Federal Democratic Republic of Ethiopia

FY2017 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Replacement of Awash Bridge on A1 Trunk Road

in the Federal Democratic Republic of Ethiopia"

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0. Summary

This project was implemented to enable smooth driving of vehicles and increase the traffic volume, especially that of large vehicles, by replacing the Awash Bridge, which would have brought the most severe negative impact on the A1 trunk road in Ethiopia if it collapsed, thereby contributing to strengthening the functions of the physical distribution route.

The A1 trunk road, which is the target route of the project, is regarded as an important route connecting the port in Djibouti, one of Ethiopia's neighboring countries, and Addis Ababa, Ethiopia's capital; the port handles 90% of the exports and imports of Ethiopia. The project was relevant to Ethiopia's road development plan and development needs both at the time of planning as well as at the time of ex-post evaluation, and Japan's ODA policy at the time of planning; therefore, its relevance is high. Although there were no major changes in the project outputs, and the project cost was lower than planned, as the project period exceeded the plan, the efficiency of the project is fair. The effect indicators that were set at the time of planning, such as the time for vehicles to stop on the Awash Bridge, the weight limit of vehicles that can pass through the bridge, and the speed of vehicles on the bridge achieved the target values. Interviews with stakeholders as well as actual measurement and qualitative surveys in this evaluation study confirmed strengthened logistical functions and better traffic safety. Therefore, this project has high effectiveness and a high level of impact. Since the completion of the project, no daily maintenance of the Awash Bridge has been implemented. Because bridges such as the Awash Bridge that have been replaced in recent years are of low priority, no basic maintenance plans and no budget is secured for them. Therefore, there are a few problems in the organizational, technical, and financial aspects, and the sustainability of this project is moderate.

In light of the above, this project is evaluated to be satisfactory.

1. Project Description

Project Location[1]

The Bridge Replaced by the Project[2]

1.1 Background

At the time of planning, roads were responsible for 95% of the inter-city traffic and transportation in Ethiopia, whereas the scarcity[3] and poor conditions[4] of roads were cited as problems. With the cooperation of donors, the Government of Ethiopia has been conducting such tasks as renovating trunk roads, constructing regional roads and ring roads, and rehabilitating bridges. In particular, the maintenance of trunk roads including bridges was regarded as extremely important from the viewpoint of improving domestic road infrastructure. Regarding bridges, according to the survey by the Ethiopia Roads Authority (ERA), out of the 2,955 bridges across the country, 101 needed to be replaced and 190 were in need of reinforcement and repair.

Among the trunk roads, the A1 trunk road is a main trade route connecting the port in the neighboring country of Djibouti, which is responsible for 90%[5] (2011) of Ethiopia's imports and exports, and the capital Addis Ababa; it is also regarded as an important route connecting to the A10 trunk road to support the physical distribution for the economy of eastern Ethiopia. On the A1 trunk road, it was necessary to replace six bridges.[6] Among them, the Awash Bridge was in a dangerous situation with regard to the load carrying capacity because of large vehicles passing through while exceeding the live load at the time of the bridge's design about 40 years ago. There was no detour route at all. A collapse of or any accident on the bridge would have caused a major negative effect on the society and economy of Ethiopia. Thus, construction of a new bridge was urgent. Under such circumstances, the Government of Ethiopia requested the Government of Japan for grant aid.

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[1] Source: Preparatory Survey Report provided by JICA
[2] Photographed by the External Evaluators
[3] The road density is 42.60 km/1,000 km^2, the total road extension is 46,812 km, and the pavement rate is 14.8%. (Source: Preparatory Survey Report)
[4] In the total road extension, 46% is in a poor condition. (Source: Preparatory Survey Report)
[5] Source: Preparatory Survey Report
[6] Awash Bridge, Gogecha Bridge, Mojo Bridge, Adaitu Bridge, Dobi Bridge, and Gedita Bridge. As of February 2018, the following three bridges among them have been rebuilt: Awash, Mojo, and Gogecha.

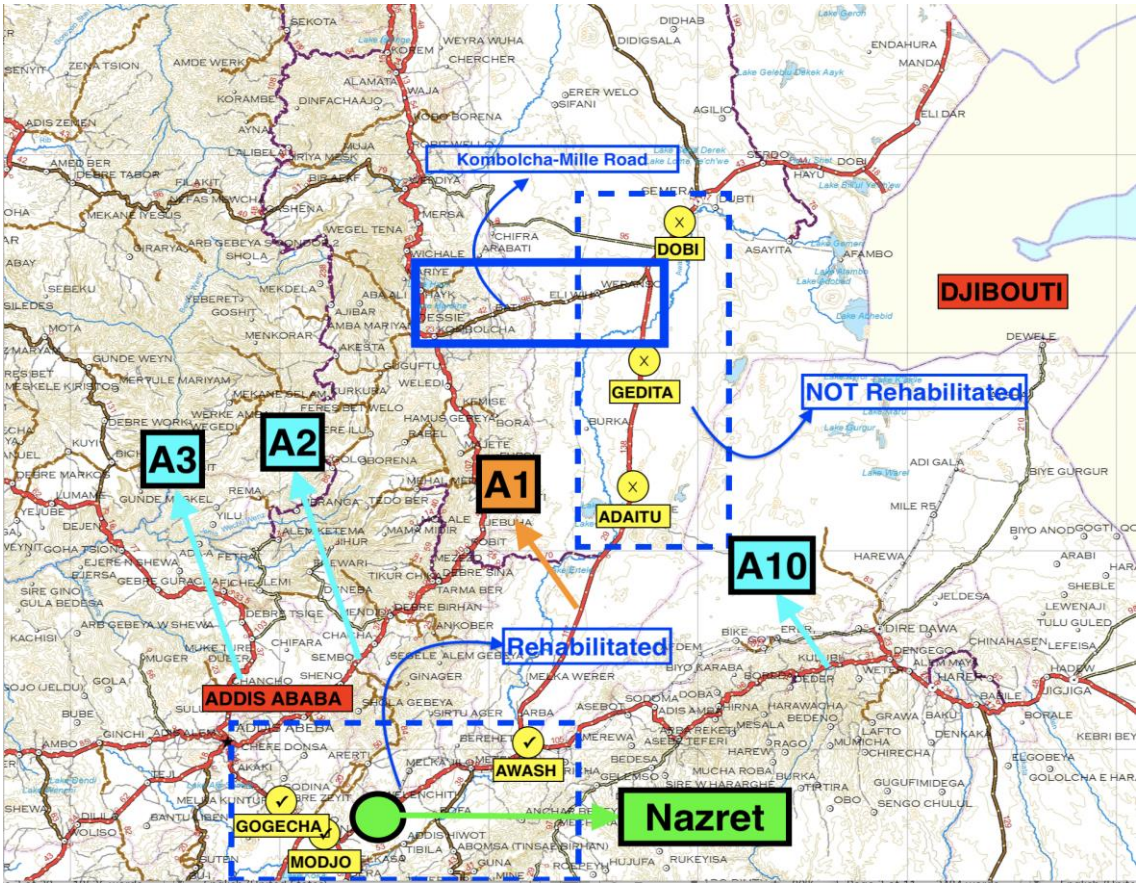

Figure 1: Location Map of Six Bridges that Needed to Be Replaced on the A1 Trunk Road between Awash and Djibouti, Kombolcha-Mille Road, and Major Trunk Roads (A1-A3, A10)

Source: A map provided by the ERA (Modified by the External Evaluators)
Note: Located 93 km away from Addis Ababa, Nazret is a major city between the capital and Awash on the A1 trunk road. The section between Nazret and the Awash Bridge is the subject of the ERA's traffic volume monitoring.

