5500-6000lit	○			
Steel wire jack	225 t	○			
Erection girder			○		Procured from Japan because local procurement is difficult and leasing from a third country (South Africa) is impossible.

### 2-2-4-7 Implementation schedule

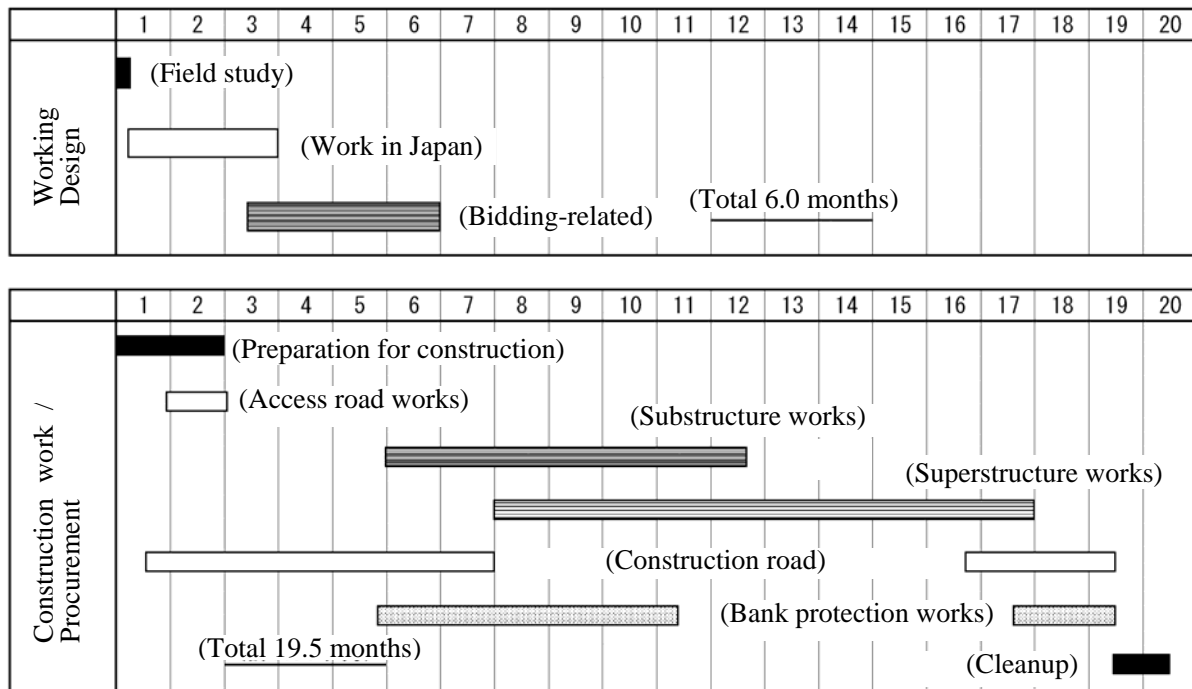
After the conclusion of the Exchange of Notes (E/N) relating to this project, the consultant enters into the consultant service contract with the government of Malawi, and commences the working design task for this project as a grant-aid assistance project. After commencement of services, the consultant performs the on-site study for working design for about 2 weeks, and thereafter performs the preparation of detailed design and bidding documents in Japan.

Subsequently, after the conclusion of the Exchange of Notes (E/N) relating to bidding assistance services, work supervision services, and the main construction works, the consultant assists the government of Malawi in performing tasks relating to bidding, such as the preparation of bidding documents, the qualification screening of potential contractors, bidding, selection of contractor, and the construction work contract.

The contractor selected by bidding enters into a construction work contract with the government of Malawi. After the construction work contract is authorized by the government of Japan, the contractor begins construction work following the issuance of the order to start construction work issued from the consultant.

The work implementation schedule for execution of these tasks is summarized in Table 2-2-35.

Table 2-2-35 Implementation Schedule



## 2-3 Obligations of the Recipient Country

The duties of the government of Malawi in relation to the implementation of this project are as follows.

