

Federal Democratic Republic of Ethiopia

FY2018 Ex-Post Evaluation of Japanese Grant Aid Project

“The Project for Rehabilitation of Trunk Road (Phase IV)”

External Evaluator: Maki Hamaoka

Foundation for Advanced Studies on International Development

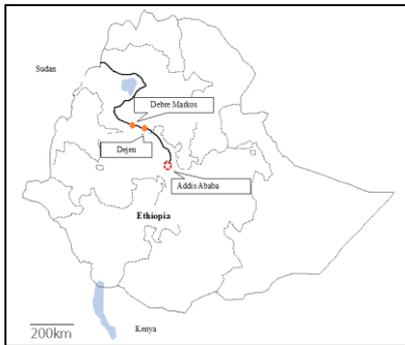
0. Summary

This project was implemented to strengthen the functions of the route for international logistics and to improve access to medical/educational facilities and food for the local population by rehabilitating the deteriorated section of Trunk Road Route 3, Dejen-Debre Markos in Amhara Region, Ethiopia, thereby contributing to the development of economic and social infrastructure that will support the realization of agricultural development and industrialization.

This project is highly consistent with Ethiopia’s development policy and sector plan, which regards road development as the foundation of economic growth and social development, the development needs of Ethiopia, and Japan’s aid policy. Although the project outputs were produced as planned and the project cost was within the planned budget, the project period exceeded the plan. Therefore, project efficiency was fair. Improvements in road stability and driving comfort were achieved after rehabilitation of the target section. As a result, among the effect indicators, improvement in driving speed and reduction of road closures due to flooding in the rainy season fully achieved their targets; annual average traffic volume almost achieved its target value. The function of the route for international logistics has been strengthened to a certain extent. In addition, impacts such as improvements in access to medical/educational facilities were also confirmed for the local population and those on economic development and supporting agricultural development such as increases in the volume of livestock transport and distribution of improved seeds and fertilizers. Improvements in comfort of transportation have led to excessive driving speeds for drivers and an increase in the number of traffic accidents in some locations of the target section. The ex-post evaluation took into account that risk-hedging against speeding was sufficiently implemented by the project, and its effectiveness and impact were judged to be high. The section targeted by this project is regularly inspected by *the Debre Markos Road Network & Safety Management Branch Directorate* (hereinafter referred to as Debre Markos Directorate) of *the Ethiopian Road Authority* (hereinafter referred to as “ERA”). Although there are currently no problems in terms of organizational and financial aspects of the operation and maintenance of the target section, there are some problems in technical aspects and operation and maintenance status related to minimization of the impact of swelling of soil (effects of black cotton soil) on the road surface in the target section. Sustainability of the project’s effects is fair.

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

1. Project Description



Project Location



Road rehabilitated by this project (Lumame)

1.1 Background

Delays in road network development and poor road conditions were problems in the transportation sector in Ethiopia. The Ethiopian government tried to improve the road network by developing main roads and expanding rural roads with the cooperation of donors. Trunk Road Route 3, which connects Addis Ababa, capital of Ethiopia, and Metema at the Sudan border (a distance of about 988km), also connects Addis Ababa as the principal market for the Amhara region, an important grain-growing region that produces 40 percent of agricultural products in Ethiopia. Moreover, the road is used as the transportation route of fuel imported from Sudan, which accounts for 80 percent of industrial fuel consumption in the vicinity of Addis Ababa. Furthermore, Trunk Road Route 3 is an important route not only for Ethiopia but also for East Africa as part of the Trans-East African Highway.

The improvement of Trunk Road Route 3 between Addis Ababa and Dejen (about 223km) was implemented as Japanese grant aid projects. Sections from Debre Markos to Bahir Dar (about 265km) and from Bahir Dar to Gondar (about 213km) were rehabilitated under the aid of the World Bank in 2004 and 2007, respectively. Improvement of the section between Gondar and Metema (about 221km) was completed in March 2011 by the Ethiopian government's own fund. Only the section between Dejen and Debre Markos (about 65.5km) remained deteriorated, and the rehabilitation of the section was urgent.

1.2 Project Outline

The objective of this project was to strengthen the functions of the route for international logistics and to improve access to medical/educational facilities and food for the local population by rehabilitating the deteriorated section of Trunk Road Route 3, thereby contributing to the development of economic and social infrastructure that will support the realization of agricultural development and industrialization in Ethiopia.