1.2 Project Outline

The objective of this project is to enable smooth driving of vehicles and increase the traffic volume, especially one of large vehicles, by replacing the Awash Bridge, which would have the most severe negative impact if it collapsed, on the A1 trunk road in Ethiopia, thereby contributing to strengthening the functions of the physical distribution route.

Grant Limit / Actual Grant Amount	45 million yen / 45 million yen (Detailed Design) 1,201 million yen / 1,187 million yen (Main Work)
Exchange of Notes Date /Grant Agreement Date	March 2011/ March 2011 (Detailed Design) June 2011 / June 2011 (Main Work)
Executing Agency	Ministry of Transport and Communications
Project Completion Date	January 2015
Main Contractor	Sato Kogyo Co., Ltd.
Main Consultant	Central Consultant Inc.
Basic Design	First survey: April 2010 to May 2010 Second survey: June 2010 to August 2010 On-site briefing on the outline design summary: December 2010

Related Projects	Technical cooperation • Project for Capacity building of Alemgena training and Testing Center ERA (2002 to 2005) • Capacity Development Project on Bridge Management (2007 to 2011) Grant Aid Projects • Project for Rehabilitation of Trunk Road (1/2) (1998) • Project for Rehabilitation of Trunk Road (2/2) (1999 to 2001) • Project for Rehabilitation of Trunk Road, Phase 2 (1/2) (2001) • Project for Rehabilitation of Trunk Road, Phase 2 (2/2) (2002 to 2004) • Project for Rehabilitation of Trunk Road, Phase 3 (2005 to 2008)

2. Outline of the Evaluation Study

2.1 External Evaluators

Yuko Kishino, IC Net Limited

Yoshinaga Nakamura, IC Net Limited

2.2 Duration of Evaluation Study

This ex-post evaluation study was implemented with the following schedule.

Duration of the Study: August 2017–November 2018

Duration of the Field Study: October 21–November 4, 2017 and February 4–14, 2018

3. Results of the Evaluation (Overall Rating: B[7])

3.1 Relevance (Rating: ③[8])

3.1.1 Consistency with the Development Plan of Ethiopia

In 1997, the Government of Ethiopia devised *the Road Sector Development Program* (hereinafter the "RSDP") to set goals for expanding road networks and improving the quality of roads. Since then, the ERA has been developing road networks[9] in a step-by-step fashion through RSDP I (1997–2002), RSDP II (2002–2007), RSDP III (2007–2010), and RSDP IV (2010–2015), which was at the time of planning of this project. *The Bridge Rehabilitation Program* (2010) (hereinafter the "BRP"), a RSDP sub-program, listed the Awash Bridge as one of the bridges to replace. In addition, the government formulated *the Growth and Transformation Plan,* 2010/11–2014/15 (hereinafter the "GTP"), and, under the GTP's medium-term strategic framework of five years, strived for comprehensive growth and development of the road development sector including bridges.

[7] A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

[8] ③High; ②Fair; ①Low

[9] In Ethiopia, roads are classified into the following five classes based on their functions: main road, link road, main connecting road, auxiliary main road, and branch road. (Source: Preparatory Survey Report)

At the time of ex-post evaluation, *the Second Growth and Transformation Plan*, 2015/16–2020/21 (hereinafter "GTPII") was formulated. As the main strategy of the road development sector, GTPII cites "Guaranteeing road network and its sustainability from the viewpoint of quality and safety," and improvement of road networks in accordance with RSDP V (2015–2020) led by the ERA is proceeding. One of the priorities of RSDP V is to build new national roads and main roads throughout Ethiopia as well as to implement quality improvement and maintenance of those roads. In addition, the BRP mentions the goal "to implement in a focused fashion the rebuilding and repair of bridges over the next few years."

Thus, from the time of planning to the time of ex-post evaluation, the A1 truck road remains the main trade route connecting Addis Ababa and the port of Djibouti, and the Awash Bridge is an indispensable bridge for heading north. Road development including bridges is one of the priority issues of GTPII and contributes to the development goals of the RSDP.

From the above, this project is highly consistent with the national development policy both at the time of planning and at the time of ex-post evaluation.

3.1.2 Consistency with the Development Needs of Ethiopia

From the planning stage, there is a consistently high need for transportation of materials and heavy machinery by large vehicles in both directions between the port of Djibouti and Addis Ababa. The annual average daily traffic (AADT) volume of the A1 trunk road in 2016 amounts to 64% of the AADT of the national roads. Thus, the traffic demand for the A1 trunk road is particularly high among the national roads.[10] As described later, the AADT has increased significantly before and after the rebuilding of the Awash Bridge, indicating that the needs for this project were high.[11]

Most of the transactions between Ethiopia and its neighboring countries, especially Djibouti, are done through the port of Djibouti, and the A1 trunk road has an important role as a trade route that supplies goods in a stable manner. As shown in Figure 2, the total weight of import and export cargoes between Djibouti and Ethiopia from 2010 to 2016 has been rising year by year, and the importance of the A1 trunk road including this project is ever increasing.

In addition, at the time of planning, the Awash Bridge was predicted to bring the most severe negative effect in case of a collapse, and was accorded the highest priority among the six bridges on the A1 truck road that required replacement. According to an interview with the ERA, the reasons are as follows: (1) the bridge length is the longest and the human and economic damage in the event of a collapse would be the most serious, (2) the regulation that allowed vehicles to pass through the bridge only in one direction, which was imposed because of the bridge's insufficient load capacity, hindered smooth transportation of goods.

From the above, it is fair to say that this project is highly consistent with Ethiopia's development

[10] It is calculated by dividing 188,846 (the average traffic volume of the A1 trunk road in 2016) by the total average traffic volume of 292,576 of the other trunk roads (A2–A10) in 2016. (Source: ERA)

[11] Refer to the section "3.3.1 Effectiveness."

needs both at the time of planning and at the time of ex-post evaluation.

(Unit: kilogram)

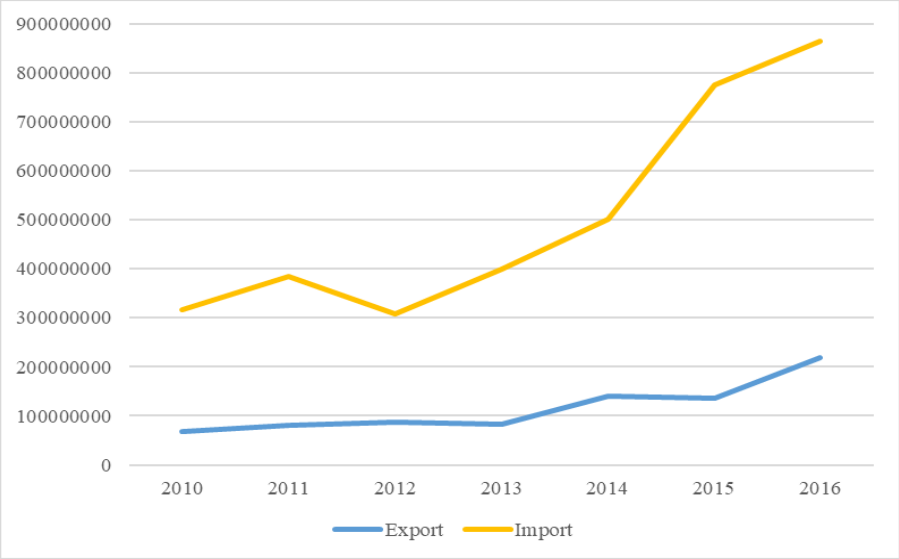

Figure 2: Total Weight of Import and Export Cargoes between Djibouti and Ethiopia from 2010 to 2016