### 2-3-1 General Duties in Japan's Grant Aid Assistance Projects

- To provide the data and information needed for the implementation of the project plan.
- To secure the land needed for the implementation of the project plan (land for road, working yard, camp yard, materials and equipment storage yard).
- To prepare construction sites before beginning of construction works.
- To open a bank account in the name of the government of Malawi at a bank in Japan and issue the Authorization to Pay.
- To conduct speedy unloading at the site of entry to Malawi and to ensure tax exemption and customs duties exemption.
- To exempt the Japanese corporations and Japanese citizens involved in this project from customs duties, domestic taxes, and other taxes regarding the provision of products or services under authorized contracts.
- To grant the persons related to the Projects the permission of entry into Malawi and staying in the both countries for work execution based on approved contracts or in relation to the provision of services.
- To grant permissions or other authorities as needed for the implementation of the Project.
- To ensure proper and effective maintenance, management, and preservation of the facilities constructed in the Project.
- To bear all costs other than the costs covered by Japan's grant aid assistance within the scope of work of the Project.

### 2-3-2 Duties Specific to This project

- Demolition of facilities and houses and relocation of inhabitants affected by works.
  - Securing additional land needed for this project outside of existing road.
  - Provision and site preparation of temporary work yard.
  - Provision of surplus soil disposal site and waste disposal site.
  - Surveillance of general construction sites during construction.
  - Supervision by the Malawi Government Officials during construction.
  - Withdrawal of the existing bridge.
- } \*

\* : To be completed before the beginning of works

## 2-4 Project Operation Plan

The government of Malawi will be in charge of the implementation and management of this project. The management of bridges and roads is the responsibility of regional offices of RA, and the Northern Regional Office of RA takes charge in the case of this project. While maintenance works were previously performed by the provincial office of MOTPI, these are now outsourced by RA to private firms selected by bidding.

The maintenance works after the completion of this projects are generally divided into those performed regularly every year and those performed at intervals of several years. In the case of this project, the following works are needed.

### (1) Inspection and maintenance needed every year

- Removal of sand and dirt accumulating in bridge deck drain pipes, the areas around bearings, gutters and other drain facilities, and cleaning of these areas.
- Maintenance of traffic safety facilities including re-application of surface signs.
- Inspection and repair of bank protection and riverbed protection works after floods.
- Removal of boulders, driftwood, etc. after floods.
- Weeding of road shoulders and slope surfaces.
- 

### (2) Maintenance performed at intervals of several years

- patching or overlaying of bridge deck and access road pavement; at intervals of about 5 years.
- Replacement of expansion joints; at intervals of about 10 years.

Because bank protection and riverbed protection works are important for bridge maintenance in this project, these structures are designed based on the design flood flow corresponding to the probability of once in 50 years. However, these structures are subject to the risk of collapse and washout as a result of unpredictable localized erosion or a flood exceeding the assumed probability. Therefore, MOTPI and RA are requested to establish a system so that relevant departments will be able to perform inspection promptly after a flood and MOTPI and RA will be able to promptly repair any damage, collapse, etc. in these structures. If left untreated, such conditions may develop to the washout of backfill earth behind abutments, leading to the subsidence of abutments and disruption of traffic in the worst case.



## 2-5 Project Cost Estimation

### 2-5-1 Cost Covered by the Malawian Side

Table 2-5-1 Cost Covered by the Malawian Side

Item	Amount (thousand MKW)	Yen conversion (million yen)
(1) Building demolition / relocation cost	7,097	4.7
(2) Land acquisition cost	383	0.3
(3) Land renting cost	231	0.2
(4) Surveillance of general construction sites during construction.	1,631	1.1
(5) Supervision by the Malawi Government Officials during construction.	1,500	1.0
(6) Withdrawal of the existing bridge.	3,754	2.5
(7) Bank charge	670	0.4
Total	15,265	10.1

### 2-5-2 Estimation Conditions

- Time of estimation: April 2009
- US\$ exchange rate: US\$1.0 = 96.08 yen (6-month average ending March 31, 2009)
- US\$ exchange rate: US\$1.0 = 144.95 K W (6-month average ending March 31, 2009)
- Work execution period: 18 months
- Other: This project is implemented according to the grant aid guidelines of the government of Japan.
- The above estimated project cost will be reviewed by the government of Japan before E/N.