Grant Limit / Actual Grant Amount	Phase 1: 4,158 million yen / 4,139 million yen Phase 2: 72 million yen / 72 million yen (for detail design study) Phase 2: 7,521 million yen / 7,468 million yen (for construction)
Exchange of Notes Date /Grant Agreement Date	Phase 1: June 2011 Phase 2: December 2012 (for detail design study), June 2013 (for construction)
Executing Agency(ies)	Ethiopian Roads Authority (ERA)
Project Completion	Phase 1: March 2014 Phase 2: February 2016
Target Area	Dejen - Debre Markos in Amhara Region
Main Contractor(s)	KAJIMA Corporation
Main Consultant(s)	Joint venture formed by Oriental Consultants Co., Ltd. and Eight-Japan Engineering Consultants Inc.
Preparatory Survey	July 2010 - April 2011
Related Projects	<p><Technical Cooperation></p> <ul style="list-style-type: none"> • Dispatch of an Expert “ERA Bridge Management” (2002.7-2004.7, 2004.7-2006.7) • “Project for Capacity Building of the Alemgena Training and Testing Center of ERA” (2002-2006) • “Capacity Development Project on Bridge Management” (2007-2012) <p><Grant Aid ></p> <ul style="list-style-type: none"> • “The Project for Rehabilitation of Trunk Road, Phase I” (FY1998-FY2001) • “The Project for Rehabilitation of Trunk Road, Phase II” (FY2001- FY 2004) • “The Project for Rehabilitation of Trunk Road, Phase III” (FY 2005) • “The Project for Operation and Maintenance of Trunk Road: Goha Tshion – Dejen across Abay Gorge” (FY 2010) • “The Project for Improvement of Axle Load Control on Trunk Roads” (FY 2015-FY 2017)

2. Outline of the Evaluation Study

2.1 External Evaluator

Maki Hamaoka, Foundation for Advanced Studies on International Development

2.2 Duration of Evaluation Study

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

Duration of the Study: November, 2018 – December, 2019

Duration of the Field Study: February 5, 2019 – February 14, 2019

3. Results of the Evaluation (Overall Rating: B¹)

3.1 Relevance (Rating: ③²)

3.1.1 Consistency with the Development Plan of Ethiopia

At the time of the ex-ante evaluation, the Government of Ethiopia formulated the *Road Sector Development Program* (hereinafter referred to as “RSDP”) in four five-year phases since 1997. Regarding this project, RSDP IV plans stated that improvement of the target section of this project in the Trunk Road Route 3 would be completed within the period of 2010–2015.

At the time of the ex-post evaluation, the Government of Ethiopia positioned roads as the backbone for the country’s accelerated economic growth and social development in the *Growth and Transformation Plan II* (2015/16-2019/20)(hereinafter referred to as “GTP II”). This document states that upgrades and improvements of existing main roads and construction of express roads that link to the main corridors will continue. The Government of Ethiopia formulated RSDP V (2016–2020) in 2015, positioning the improvement of road networks as important for Ethiopia to reach low-middle-income country status by 2025. RSDP V prioritizes the construction of main roads and link roads to improve access to crop surpluses, potential areas of economic development, and densely populated rural areas, as well as large-scale maintenance of existing road networks.

In light of the above, this project which aimed to strengthen the route for international logistics and improve access to medical/educational facilities and food for the local population through road improvement was highly relevant to the development policy of the Government of Ethiopia both at the time of the ex-ante evaluation and the ex-post evaluation.

3.1.2 Consistency with the Development Needs of Ethiopia

At the time of the ex-ante evaluation, the low density of paved road (Density of federal and rural trunk roads per 1000km² = 42.6km; Road density per 1000 people = 0.57km; Paved road ratio = 14.8% of all roads in 2009) and poor road conditions (46% of the total road length was in poor condition as of 2009) were the issues in the transportation sector in Ethiopia.

As shown in Table 1, rural roads and trunk roads have been extended in accordance with RSDP V. However, there are target indicators that have not been achieved, such as road density per population, and others that have not been stable, such as the proportion of the road network in acceptable condition. In this regard, the need for road network development is continuously recognized.