Source: Ethiopian Revenues and Customs Authority modified by the External Evaluators)

3.1.3 Consistency with Japan's ODA Policy

The Rolling Plan for Ethiopia at the time of planning describes the road network of Ethiopia as follows: "In the road field, main roads in major cities are being improved, but the maintenance and management of roads and bridges are inadequate, posing problems to transportation. Natural disasters such as landslide occur frequently on the roads and bridges, becoming an obstacle to economic development. Thus, using its high technical capabilities, Japan will contribute to the capacity building of Ethiopia by implementing cooperation projects such as maintenance of roads and bridges and measures to prevent landslides." The plan also states that Japan will continuously implement "bridge replacement" in Ethiopia. Therefore, it is fair to say that this project was consistent with Japan's aid policy.

As described above, this project has been highly relevant to Ethiopia's development plan and needs as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Table 1 shows a comparison between the planned and actual outputs of this project. There was no major change in the outputs that could affect the outcomes (smooth driving of vehicles and increased traffic volume). The outputs were implemented almost exactly as planned except for a

few parts. The details and reasons for the partial changes are as follows.[12] The relocation of such items as utility and telephone poles, whose cost the Ethiopian side was to bear, was done as planned.

- "Addition of concrete to P1 pier foundation": This was done because the bedrock that is the support layer of the P1 pier foundation did not appear at the height assumed in the detailed design.[13] It was an unavoidable change.
- "Changing the thickness of the pavement on the main road": It was to be calculated when the direct construction cost was finalized before the project completion. It was an unavoidable change.
- "Changes in the shape and supporting structure of upper drainage pipes" and "Addition of slope protection (stone type) to the front of the A1 abutment": To prevent scouring of the surface of slope protection caused by strong winds and road drainage at the site which were confirmed during the construction. It was an unavoidable change.
- "Changing the road pavement specifications for access to the current road": At the time of rough design, the consultant investigated the procurement of modified asphalt for measures against digging, which was a problem on the current road. Consequently, standard asphalt was used because the actual performance was not confirmed in the ERA. However, because another survey at the time of detailed design confirmed the effect of durability improvement in a third country, it was decided to use the same modified asphalt in Ethiopia. Therefore, the change can be done at the time of planning.
- "Changing the specification of access road (Access to the old bridge)": There were changes in the road width of the existing access road,[14] guardrail quantity, and painting specifications. These changes were made because another survey at the time of the detailed design survey revealed their necessity. Such necessity should have been clarified at the time of planning.

[12] Source: a document provided by JICA
[13] It is method to keep drilling the soil until the support layer appears, and the ground between the lower surface of the foundation bottom plate and the support layer is replaced with concrete. (Source: document provided by JICA)
[14] The road width was reduced to the minimum required because it was judged in the detail design survey that construction as a sliced cut (rock drilling) on the existing slope surface should be avoided due to disadvantageous for construction.

Table 1: Plans and Results in the Project Outputs

Facility Item	At the Time of Planning	Result
Bridge structure	PC continuous rigid-frame box-girder bridge with three connected spans	PC continuous rigid-frame box-girder bridge with three connected spans, cantilever erection (cantilever method) "As planned"
Bridge length	43.0m+70.0m+32.0m=145.0m	43.0m+70.0m+32.0m=145.0m "As planned"
Width	Carriageway width: 3.65m×2=7.3m; Shoulder width: 1.0m×2=2.0m; Total: 9.3 m (Effective width), (Gross width: 10.3 m)	Carriageway width: 3.65m×2=7.3m; Shoulder width: 1.0m×2=2.0m; Total: 9.3 m (Effective width), (Gross width: 10.3 m) "As planned"
Bridge deck pavement	Asphalt pavement (70 mm on the carriageway)	Improved asphalt pavement "Almost as planned"
Abutment structure	Abutment A1: reverse-T type (with spread foundation) Abutment A2: reverse-T type (with spread foundation)	Abutment A1: reverse-T type (with spread foundation) Structure height 8.0m Abutment A2: reverse-T type (with spread foundation) Structure height 5.0m "Almost as planned"
Pier structure	Pier P1: Rectangular-shaped (with spread foundation) Pier P2: Rectangular-shaped (with spread foundation)	Pier P1: Rectangular-shaped (with spread foundation) Structure height 29.0m Pier P2: Rectangular-shaped (with spread foundation) Structure height 27.7m "Almost as planned"
Access road (Total length)	On the origin (Addis Ababa) side: approx. 527 m On the destination (Djibouti) side: approx. 408 m, total: 935 m	(Access road to the main road) On the origin (Addis Ababa) side: approx. 627 m, on the destination (Djibouti) side: approx. 388 m, total: 1,015.0 m "Almost as planned" (Access road) On the origin (Addis Ababa) side: approx. 85.0 m, on the destination (Djibouti) side: approx. 361.1 m, total: 446.1 m
Access road (Width)	Carriageway width: 3.65 m × 2 = 7.3 m; Shoulder width: 2.5 m×2 = 5.0 m Total: 12.3 m (Effective width) Protection shoulder: 1.0 m x 2 = 2.0 m, Total: 14.3 m (Gross width)	(Access road to the main road) Number of lanes: Two lanes (a single-lane road on each side) Effective width: 12.300m= Carriageway width 2x3.650m+ Shoulder width 2x2.500m "As planned" (Access road) Number of lanes: Two lanes (a single-lane road on each side) Effective width: 7.000m= Carriageway width 2x3.000m+ Shoulder width 2x0.500m
Access road (Pavement)	Asphalt pavement (surface course: 50 mm, base course: 200 mm, subbase course: 100 cm)	Improved asphalt pavement "Almost as planned"
Remarks		Completion: January 15, 2015 Defect inspection: January 26, 2016 Observation of on-site repair work: February 3, 2016

Source: Preparatory Survey Report provided by JICA

Before the Construction[15]

After the Construction[16]

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total cost of the project amounted to 1,449 million yen, 87% of the budget of 1,657 million yen at the time of planning. Table 2 summarizes the planned cost, actual cost, and percentage against the planned cost borne by Japan and Ethiopia. The cost borne by Japan was 92% of the planned cost. The cost borne by Ethiopia was 99.8% of the planned cost on an Ethiopian birr basis. However, it was 72% of the planned cost on a yen basis because the birr became weaker against the yen.