### 2-5-3 Operation and Maintenance Cost

Maintenance and management of the new bridge and access roads to be constructed by this Project will be undertaken by RA, which contracts private companies to maintain roads and bridges using the budget appropriated by the government. As shown in Table 3-5-3, the maintenance works required after the completion of South Rukuru Bridge consist of daily inspection, cleaning, and repair, the cost of which is estimated at 3,780 thousand MKW on the annual average. This is only 0.12% of RA's total maintenance budget of 3,067,600 thousand MKW (2008/2009), which can amply cover the maintenance cost of the Project.

Table 2-5-2 Major Maintenance Items and Cost

Category	Frequency	Parts requiring inspection	Description of work	Estimated cost (thousand MKW)		Remarks
				Per once	Per annum	
Maintenance and management of drainage system	Twice a year	Bridge deck drainage	Sediment removal	8	16	
		Gutters	Sediment removal	135	270	
Maintenance and management of traffic safety facilities	Once a year	Markings	Re-coating	290	290	Assuming restoration of 10% of direct cost
Maintenance of road	Twice a year	Shoulders / slopes	Weeding	43	86	
Inspection and repair of bank and riverbed protection works	At the time of flood (assumed to be once in 2years)	Bank and riverbed protection	Repair of damaged parts	2,415	1,208	Assuming restoration of 2% of direct cost
Maintenance and repair of pavement	Once in 5 years	Pavement surface	Overlaying, repair of pavement cracks, potholes, etc.	5,131	1,026	Assuming restoration of 10% of direct cost
Exchange of bearings and expansion joints	Once in 10 years			8,826	883	direct cost, removal cost and overhead charge
The above maintenance cost converted to annual average amount					3,780	

### 2-5-4 Points to Note in Implementing the Assistance Project

In order to smoothly carry out the assistance project and fully realize and sustain its effects, the Malawi side should take special note of the following:

- The new bridge and access roads are designed at the design speed of 80km/h and the design load of 43 tons. In order to prevent accident and prolong the durable life, speed and load limits should be strictly enforced.
- After each flood, driftwood and stones should be removed to maintain a sufficient river cross-section area, and the drain culvert should be cleared of soil and sand.

Parking areas are situated at both ends of the bridge to provide commercial opportunities for small retailers. However, vendors should be cautioned not to set up stores within the parting areas.

## Chapter 3 Project Evaluation and Recommendations

### 3-1 Project Effects

The project is expected to bring about the following effects when examined based on the results of the field survey, social and economic analysis and outline design:

Table 3-1-1 Direct Effects and Outcome Indicators

Current condition and challenges	Undertakings as grand aid assistance	Direct effects and improvements	Indirect effects and improvements
<p>①The existing Rukuru Bridge is a one-lane bridge despite its location over Main Road No. 1, causing a bottleneck in traffic and distribution of goods.</p> <p>②It is a temporary structure (Bailey bridge), which has become decrepit after more than 30 years of use. As a result, the speed limit (10km/h) and load restriction (16.3 tons as design load) have been imposed.</p> <p>③The South Rukuru River running beneath the Rukuru Bridge is joined by a tributary Lura River at a location 30m upstream from the present bridge and the site around the bridge is filled with deposits of boulders and driftwood from the Lura River, severely damaging the bridge piers.</p> <p>④Because the South Rukuru River and the Lura River meet, serious floods are caused in the rainy season every year, which hinders smooth flow of traffic.</p>	<p>①Replacement of bridge</p> <p>②Construction of access roads</p> <p>③Bank and bed protection works</p>	<p>①The vehicle weight allowance increases significantly from the current design load of 16.3 tons to 43 tons, which accommodates an increase in traffic, an increase in large trucks, in particular.</p> <p>②Currently, cars need to stop to let the oncoming car pass due to the narrow width. As the new bridge will have sufficient width, cars do not need to stop and the average traveling speed on the bridge will increase from the current approx. 10 km/h to 60 km/h.</p> <p>③Raising the height of the bridge and road by 2.5m, securing cross-sectional area of the river, and bank protection works mitigate flood damage caused to the bridge, access roads and neighboring area.</p> <p>④Building sidewalks on both sides separates the roadway and sidewalk, allowing smooth traffic flow and lowering the risk of accidents involving pedestrians.</p>	<p>①Enhancing the load bearing ability of the bridge and ensuring stable transportation route stabilizes, normalizes and accelerates domestic distribution of goods, which will contribute to economic development of the northern Malawi that is relatively lagged behind the southern part and contribute to the development of market economy of the whole country.</p> <p>②The bridge not only promotes distribution of goods but contributes to more active cultural exchange and exchange for tourism promotion and regional development as well as creation of stronger friendly ties among southeastern African countries.</p> <p>③The construction of the parking zone enables vendors around the existing bridge to maintain their small-scale commercial activities.</p>

## 3-2 Recommendations

### 3-2-1 Tasks Recipient Country Should Tackle and Recommendations

Malawi needs to tackle the following tasks to bring about and sustain effects of the project sufficiently:

- ① Although Main Road No. 1 is a trunk road for Malawian economy, there are some other bridges and culverts that need to be renovated between Mzuzu and Chiweta. The renovation of these bridges and culverts are essential for the South Rukuru Bridge to have sufficient effects and have Main Road No. 1 serve as an international trunk road.
- ② For the maintenance of the bridge and access roads in a good condition for a long time after their completion, maintenance work in the table below is essential.

Table 3-2-1 Maintenance Plan of New Bridge and Access Roads

Item	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Maintenance of drainage system	○	○	○	○	○	○	○	○	○	○
Maintenance of traffic safety facilities		○	○	○	○	○	○	○	○	○
Maintenance of access roads	○	○	○	○	○	○	○	○	○	○
Inspection and repair of bank and riverbed protection works		○		○		○		○		○
Maintenance and repair of pavement					○					○
Painting of bridge railing										○
Exchange of expansion joints										○

No technical cooperation is planned in the project. It is an independent project and does not require partnership with other donors.

## 3-3 Validity of the Project

The validity of the grant aid project is confirmed based on the following reasons:

- ① The project benefits a great number of the general public including the poor.  
(It benefits 13.2 million Malawians directly and a total of 56.68 million peoples of Tanzania and Zambia indirectly.)
- ② The project contributes to the improvement of the livelihood of the people by ensuring stable and smooth traffic, social and economic vitalization, and easing poverty along the roadsides.
- ③ Operation and maintenance of the bridge and other facilities provided in the project does not require any advanced technology and Malawi is capable of their operation and maintenance after its completion with its own fund, human resources and technology.
- ④ The project is regarded as one of specific strategies in the road sector in the Malawi Growth and Development Strategy (MGDS) and the bridge is the most important facility of Main Road No. 1 trunk road improvement projects.
- ⑤ The project imposes almost no negative environmental impact.
- ⑥ The project can be implemented with so special difficulty under Japan's grand aid scheme.

## 3-4 Conclusion

The project is expected to bring about significant effects as described earlier, contributing to the improvement of the livelihood of Malawians and easing of poverty. Thus, its validity as a grant aid project is confirmed. Malawi has sufficient human resources and funds for the operation and maintenance of the facility. If the maintenance and management of Main Route No. 1 beneath the bridge and the management of the South Rukuru River and the Lura River are ensured, the project will have bigger effects.