¹ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

² ③: High, ②: Fair, ①: Low

Table 1: Change in Major Indicators of the Road Sector in Ethiopia

Indicators	2010/2011		2011/2012		2012/2013		2013/2014		2014/2015		2015/2016		2016/2017	
	Plan	Result												
Length of federal and regional road network (km)	51,636	53,143	54,818	56,100	58,211	58,338	61,771	60,466	64,522	63,604	110,414	65,009	119,000	67,423
Length of all-weather road (km)	9,568	854	24,299	6,983	40,044	27,628	55,790	39,056	71,522	46,810		48,057		52,748
Road density per 1000 km ²	55.6	49.1	71.9	57.4	89.3	78.2	106.9	90.5	123.7	100.1	144	102.8	163	109.2
Road density per 1000 population	0.78	0.66	0.98	0.75	1.18	1.00	1.37	1.13	1.54	1.3	1.7	1.3	1.9	1.3
Proportion of road network in acceptable condition (%)	81.3	81	83	86	84.6	86	85.9	86	86.7	87	74	72	76	72

Source: RSDP V (2015–2020)

In light of the above, the needs for the improvement of the road network were high at both the ex-ante and ex-post evaluation stages.

3.1.3 Consistency with Japan’s ODA Policy

The Country Assistance Program for Ethiopia (2008) prepared by the Ministry of Foreign Affairs and *JICA’s Country-Specific Program (2008)* gave a priority to “establishment of transportation infrastructure for the purpose of promoting the distribution of agricultural products from the viewpoint of poverty reduction and human security (especially food security).” In addition, *the Country Assistance Policy for Ethiopia (2012)* emphasized the development and maintenance of transportation infrastructure to promote the transportation of agricultural products from the perspectives of food security and industrialization. In addition, this project contributed to the development of wide-area transport infrastructure, which is a priority area of *the Yokohama Action Plan (2008)* formulated at the 4th Tokyo International Conference on African Development (TICAD IV). As seen above, it can be concluded that this project was consistent with Japan’s ODA policy at the time of planning.

In light of the above, the implementation of this project has been highly relevant to the development plan and development needs of Ethiopia, as well as Japan’s ODA policy. Therefore its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Through this project, the rehabilitation of road, bridges and large-scale structures (box culverts), and installation of auxiliary facilities such as signs and guideposts were carried out in the Dejen–Debre Markos section, deteriorated section of Trunk Road Route 3. As shown in Table

2, the rehabilitation of road and bridges and installation of large-scale structures went almost as planned, and that of bridges exceeded the planned values.

Table 2: Planned and Actual Project Outputs

Item		Plan			Actual		
		Phase 1 (Dejen-Lumame)	Phase 2 (Lumame - Debre Markos)	Total	Phase 1 (Dejen- Lumame)	Phase 2 (Lumame - Debre Markos)	Total
Road	Length (km)	30.5	39.85	70.35	29.0	39.90	68.9
	Cross Section	Overall width: 11.0m-20.0m Carriageway width: 3.5m x 2 Shoulder: 1.5m-3.5m Sidewalk: 2.5m			Overall width: 10m-19m Carriageway width: 3.5m x 2 Shoulder: 1.5m-2.5m Sidewalk: 2.5m		Overall width: 10m-20m Carriageway width: 3.5m x 2 Shoulder: 1.5m-3.0m Sidewalk: 2.5m
	Pavement	Surface Course: 5cm Binder Course: 5cm Base Course: 20cm/Sub-base Course: 25cm Capping Layer: 20cm (If necessary)			Surface Course: 5cm Binder Course: 7.5 cm Base Course: 22.5cm Sub-base Course: 22.5cm- 25cm Capping Layer: 20cm		Surface Course: 5cm Binder Course: 7.5 cm Base Course: 22.5cm Sub-base Course: 22.5cm-25cm Capping Layer: 20cm
Bridge	RC Slab	10m: 1 Bridge	10m+10m: 1 Bridge	2	10.6 m: 1 Bridge	72m(9x8m): 1 Bridge	2
	RC Girder	17m+17m: 1 Bridge 15.6m: 1 Bridge 15.0m: 1 Bridge	15m: 2 Bridges 15m+15m: 1 Bridge	6	30.6m: 1 Bridge 15.6m: 1 Bridge	15m: 5 Bridges 15m+15m: 1 Bridge	8
	Box Culvert	1	5	6	1	5	6
		Total			Total		
				14			16
Auxiliary Facilities	Lane marking (Ten thousand m)	8.9	12.7	21.6	4.5	12.7	17.2
	Traffic Sign	69	230	299	78	230	308
	Guide Post	880	17,530	18,410	2,400	17,530	19,930
	Kilometers post	30	40	70	30	40	70
	Guardrail (m)	740	9,000	9,740	0	9,000	9,000