Table 2: Project Cost

		Planned Cost	Actual Cost	% against the planned cost
A	Cost borne by Japan (million Japanese yen)	1,291(1)	1,187(2)	92%
B	Cost borne by Ethiopia (1,000 Ethiopian birr [ETB])	52,161(3)	52,059(4)	99.8%
C	Cost borne by Ethiopia (million Japanese yen) (5)	366	262	72%
D	Total cost (A+C=D)	1,657	1,449	87%

Source: Planned cost and actual cost by Japan as well as planned cost by Ethiopia: Materials provided by JICA,
Actual cost by Ethiopia: Materials provided by the implementing agency
Note 1: G/A Grant Amount (including Detailed Design);
Note 2: Including the Detailed Design;
Note 3: Because "taxes on major construction materials from Japan and third countries" were not included in the cost borne by Ethiopia at the time of planning, 51,967 thousand Ethiopian birr is added to the planned value at the time of the basic design study;
Note 4: material of the 1st Field Study;
Note 5: Exchange rate of the planned value: 1US$ = ¥92.35, 1ETB = ¥7.017 (average value from January 1, 2010 to June 30, 2010). Exchange rate of the actual value: 1ETB = ¥5.024 (average value from April 26, 2010 to January 15, 2015)

3.2.2.2 Project Period

The actual period of the project was 47 months, longer than the planned period of 35 months and 134% of the planned period. Factors for the extension of the 12-month construction period are in the preparatory phase of the first contract year as well as the preparatory stage of the bridge construction for the second contract year. In the first year, delays in construction

[15] Document provided by JICA (Awash Bridge before the project implementation)
[16] Document provided by JICA (Awash Bridge after the project implementation)

arrangements occurred because of necessary procedures such as tax refund and land acquisition of camp yards. In the second year, in addition to not being able to procure materials for keeping the concrete strength sufficiently, which had been initially expected to be obtained around the Awash Bridge, the high outside temperature around the Awash Bridge compelled the contractor to spend additional time for the design of concrete blending at an ordinary temperature. The above-mentioned additional work of the P1 piers led to the extension of the construction period, resulting in a 12-month delay on the start of the construction for the bridge. The construction whose cost was borne by Ethiopia was completed before the completion of the construction whose cost was borne by Japan, and did not affect the development of the effect of this project.

Table 3: Project Period

	Planned (month)	Actual (month)	% against the planned period
Project Period (Detailed design / Bidding and contract phase / main construction) (1)	35.0	47	134%

Source: Materials provided by JICA and the implementing agency

Note 1: [Final design] March 18, 2011 (Detailed design) – December 31, 2011 (completion date): nine months, 106% of the planned time
[Bidding and contract phase] January 12, 2012 (Public notice date) – March 2, 2012 (contract date): 1.7 months
[Bridge construction] May 1, 2012 (Construction date) – January 15, 2015 (completion date): 33 months, 127% of the planned time

Note 2: Because it was not clear whether the detailed design period was included from the grant agreement during the cooperation period described in the project preliminary evaluation table, the planned values of the Preparatory Survey Report were adopted and the starting points of the project period were aligned.

In light of the above, although the project cost remained within the plan, the project period exceeded the plan. Delays in the tax refund procedure as well as land acquisition of camp yards[17] are due to external factors that this project was not able to control. In addition, because the height of the bedrock of the pier foundation support layer was not as expected, the delay due to the necessity of additional construction was unavoidable. However, it seems that the problem of concrete procurement[18] could have been clarified by prior investigation of the availability of local procurement. Therefore, the efficiency of the project is fair.

3.3 Effectiveness and Impacts[19] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

For the evaluation of effectiveness, actual measurement surveys and interviews with the ERA were conducted on the three indicators described in the preliminary project evaluation table. The three indicators are as follows: (1) pause time (minutes); (2) vehicle weight volume that can pass (tons); and (3) travel speed on the bridge (km/h). In addition, (4) large-vehicle mixing rate was added to ascertain to what extent large vehicles were able to pass as a result of the improved load

[17] There was a four-month delay in the first contract year.
[18] After a five-month delay in the second contract year, there was a total delay of 12 months, including another extension period for additional construction thereafter.
[19] Sub-rating for Effectiveness is to be put with consideration of Impacts.

carrying capacity, and (5) AADT volume was adopted to check the extent of how much this project is being used. Table 4 shows the baseline, target, and actual values.

Table 4: Operation and Effect Indicators

Indicator	Baseline	Target	Actual
	2010	2017	2017
		2 years after completion	2 years after completion
(1) Pause time (minutes)	Approximately 3 (Because of one-way traffic regulation)	0 (Two-way traffic)	0
(2) Vehicle weight volume that can pass (tons)	32.6	40.8	40.8
(3) Travel speed on the bridge (km /h)	Approximately 20	85 (Design speed)	Weekday: 58.56 (95%CI[20]): 56.63–60.49 Weekend: 59.44 (95%CI): 57.61–61.28
(4) Large-vehicle mixing rate (%)	Weekday: 48 Weekend: 56	No information	Weekday/Weekend: 51.1[21]
(5) AADT volume (a vehicle/day)[22]	Weekday/Weekend: 3,203	No information	Weekday/Weekend: 6,279

Source: Reference value/Target value except (5): Materials provided by JICA and Reference value of (5) and Actual values provided by the ERA

(1) Pause time

Interviews with the state police who regularly guard the Awash Bridge with the ERA revealed that none of the vehicles temporarily stopped on the bridge after the replacement of the Awash Bridge. Even with the visual confirmation of the vehicle running speed survey on the bridge, no vehicle was seen temporarily stopping.[23]

[20] 95% confidence interval (95% CI): The population average is within the range with a probability of 95%.
[21] The large-vehicle mixing rate (%) is calculated using 2017 data between Nazret and Awash, and the calculation method is as follows: (Large Bus (396) + Large Truck (885) + Truck and Trailer (1,932)) / Total (6,279) = 0.5117
[22] The observation point is between Nazret and Awash. The actual result is the data for year 2016. (Source: ERA)
[23] The ERA does not monitor the data on the pause time.

(2) Vehicle weight that can pass

A vehicle weight that can pass was strengthened to 40.8 tons[24] as planned. The ERA has the authority to control overloaded vehicles, measures vehicle weight for all freight vehicles using the Awash Bridge, and takes necessary measures based on ERA regulations. For each shaft weight, the maximum weight is stipulated, and a user is charged a fine of 150 Ethiopian Birr (ETB) every time the weight exceeds the maximum weight by one ton.

Vehicle weight measuring site at the station

The number of legal axles on the front axle from 2015 to 2016 was 34,353, and the one of illegal axles was 209 (0.6%). The number of legal axles on the rear axle was 118,347, and the number of illegal axles was 41,044 (25.8%). Including both the front and rear axles, a total of 41,253 axles were observed as illegal axles.[25]

(3) Travel speed on the bridge

Because there is no travel speed data on the bridge inside the ERA, the vehicle running speed survey was conducted for vehicles traveling in the Addis Ababa-bound lanes and the Djibouti-bound lanes, respectively.[26] The survey revealed that the average speed of 58.56 km/h (95% CI: 56.63–60.49 km/h[27]) on a weekday and 59.44 km/h (95% CI: 57.61–61.28 km/h[28]) on a holiday, which were significant improvements from the time of planning. The target value of 85 km/h is the maximum design speed, and the statutory speed limit on the A1 trunk road is also 85 km/h. Considering accident prevention and safety, it can be judged that the observed average speed is appropriate, and no traffic jam has occurred on the bridge.