Source: Documents provided by JICA

The change in the planned value was due to adjustments at the time of detailed design study, measures to deal with unsuccessful tender and adjustments during construction. For example, in response to the unsuccessful tender of Phase 1, the length of road was changed from 30.5km to 29.0km after exclusion of a part of Lumame town woreda and Bogena Bridge from the component. As for the pavement structure, at the time of detailed design study in 2011, the binder course asphalt was changed from 5.0cm to 7.5cm as a result of the review of the traffic analysis conducted by ERA in 2009, which showed the estimated traffic volume would increase compared to the time of the preparatory survey. Regarding bridges, Ambesh Bridge was changed from reinforced concrete (RC) culvert to RC girder. Bogena Bridge, which was excluded as a response to the bidding failure in Phase 1, was added in Phase 2, and Useta Bridge was changed from RC slab to RC girder. As a result of these changes, the actual number of bridges has been increased from 3 to 6. For the above changes, the Japanese consultant considered and implemented timely and appropriate countermeasures according to the detailed design study and changes recognized during construction through discussions with ERA and

JICA.

The obligations of the Ethiopian side, such as acquisition of construction sites, compensation for resettlement, relocation of obstacles and compensation were implemented as initially planned, although there was a slight delay in the relocation of utility poles and distribution lines.

3.2.2 Project Inputs

3.2.2.1 Project Cost

As for the project cost, the initial plan was compared with the total actual result in Phases 1 and 2. Because no information on the actual cost borne by the Ethiopian side was available, only the cost borne by the Japanese side was evaluated. The total cost at the time of planning was 12,749 million yen, with 11,751 million yen borne by Japan and 998 million yen borne by Ethiopia. As shown in Table 3, the actual cost borne by Japan was 11,679 million yen (99% of the planned budget), which was within the plan. Regarding the difference between the planned and the actual cost, it was due to the fact that the contract amount was lower than the planned amount. This occurred due to the competition principle at the time of bidding, and the amount that was higher than planned (supervision cost for Phase 2) was due to the increase in expenses associated with a five-month extension of the construction period.

Table 3: Planned and Actual Project Costs

Unit: million yen

		Phase 1		Phase 2		Total		Compared with plan
		Plan	Result	Plan	Result	Plan	Result	
Cost borne by Japan	Detailed design (Phase 2)			72	72	72	72	100%
	Detailed design/Supervision	189	189	124	138	313	327	104%
	Construction	3,969	3,950	7,397	7,330	11,366	11,280	99%
	Sub-Total	4,158	4,139	7,593	7,540	11,751	11,679	99%
Cost borne by Ethiopia		376	n.a.	622	n.a.	998	n.a.	n.a.
Total project cost		4,534	n.a.	8,215	n.a.	12,749	n.a.	n.a.

Source: Documents provided by JICA

3.2.2.2 Project Period

The actual project period was 75 months against a planned 66 months (114% of the planned period). The difference between the plan and the actual result was due to the fact that the construction period was extended for three months for Phase 1 and seven months for Phase 2. Reasons for extension included delays in land acquisition in Debre Markos, unusual rainfall, construction interruption (60 days)³ to deal with requests for road widening (from 20m to

³ Regarding the section of 6.5km from Debre Markos City, end point of the target section, there was a request from

30m) by residents of Debre Markos City and review of the construction period due to the prediction that the extension period (78 days) would overlap the rainy season. Among these factors, the extension period entering the rainy season was a major and inevitable factor, so it was judged to be appropriate.

Table 4: Planned and Actual Project Periods

	Plan		Actual result	
	Period	Months	Period	Months
Phase 1	July 2011 – March 2014	34months	June 2011 – June 2014	37months
Phase 2 (Detailed design)	December 2012 – May 2013	6 months	December 2012 – May 2013	6 months
Phase 2 (Construction)	May 2013 – June 2015	26 months	June 2013 – January 2016	32 months
	Total	66 months	Total	75 months

Source: Documents provided by JICA

Although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair.

3.2 Effectiveness and Impacts⁴ (Rating: ③)

3.2.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

(1) Annual Average Traffic

The annual average traffic was added as a target value at the time of ex-ante evaluation of Phase 2. Values were forecast based on the traffic survey conducted by ERA in 2009.

Initially, the target value of the annual average traffic for Phase 2 was 2,181 units/day for 2019. Since the actual value for 2019 can be confirmed in 2020, the 2018 forecast from the above traffic survey was replaced with the initial target value and compared with the actual result for 2018 (Table 6). The actual results were obtained from traffic volume survey results by the executing agency.⁵ The result in 2018 was 80% of the target value (predicted value). Looking at chronological changes, the average annual traffic has been maintained at a generally high level after project completion (after 2016) (Table 6).

The difference between the target value and the actual value is due to the completion of the rehabilitation of Road B31 (80km) with investment by the Ethiopian government in 2015,

the residents of Debre Markos City to change the road width including the sidewalk from 20m to 30m. The construction of the same section was suspended for about two months from December 16, 2013, and discussions were held between ERA and Debre Markos City. Finally, on the condition that ERA will construct another road, construction was resumed with the agreement of the Debre Markos City for the 20m wide road construction as originally planned. (Source: Documents provided by JICA)

⁴ Sub-rating for Effectiveness is to be put with consideration of Impacts.

⁵ In Ethiopia, daily average traffic is calculated through traffic count which is implemented three times a year, 7 days of 12-hour count in each session, out of which 2 days is a 24-hour count (Source: Answers to questionnaire to the executing agency).

which goes from the middle of the target section to Bahar Dar, the capital of Amhara Region. Before the completion of the rehabilitation of Road B31, Trunk Road Route 3 was used to travel from Addis Ababa to Bahar Dar. After rehabilitating Road B31, the travel time to Bahar Dar was reduced by 30 minutes compared to the travel via Trunk Road Route 3.

Table 5: Annual Average Traffic in the Target Section (cars/day)

	Baseline	Target	Actual
	2012	2018	2019
		3 Years After Completion	3 Years After Completion
Annual average traffic (cars/day)	1,052 (2012)	2,037 (2018)	1,647 (2018)

Source: Documents provided by JICA and the executing agency

Note 1: The baseline in 2012 was a prediction based on the detailed design implemented by ERA in 2009.

Note 2: At the time of the ex-ante evaluation, the project completion was expected for 2015, and 3 years after project completion was 2018. However, the project was completed in 2016 due to the extension of the project period. Therefore, 2019 is 3 years after the completion of the project.

Note 3: The target value for 2018 was a prediction based on the detailed design implemented by ERA in 2009, which was added as a target value at the time of ex-ante evaluation for Phase 2. The reasons why the predicted value of the annual average traffic was newly added as an indicator in Phase 2 were confirmed with related parties, but we could not confirm them because there were no records.

Table 6: Chronological Change of Annual Average Traffic in the Target Section (cars/day)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Car	13	21	23	32	25	28	29	51	50	49	47
Land Rover	129	154	156	195	181	188	206	195	218	211	175
Small Bus	142	247	293	324	267	240	256	314	386	385	372
Large Bus	78	102	128	154	104	113	147	213	179	183	184
Small Truck	94	155	194	176	104	133	132	145	136	133	175
Medium Truck	128	234	276	241	192	194	152	225	192	265	262
Heavy Truck	114	261	226	165	138	114	133	192	189	240	264
Trailer	105	174	182	172	124	129	166	174	171	188	168
Total	803	1,348	1,478	1,459	1,135	1,139	1,221	1,511	1,521	1,654	1,647
Increase rate (compared to previous year)		67.9%	9.6%	-1.3%	-22.2%	0.4%	7.2%	23.8%	0.7%	8.7%	-0.4%
Predicted traffic by ERA (Detailed Design in 2009)		852	918	982	1052	1129	1546	1655	1774	1901	2037
Increase rate (compared to the prediction)			7.7%	7.0%	7.1%	7.3%	36.9%	7.1%	7.2%	7.2%	7.2%
Achievement compared to the prediction		158.2%	161.0%	148.6%	107.9%	100.9%	79.0%	91.3%	85.7%	87.0%	80.9%

Source: ERA

(2) Average Driving Speed

The average speed was measured directly during the field survey of the ex-post evaluation because no data was obtained from the executing agency. In the case of cars, the speed was measured by driving through town areas at the legal speed (35km/hour) and other sections at the designed speeds (70–80km/hour). In the case of heavy trucks, speed was measured by following a truck driving in the target section. In addition, interviews with drivers of small buses (hereinafter referred to as minibuses) and long-distance bus drivers driving in the target section

and concerned parties such as hospitals and agriculture bureaus working in the target section were also used as references. As a result of direct measurement and interview surveys, it was confirmed that the average speed achieved the target value.