[24] The ERA bridge design manual states the background for setting 40.8 t for the target value plan as follows: the planned value of 32.6 tons was designed based on the standard value of the American Association of State Highway and Transportation Officials (AASHTO). Because a tendency of overloading was seen in vehicles using the A1 truck road, the value was set as 40.8 t, which added 8.15 t to the original 32.6 t as 25% overloading. The bridge can withstand up to 58 t in the total weight of each axle connection point. As of September 2017, out of the 3,214 vehicles that passed through the bridge, 589 (18.3%) have recorded vehicle weights of 40 t to 50 t.

[25] The axle weights of the front and rear axles are measured at the vehicle weight measurement site, and the number of legal and illegal axles are respectively counted. (Source: ERA Awash station)

[26] This evaluation study team conducted the survey on Thursday, October 26, and Saturday, October 28, 2017. Although measurement survey using GPS was conducted at the time of planning and 32.6 km/h was recorded, its measurement method was not confirmed, it was therefore measured by own method. Samples of total 530 (weekdays: 266 and weekends: 264) were collected and measured for 30 minutes in the morning, afternoon and evening hours, respectively, for a total of 6 hours in both directions.

[27] Meaning that the population mean of the vehicle speed on weekdays is within the range of 56.63 km/h to 60.49 km/h with a probability of 95%.

[28] Meaning that the population mean of the vehicle speed on weekends is within the range of 57.61 km/h to 61.28 km/h with a probability of 95%.

(4) Large-vehicle mixing rate

The cross-sectional survey at the time of planning (2010) recorded the large-vehicle mixing rates of 56% (holiday) and 48% (weekday). Based on the AADT volume obtained from the ERA, the large-vehicle mixing rate at the time of ex-post evaluation (2017) is 51.1%, which is almost the same as 52% at the time of planning (average of 56% on holidays and 48% on weekdays).

Although there was no major change in the indicator, it was evaluated that the implementation of this project enabled large vehicles to pass the A1 trunk road safely by increasing vehicle weight that can pass from 32.6 ton to 40.8 ton, which has a high large-vehicle mixing rate, and the road can cope with an increase of large vehicles in the future.

(5) AADT volume

A target value of the AADT volume was not set at the time of planning. The ERA conducts a traffic volume survey annually, and Figure 3 shows the transition in the AADT volume of the A1 trunk road (Nazret–Awash) and other main roads (A 2, A 3, and A 10) from 2010 to 2016.[29]

(Unit: A vehicle)

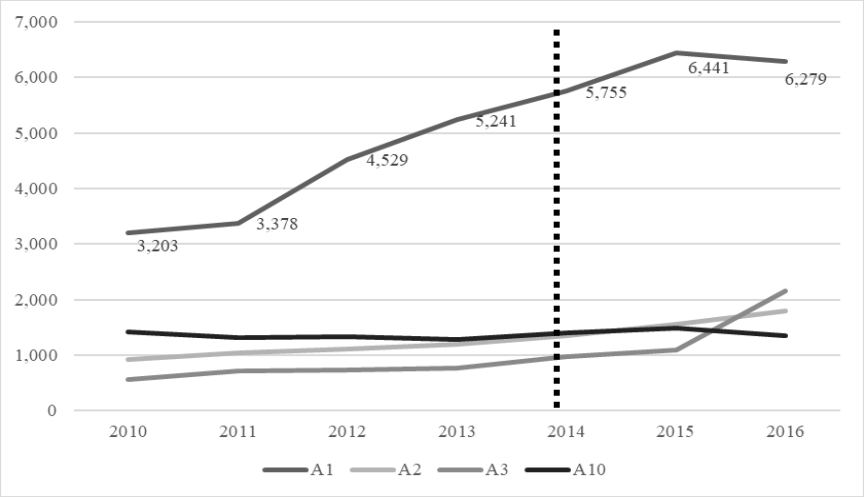

Figure 3: Transition in AADT Volume (2010–2016) of A1 Trunk Road (Nazret–Awash) and Trunk Roads (A2, A3, and A10)

Source: Documents provided by the ERA (Modified by the External Evaluators).
Black dotted line: opening year of Addis Ababa–Adama Highway (2014)

The AADT volume in the past seven years between Nazret and Awash on the A1 trunk road has increased significantly compared with other trunk roads. In particular, in 2016, one year after the completion of the project, it recorded about twice the volume in the planned time in 2010. Thus, it can be concluded that this project promotes an increase in the traffic volume of the A1

[29] The A2 and A3 trunk roads are the main roads for accessing northern Ethiopia from Addis Ababa, which is the same function as the one of the A1 trunk road. The A10 trunk road is the main road to access the Awash Bridge from the eastern part of the country.

trunk road and the Awash Bridge is fully used.[30]

Figure 4 shows changes in the traffic volume of five bridges other than the Awash Bridge between Addis Ababa and Djibouti on the A1 trunk road. An analysis was conducted taking into account the replacing situation of each bridge and the construction year of Addis Ababa-Adama Highway. The three bridges that are located to the north of the Awash Bridge have seen little change over the past seven years.[31] It can be surmised that the traffic volume of the Gogecha Bridge is on a downward trend from 2013 because the 2014 construction of the Addis Ababa-Adama Highway caused the number of the bridge's users to decrease.

(Unit: A vehicle)

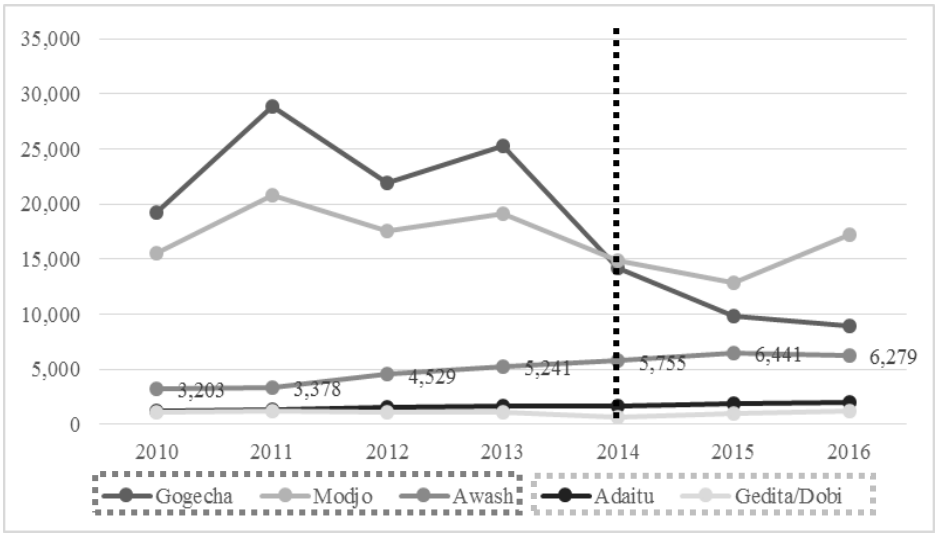

Figure 4: Transition in Traffic Volume of Six Bridges that Required Rehabilitation between Awash–Djibouti on A1 Trunk Road[32]

Source: Documents provided by the ERA modified by the External Evaluators.
Black dotted line: opening year of Addis Ababa–Adama Highway (2014)
Dark grey dotted box: replaced bridges / Light grey dotted box: un-replaced bridges

3.3.1.2 Qualitative Effects (Other Effects)

Interviews were conducted with a total of 30 drivers for logistics companies and passenger transportation companies[33] (19 and 11 drivers, respectively) regarding: (1) pause time; (2) passable vehicle weight; and (3) travel speed on the bridge after the replacement of the Awash Bridge. In selecting the interviewees, in cooperation with the ERA and the federal police, in the bus stations of the Awash region and Addis Ababa in addition to the project sites,[34] the External Evaluators extracted samples during the morning, afternoon, and evening hours, which meet the

[30] According to the JICA Ethiopia Office, the possible reason that the AADT volume declined slightly in 2016 is that the roads to Djibouti were blocked for about three weeks and restrictions on moving continued for a while after a declaration of a state of emergency, which lasted six months from October 2016.
[31] Regarding the Adaitu Bridge located south of the Kombolcha-Mille Road, the traffic volume has been gradually increasing over time.
[32] The two bridges with the lower traffic volume, Gedita and Dobi, had the same traffic volume.
[33] Bus transport company
[34] Customs points around the Awash Bridge

conditions[35] for subjects of the survey, and agree with the purpose and content of the survey.