Table 7: Average Driving Speed in the Target Section

	Baseline	Target	Actual
	2010	2018	2019
		3 years After Completion	3 years After Completion
Average speed (cars)	44.8km/hr	60.6km/hr	65km/hr
Average speed (heavy trucks)	30.0km/hr	50.0km/hr	50-60km/hr

Source: Documents provided by JICA, measurement during the ex-post evaluation

Note 1: Before the project, the average speed of heavy trucks was calculated by subtracting 15 km/h from that of cars, since generally the speed difference between cars and heavy trucks is in the range of 10 to 20 km/h. Target speed after the project was calculated by subtracting 10km/h from the speed of cars since the road condition was expected to improve and the road was expected to be widened (Source: documents provided by JICA).

Note 2: At the time of the ex-ante evaluation, the project completion was expected for 2015, and 3 years after project completion was 2018. However, the project was completed in 2016 due to the extension of the project period and the actual result of average driving speed was verified through the field survey of the ex-post evaluation in 2019, 3 years after project completion.

Travel time has been greatly shortened by the improvement in driving speed. Before project implementation, it took 90 minutes in the dry season and more than 2 hours in the rainy season to travel between Dejen and Debre Markos. After project completion, it takes 40–60 minutes regardless of the season.⁶

(3) Road Closure due to Flooding

Before project implementation, the Yeda River flowing through the target section was flooded several times during the rainy season from July to September, and roads were frequently closed.⁷ After project completion, there were no road closures due to flooding,⁸ and the target was achieved.

⁶ Source: Interviews with a union of minibus operators (Ghion Transport), minibus drivers and passengers

⁷ According to the interview survey conducted during the preparatory survey, the frequency of closing of road due to flooding was around 10 times in the rainy seasons. According to the interview implemented at the time of the ex-post evaluation, there were reports that roads were always closed due to flooding in July-September before the project implementation.

⁸ Source: Answers to questionnaire to the executing agency, interviews with minibus operators, local population and governmental organizations (health centers, transportation offices).

Table 8: Frequency of Road Closures due to Flooding

	Baseline	Target	Actual
	2010	2018	2018
		3 Years After Completion	2 Years After Completion
Frequency	About 10 times/year×3–5 hours	0	0

Source: ERA

Note 1: At the time of the ex-ante evaluation, the project completion was expected for 2015, and 3 years after project completion was 2018. The project was completed in 2016 due to the extension of the project period and the actual result of frequency of road closures due to flooding was the result of the rainy season in 2018, 2 years after project completion.

3.3.1.2 Qualitative Effects (Other Effects)

Through this project’s rehabilitation of the deteriorated section of Trunk Road Route 3, increased function of the route for international logistics and access to medical/educational facilities and food for the local population were expected. The results confirmed through the ex-post evaluation are discussed below.

(1) Strengthening of the Functions of the Route for International Logistics

a) Increase in Oil and Coal Imports from Sudan

Ethiopia imports 50% of its oil imports and 100% of its coal by road from the neighboring country of Sudan. Since 2011, imports of both oil and coal have increased. Changes in imports are affected by consumption and economic conditions, so the increase cannot be attributed to road rehabilitation alone; however, the safety and stability of transportation for transporters due to improved driving comfort and reduction in transportation time have enhanced the function of the transportation network.

Table 9: Ethiopian Imports of Oil and Coal

Unit: metric tons

Year	Oil	Coal
2011/12	2,262,578	141,001
2012/13	2,289,613	224,450
2013/14	2,622,807	291,388
2014/15	2,822,091	352,171
2015/16	3,080,258	418,101
2016/17	3,501,759	452,103

Source: Ethiopian Petroleum Corporation

b) Improved Convenience of Transportation between Ethiopia and Sudan

In 2016, when this project was completed, a direct international bus service started between Addis Ababa and Khartoum, capital of Sudan. The number of long-distance bus operators that started the service was five as of 2016 and six as of 2019. These companies rotate in the bus

operation once a day.⁹ Before the start of international bus operations, people moved on this section by minibuses and medium- and long-distance buses. With the start of international bus operations, logistics and mobility of people were strengthened. Before, people traveled between Addis Ababa and Khartoum by making connections with minibuses and/or medium- and long-distance buses. Also, buses traveling on this international route are always full (capacity is 51 seats), leading to an increase in fare revenue for bus operators.¹⁰

(2) Improvement of Access to Medical/Educational Facilities and Food for the Local Population

a) Improvement of Access to Medical Facilities

After rehabilitation of the road, the transport time for patients requiring emergency treatment has been significantly reduced. In the target section in 2015, primary hospitals equipped with facilities for surgery and delivery were opened at Dejen (starting point of the target section) and Lumame (about 30 km from Dejen). The local population in the target section was previously transported to the referral hospital in Debre Markos City (the end of the target section, about 70 km from Dejen) in case of illness or injury that could not be treated in health centers. Currently, they go to the abovementioned primary hospitals for the treatment of diseases that cannot be handled by the health centers, making it easier to access medical facilities. In addition, for surgeries and deliveries that require urgent treatment but cannot be handled by the primary hospital, patients are transported to the referral hospital in Debre Markos City. It previously took 40 minutes to travel by ambulance to Debre Markos, about 20 km away from Andede woreda, but this was reduced to 20 minutes after project completion. In addition, during the rainy season, roads were often closed due to flooding of the Yeda River, and ambulances sometimes could not reach the hospital in Debre Markos City. After project completion, there were no road closures due to flooding, and these problems were resolved.¹¹

b) Improvement of Access to Educational Facilities

The linear improvements, road widening and installation of sidewalks and painting of zebra lines for pedestrian crossings in this project have reduced traffic accidents that occurred previously in town areas and thus improved safety for commuters to school. For example, in Lumame woreda town, students attending Lumame higher education preparatory school were frequently involved in traffic accidents before the project due to narrow roads, sharp curves, and no pedestrian crossings. After project completion, there was only one accident in which a student was injured. This was a benefit of road widening, gentle curves, and installation of

⁹ From January 2019, international bus services were temporarily suspended as of February 2019 due to the deterioration of security in the Benishangul-Gumuz Region.

¹⁰ Source: Interviews with two bus operators (LIMALIMO, Golden Bus)

¹¹ Source: Interviews with head of health center of Andede Woreda, 3 patients visiting the center and 1 ambulance driver.

pedestrian crossings.¹² In another example, a student who had attended a university located in Debre Markos City was sometimes unable to attend school due to road closure caused by flooding of the Yeda River. She said that after project completion, commuting time was shortened, and the problems such as late arrivals or absences were resolved.

c) Improvement of Access to Food

After project completion, travel time was shortened and travel comfort was improved, making it easier to move by minibus or walk when shopping, as well as easier to transport harvested grains to market.¹³ For example, in Andede woreda, it previously took 50 minutes to harvest *tef* (a type of grain) and transport it to Debre Markos City by small truck, but this was reduced to 30 minutes after project completion.

3.3.2 Impacts

3.3.2.1 Intended Impacts

In this project, development of economic and social infrastructure that would support the realization of agricultural development and industrialization was assumed as an impact.

(1) Contribution to Economic Development through Promotion of Agricultural Activities

The amount of improved seeds and fertilizers that the zonal agriculture bureau distributes to farmers in the East Gojam zone for a fee is increasing due to improved driving comfort and reduced travel time. The table below shows the distribution of improved seeds and fertilizer to farmers in 21 woredas of the East Gojam zone, including five woredas in the target section. According to the zonal agriculture bureau, the road rehabilitation reduced travel time significantly, contributing to an increase in the distribution of these agricultural inputs. In addition, since damage to vehicles during driving has been reduced, the frequency of vehicle repairs has decreased, and the frequency of vehicle operation has also improved, leading to an increase in distribution of agricultural inputs.

Table 10: Distribution of improved seeds and fertilizers in East Gojam zone

	2009 /2010	2010 /2011	2011 /2012	2012 /2013	2013 /2014	2014 /2015	2015 /2016	2016 /2017	2017 /2018
Improved seeds	22,655	22,345	14,080	23,859	27,798	27,604	34,621	29,437	39,638
Fertilizer	518,321	468,388	507,604	557,734	631,213	677,243	751,247	876,025	969,942

Source: Agricultural Bureau of East Gojam Zone, Amhara Region

¹² Source: Interview with 1 Lumame Higher Education Preparatory School Principal, 1 vice principal and 2 teachers.