Regarding (1), all the respondents replied “decreased dramatically," and (3) as well, 27 respondents (90%) answered "rose dramatically" and three respondents (10%) answered "rose," which means that every respondent answered positively. This result is highly credible as it proves the result of the actual measurement of the indicators of effectiveness. However, with regard to (2), 22 respondents (73.3%) answered "did not change," which did not result in supplementing the rise in the "passable vehicle weight" of the indicators of effectiveness. It can be surmised that the replacement of the bridge itself does not promote the change of vehicles and does not necessarily affect the loading capacity.

3.3.2 Impacts

3.3.2.1 Intended Impacts

In addition to (1) strengthening the functions of the physical distribution route, which is the impact of this project, a qualitative survey was conducted to confirm (2) improvement of traffic safety, and (3) improvement of the user's safety awareness. The target of the survey on (1) is a total of 12 respondents, who are the management members of logistics companies and passenger transportation companies[36] (five and seven respondents, respectively). In choosing samples, the External Evaluators requested the Chambers of Commerce of Addis Ababa and Awash to introduce these companies and selected samples from the list of companies whose approval for the survey was already gained. The target of the survey for indicators (2) and (3) is a total of 30 respondents including drivers of logistics companies and passenger transport companies (19 and 11 respondents, respectively). The selection of samples was done in the same way as the one described in “3.3.1.2 Qualitative Effects (Other Effects).”

(1) Strengthening logistics functions

An analysis was conducted on how the logistics functions changed before and after the replacement of the Awash Bridge. Variables related to the functions of the physical distribution route used for the analysis are as follows: (1) product delivery area; (2) product price; (3) product type; (4) product quantity; (5) product quality; (6) delivery time of products; (7) supply chain management[37] and; (8) business expenses of enterprises. Table 5 shows the responses for each variable, with the upper part of the table showing variables with a decreasing trend, and the lower part showing the variables with a rising trend. With regard to the variable (6) delivery time of products, eight answers (66.7%) were "dramatically decreased" and three answers (25.0%)

[35] A driver who has used both the old Awash Bridge and the bridge after the replacement. Because this survey aimed to verify actual data measurement and find out the condition of the bridge, no calculation of strict sample size was conducted.

[36] Bus transport company

[37] This is a management method that promotes efficiency and cost reduction by sharing information on the processes from manufacturing to sales across organizations and companies. This survey refers to changes in the management method of the same concept.

were "decreased slightly," indicating that the delivery of products became smooth. Moreover, regarding the variable (1) delivery area, seven responses (58.3%) were "dramatically increased" and three responses (25.0%) were "slightly increased." It was confirmed that the logistics functions were strengthened after the replacement of the Awash Bridge.

Table 5: Changes in Variables Related to the Logistics Functions Before and After Replacing Awash Bridges

(−)	Product price		Product type		Delivery time of products		Business expenses of enterprises	
	No.	%	No.	%	No.	%	No.	%
Dramatically decreased	3	25.0	0	0.0	8	66.7	6	50.0
Slightly decreased	2	16.7	0	0.0	3	25.0	4	33.3
No change	7	58.3	9	75.0	1	8.3	0	0.0
Slightly increased	0	0.0	2	16.7	0	0.0	0	0.0
Dramatically increased	0	0.0	1	8.3	0	0.0	2	16.7
(+)	Product delivery area		Product quality		Product quantity		Supply chain management	
	No.	%	No.	%	No.	%	No.	%
Dramatically decreased	0	0.0	0	0.0	0	0.0	0	0.0
Slightly decreased	1	8.3	0	0.0	0	0.0	1	8.3
No change	1	8.3	3	25.0	7	58.3	2	16.7
Slightly increased	3	25.0	2	16.7	1	8.3	6	50.0
Dramatically increased	7	58.3	7	58.3	4	33.3	3	25.0

(2) Improvement of traffic safety

Regarding traffic safety, before the replacement of the Awash Bridge, 29 responses (96.7%) were "extremely dangerous" and one response (3.3%) was "dangerous". However, after the replacement of the bridge, all the respondents recognized the bridge as safe: 28 responses (93.3%) were "very safe" and two responses (6.7%) were "safe".

(3) Improvement of the user's safety awareness

How the replacement of the Awash Bridge affected safety consciousness was investigated. Twenty-three respondents (76.7%) answered "significantly influenced" and four people (13.3%) answered "strongly influenced," meaning that 27 (90%) out of the interviewed 30 respondents recognize that the replacement has affected their safety awareness. Also, all of them replied that this change occurred after the replacement of the Awash Bridge, indicating that their safety awareness has changed as a result of this project. Furthermore, 25 responses (83.3%) were "satisfied" with the regional police system of traffic control and crackdown on violations of rules.[38]

[38] However, 20 (66.7%) out of the 30 respondents answered that they are "paying attention" to the traffic rules and signs of the Awash Bridge and surrounding roads, whereas 10 (33.3%) answered "never paid attention." As a background to

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

According to an interview with the ERA, the environmental monitoring task instructed by the consultant was implemented based on the plan although no record to show that was found.[39] The material provided by JICA has no passage suspecting a major environmental impact. In addition, no negative impact after the project completion was confirmed from the results of the field survey and qualitative survey conducted as parts of ex-post evaluation. However, the project impacts on the natural environment cannot be judged without confirming the environmental monitoring results.

(2) Resettlement and Land Acquisition

According to an interview with the state police who routinely guard the Awash Bridge with the ERA, there was no residence near the Awash Bridge from the beginning of this project, and it was confirmed that no relocation of residents and land acquisition occurred. There is no problem concerning the acquisition of land for the guard hut of the bridge and transfer of electric wires for communication.

The implementation of this project made it possible for vehicles to run in both directions on the bridge, and eliminated the need for vehicles to stop temporarily on the bridge. In addition to the fact that the passable vehicle weight increased to 40.8 t as specified in the design weight, the running speed of vehicles improved greatly, achieving the planned target. The logistics functions were strengthened, and traffic safety as well as the user's safety awareness improved significantly. In light of the above, this project has achieved its effects as planned, and it is fair to say that the effectiveness and impact of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

At the time of planning, the competent authority to implement this project was the Ministry of Transport and Communications and the ERA was affiliated with it. The ministry was an organization with 18,372 officials,[40] consisting of two offices under the Planning and Information and Communication Technology (ICT) Department, four offices under the Technology and Management Department, and four offices under the Human Resources and Finance Department. The jurisdiction on road maintenance and management including bridges belongs to the Road Asset Management and Implementation Coordinating Office under the Technology and

these results, it can be assumed that the traffic rules as well as markings in the Awash Bridge and surrounding roads are not sufficient at present, and it is difficult for the user to recognize them.

[39] The project progress report kept in the ERA head office states that monitoring was implemented and the influence on the environment and society was appropriately mitigated.

[40] 2,942 officials at the ERA headquarters, 6,765 in local offices, and 8,665 in projects

Management Department; 26 officials[41] in the road management team worked on road maintenance except bridges and related structures, and seven[42] in the bridge management team were responsible for maintaining and managing bridges and related structures. After the completion of this project, the bridge management team at the ERA headquarters was to perform such tasks as current state survey, forming plans for repairing, and requesting the necessary budget, and the Dire Dawa district office[43] was to conduct repair work.

In June 2011, the ERA was re-organized, and the ERA headquarters was divided into the following offices: three offices under the Planning and ICT Department; two offices under the Technology and Management Department; two offices under the Road Asset Management and Implementation Coordinating Department; and four offices under the Human Resources and Finance Department. The Road Asset Management and Implementation Coordinating Office, which was under the Technology and Management Department in 2010, became a department of its own. At the time of ex-post evaluation, 15 officials in the road management team (11 engineers, one economist and three others[44]) are in charge of road maintenance work except bridges and related structures, and seven officials in the bridge management team (which has four engineers) are responsible for maintenance of bridges and related structures.[45] However, according to an interview with the ERA, the prescribed number of personnel in the bridge management team is 10, and seven of them are to be engineers. Thus, each team member has an excessive workload because of the personnel shortage. Furthermore, the interview revealed the problem that highly skilled engineers tend not to stay with the ERA as a whole for a long time. To compensate for the shortage of personnel, bridges with high priorities of replacement and repair are maintained and managed by outsourcing.[46] However, the priority of bridges such as the Awash Bridge that have been replaced in recent years is relatively low, and they are not the target of maintenance. Such bridges are not maintained on a regular basis, and there is room for improvement in the “Institutional/Organizational Aspects of Operation and Maintenance.”

3.4.2 Technical Aspects of Operation and Maintenance

At the time of planning, the bridge management team of the Road Asset Management Implementation Coordinating Office was receiving technology transfer as a counterpart of a JICA technical cooperation project titled "Capacity Development Project on Bridge Management" (2007–2012).[47] Although the team had a certain technical level, it faced the following issues in its

[41] Including one weight controller, three engineers, and one economist
[42] Including four engineers
[43] The number of officials in the ERA Dire Dawa district office was a total of 486.
[44] The three are one office manager and two drivers.
[45] One of them is studying abroad.
[46] In the "Capacity Development Project on Bridge Management," a JICA technical cooperation project, a bridge management support service (BMSS) program was introduced for the purpose of developing a computer-based management system, and concluded contracts with three private consulting firms regarding bridge management.
[47] The contents of cooperation in the project include the following: implementation of training for officials, preparation of bridge management manual, development of computer-based operation management system

technology and structure on bridge maintenance and management: (1) the turnover rate of its personnel is high because their salary level is lower than that of private enterprises[48]; (2) although the personnel have credible potential, they have problems in cooperativeness, morale, and continuity; and (3) it is difficult to secure the motivation of the personnel because the work in maintenance and management is low-key and does not attract attention.[49]

At the time of ex-post evaluation, engineers account for about 13.3% of all the personnel at the ERA headquarters.[50] Although the ERA has the problem that highly skilled engineers tend not to stay with its headquarters, it maintains a certain number of engineers as an organization. Since the counterpart personnel of the project above are still engaging in maintaining and managing bridges, it is fair to say that they have an opportunity to use acquired knowledge and technology. In addition, about 15 of the participants of the seminar that was implemented in the project are serving as directors and team leaders. Moreover, such documents as *the Bridge Maintenance Manual* and *the PC Bridge Maintenance Manual* were distributed, indicating that the outputs of the technical cooperation are used.[51] By contrast, after the completion of the project above, opportunities for basic training on maintenance and management of bridges are currently limited to new personnel of the Road Asset Management Implementation Coordinating Office.

Thus, judging from the number of engineers at the ERA headquarters as well as the level of knowledge and skills acquired the "Capacity Development Project on Bridge Management", the "Technical Aspects of Operation and Maintenance" can be evaluated to be at a credible level in such areas as bridge data management. However, according to ERA officials, they do not have the ability to revise the manuals, and their technical level may decline unless they receive external support in the future. It is necessary for the ERA to strengthen its technical capabilities by such means as conducting periodic training systematically.

3.4.3 Financial Aspects of Operation and Maintenance

At the time of planning, the total national budget of Ethiopia for the fiscal year 2010–2011 was about 77.2 billion ETB (about 772 billion yen), and the general budget including the ERA's construction budget was 12.9 billion ETB (about 129 billion yen).[52] Maintenance expenses for roads and bridges[53] are disbursed to the Road Asset Management Implementation Coordinating Office every year according to the damage situation of bridges, the road class (type and extension

[48] About one third of private enterprises
[49] Source: Excerpts from the preparatory survey report's section on "Problems and tasks related to bridge maintenance and management technology and structure" of the Capacity Development Project on Bridge Management
[50] It is calculated by dividing 377, the total number of engineers, by 2,821, the total number of personnel at the ERA headquarters.
[51] These manuals were revised in 2013. At the time of ex-post evaluation, they were translated into Amharic, the local language, and used by officials on site. The manuals cover a wide range of topics on the basics of bridge maintenance and management including the following: types of bridge inspection, flow of bridge inspection, bridge defects and damage, methods of setting bridge inspection rates, bridge inspection form, how to write and submit a report on bridge inspection, and emergency response.
[52] Approximately 17% of the total national budget
[53] Budget items are divided for roads and bridges. ERA local offices implement maintenance.

distance), and the number of bridges on the master plan that describes the maintenance plan.[54] This disbursement will be used for minor repairs. From the budgetary perspective, it is assumed that maintenance and management at the same level will be sustainable in the future.

At the time of ex-post evaluation, the total national budget of Ethiopia for the fiscal year 2016–2017 was about 274 billion ETB (about 1,149 billion yen), and the general budget including the ERA's construction budget was 47.6 billion ETB.[55] As at the time of planning, the general budget accounts for about 17% of the total national budget, and the growth in three years between 2014 and 2017 is 59%. However, the execution rate of maintenance and management expenses in the general budget is only about 67% (3.9 billion ETB/5.8 billion ETB).[56] It can be assumed that neither maintenance management based on the master plan is being done nor the budget is formulated appropriately.

In other words, with regard to the "Financial Aspects of Operation and Maintenance," the master plan gives high priority only to bridges that need repair or are aging, and the maintenance budget is secured only for such bridges. Meanwhile, no ideal budget for daily periodic inspections of all bridges and more steady maintenance has been assumed. Therefore, appropriate budget allocation is necessary.[57]

3.4.4 Status of Operation and Maintenance

Regarding the Awash Bridge, no maintenance has been conducted since the replacement, and it was confirmed that sediment and garbage accumulate in drainage facilities such as roadside grooves and drainage (Photo 1), causing problems in drainage functions (Photo 2). Factors that account for this are the following: (1) the Ethiopian government gives higher priority to the construction of new roads and bridges than the maintenance of newly constructed bridges[58]; and (2) the budget was not appropriately executed. Although maintenance and management per se are the responsibility of the ERA, they are to be entrusted to construction companies and contractors. Another problem is that Ethiopia has few companies that can meet requests from the ERA.

In this evaluation study, a master plan for maintaining and managing bridges was obtained from the ERA headquarters. According to an interview survey, plans based on the master plan were formulated, and records on maintenance activities were kept. In the maintenance activities, it was

[54] The ERA bridge management team supports ERA local offices and the public corporations for local roads, assigns priorities to bridge inspection, evaluation, repair and replacement, and prepares a master plan based on the result of the prioritization.

[55] The general budget execution rate is about 63%. It is calculated by dividing 29.9 billion ETB (expended amount) by 47.6 billion ETB (budget amount). (Source: ERA)

[56] Source: ERA

[57] In the ERA, budget formulation is done based on the updating of a bridge and drainage database, development of a priority maintenance list of major bridges and drainage culverts, and the plan for investment plan development for bridge and drainage reconstruction. However, the ERA assigns lower priority to basic maintenance and management than to the construction of new roads and bridges. Thus, a problem is that the budget is not secured for the former.

[58] The maintenance tasks of bridges such as routine maintenance (cleaning) and removal of sands are conducted through BMSS along with maintenance and management of roads, and each local office (district office) affiliated with the ERA conducts preliminary bridge inspection and monitoring. However, according to an interview with the ERA, the maintenance and management of the Awash Bridge after its rehabilitation are not the subject of a BMSS contract because their priority is lower than other main roads and bridges.

confirmed that inspection was conducted on the bridges with high priority in the master plan such as bridges that were damaged severely and needed replacement, and those that saw a few years from the construction, with regard to "drainage facilities," "road pavement", and "roadside groove."

In other words, regarding the “Status of Operation and Maintenance," steady maintenance and management such as basic daily maintenance (cleaning) and periodic inspection for the Awash Bridge have not been conducted, and it is not a sufficiently appropriate situation. Problems will be addressed only if the priority of the bridge’s maintenance increases compared to other bridges under such circumstances as when repair becomes necessary.

Photo 1: Drainage Facilities Covered with Sediment and Garbage

Photo 2: Structure of Drainage Facilities

In light of the above, a few minor problems have been observed with regard to the organizational, technical, and financial aspects. Thus, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented to enable smooth driving of vehicles and increase the traffic volume, especially that of large vehicles, by replacing the Awash Bridge, which would have brought the most severe negative impact on the A1 trunk road in Ethiopia if it collapsed, thereby contributing to strengthening the functions of the physical distribution route.

The A1 trunk road, which is the target route of the project, is regarded as an important route connecting the port in Djibouti, one of Ethiopia’s neighboring countries, and Addis Ababa, Ethiopia’s capital; the port handles 90% of the exports and imports of Ethiopia. The project was relevant to Ethiopia’s road development plan and development needs both at the time of planning as well as at the time of ex-post evaluation, and Japan’s ODA policy at the time of planning; therefore, its relevance is high. Although there were no major changes in the project outputs, and the project cost was lower than planned, as the project period exceeded the plan, the efficiency of the project is

fair. The effect indicators that were set at the time of planning, such as the time for vehicles to stop on the Awash Bridge, the weight limit of vehicles that can pass through the bridge, and the speed of vehicles on the bridge achieved the target values. Interviews with stakeholders as well as actual measurement and qualitative surveys in this evaluation study confirmed strengthened logistical functions and better traffic safety. Therefore, this project has high effectiveness and a high level of impact. Since the completion of the project, no daily maintenance of the Awash Bridge has been implemented. Because bridges such as the Awash Bridge that have been replaced in recent years are of low priority, no basic maintenance plans and no budget is secured for them. Therefore, there are a few problems in the organizational, technical, and financial aspects, and the sustainability of this project is moderate.

In light of the above, this project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Strengthening the organization of the ERA

The ERA needs to develop strategies and systems for strengthening its personnel's capacity. This evaluation study revealed that the ERA has neither a long-term strategy for strengthening the organization nor a framework for such strategy. In the short term, knowledge and information on maintaining and managing bridges can be shared through training and distribution of manuals developed by JICA's technical cooperation projects. However, it seems necessary to strengthen the organization of the ERA from a long-term perspective by such means as establishing a regular training system and reviewing the salary system.

(2) Implementing daily and regular maintenance

Regarding the maintenance of the Awash Bridge, it is imperative to: (1) conduct daily and periodic maintenance and always keep track of the facilities' status; (2) conduct inspection and cleaning of drainage facilities, especially before the rainy season; and (3) secure the maintenance budget based on the master plan for maintenance of bridges. Concerning basic inspection tasks, it can be suggested that ERA lead management based on the manual produced in the "Capacity Development Project on Bridge Management", rather than entrusting it to an external consulting firm. Newly replaced bridges are given low priority and not subject to maintenance management. Therefore, in the master plan for maintaining and managing bridges, it can be an option for ERA to consider giving distinct and separate priorities for maintenance and management of these bridges, and conducting basic daily and regular maintenance.

(3) Responding to requests from users

In this ex-post evaluation study, drivers in logistics-related and passenger transportation companies cited the following requests: (1) installation of reflectors, automatic speed violation

control equipment, and traffic signs in bridges and roads; (2) additional construction for paving the corner part of the road in a flat and level manner[59]; (3) periodic maintenance that focuses on road paving; (4) cleaning of roadside gutters and drainage; and (5) periodic inspection of the old Awash Bridge.[60] It is desirable to verify the status of these items and respond to the requests in a planned and appropriate manner.

4.2.2 Recommendations to JICA

Need to follow up on recommendations

The defect inspection conducted before this ex-post evaluation study (2016) recommends that ERA establish a system for daily bridge maintenance (such as periodic inspection and cleaning), and maintain drainage facilities. This ex-post evaluation study also points out sands and dust accumulated in drainage facilities such as roadside trenches and drainage, hindering drainage functions. It shows that the recommendation at the time of defect inspection has not been fully responded.

Whether to take into account the recommendations of the ex-post evaluation is up to the executing agency. However, it is recommended that JICA take measures including monitoring of the responses by the executing agency to ensure the sustainability of a series of project effects.

4.3 Lessons Learned

Implementing a comprehensive survey of the maintenance system at the time of planning

At the time of planning, to see the maintenance capability of the executing agency after the completion of the project JICA checked its organization, budget and technical level but not its master plan for maintaining and managing bridges. In Ethiopia, a bridge will not be subject to maintenance and a budget for its maintenance will not be allocated unless it is given high priority is in the master plan. In other words, the budget is preferentially allocated to bridges that require an urgent response, such as those with severe damage, and does not go to newly built bridges. From the completion of the project to the time of the ex-post evaluation, the Awash Bridge was not cleaned on a daily basis.

To avoid such a situation and prolong the life of bridges, at the time of planning a project, it is necessary to confirm the maintenance system comprehensively, including the maintenance master plan of the recipient government. If necessary, the donor country and the recipient country need to consider and agree on specific measures in advance. The executing agency should prepare a plan to ensure that periodic inspections, especially inspection and cleaning of drainage facilities before the rainy season, are implemented, and strive to secure the maintenance budget.

[59] According to interviews with users, a few of them feel a slight tilt while driving in the corner part of the road.
[60] Although the bridge is not used on a daily basis, it is to be used in limited cases such as emergencies.