¹³ Source: 4 residents of Lumame woreda town and 4 residents of Andede woreda.

(2) Contribution to Economic Development and Increase in Livestock Transport from the Target Area to Other Markets

After project completion, the number of livestock transported from East Gojam to other markets has increased significantly. About 25% of livestock transported to other markets is transported to the capital, Addis Ababa, and about 75% is transported to the capital of the Amhara Region. The increase in transport volume is attributed to the fact that transportation of goods has become easier than before; this is due to improved traveling performance and roads that make it easier to travel at night.

Table 11: Livestock transport (number)

	2015/2016	2016/2017	2017/2018
Cow	7,946	32,255	34,512
Goat	2,566	33,323	38,984
Horse	710	2,925	4,282
Total	11,222	68,503	77,778

Source: Agricultural Bureau of East Gojam Zone, Amhara Region

(3) Other Impacts to Economic Development

a) Decrease in Profits of Public Transport Operators (Minibus Operators)

After project completion, road surface quality improved and damage to vehicles during driving was reduced. The frequency of repairs and driving fuel costs were reduced as well. However, maintenance costs are increasing year by year due to fuel costs, spare part costs, and repair costs incurred by minibus operators. In addition, with the increase in the number of operators, the number of bus operations per day per bus has decreased compared to before the project, and the bus fee has decreased, so the profits of bus operators in the target section have decreased.¹⁴

b) Increase in Profits of Long-Distance Bus Operators

On the other hand, according to interviews with bus operators who entered the international bus route between Addis Ababa and Khartoum, the route is always full and contributes to an increase in fare revenue. Fuel consumption is also decreasing due to a decrease in travel time from Addis Ababa to local cities in the Amhara Region (Bahar Dar, Debre Markos, etc.).¹⁵

(4) Impacts on Development of Social Infrastructure

As for the impact of this project on the development of social infrastructure, improvement of the convenience of public transportation can be cited.

¹⁴ Source: Interview with a union of minibus operators (Ghion Transport), minibus operators

¹⁵ Source: Interview with two long-distance bus operators (LIMALIMO, Golden Bus).

Prior to the project, 10 minibuses operated four times a day in the target section. After project completion, the number of minibuses increased to 50 from an increase in the number of people entering the bus business due to driving comfort. Each bus operates on average twice a day (one round trip), and the number of minibuses operating in the target section per day increased from 40 before the project to 100. In addition, since the bus between Dejen and Debre Markos was always full before project completion, residents along the target section could not get on from the middle of the section. Currently, the number of operations has increased and some buses have vacant seats, so residents can take the bus from the middle of the bus route. Thus, it has become easier for residents to secure transportation.

The convenience of public transportation is also seen in mobility between major cities in Ethiopia. For example, the time required from Debre Markos City to Addis Ababa (about 300km) has been reduced from 6 hours (50km/h) to 4–5 hours (100–120km/h) after project completion. Before the project, the road was closed due to the flooding of the Yeda River, but after the project, there have been no road closures and driving stability has been secured. In addition, fuel consumption has decreased due to the decrease in travel time.¹⁶

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

At the ex-ante evaluation, this project was classified as Category B according to the classification of the road sector in the JICA Guidelines for Environmental and Social Considerations (2004), as it was not classified as large-scale and did not fall under the easily affected characteristics and sensitive areas listed in the Guidelines. The Environmental Impact Assessment (EIA) was approved by the executing agency in August 2011.

During the implementation period, as monitoring of environmental impact and mitigation measures,¹⁷ the person in charge of the executing agency visited the construction site, interviewed the contractor and confirmed the site, and prepared a monitoring report on EIA. The contractor took measures to mitigate environmental impacts as planned, and no particular problems have occurred.¹⁸

(2) Resettlement and Land Acquisition

Because this project involved the involuntary resettlement of 164 residents, land acquisition was planned during the planning stage in accordance with Ethiopia's national procedures and Resettlement Action Plan (hereinafter referred to as "RAP"). The executing

¹⁶ Source: Interview with two long-distance bus operators (LIMALIMO, Golden Bus).

¹⁷ Measures to pollution: measures to minimize the impact predicted to be caused during construction and operation such as soil erosion on the side of the road and deterioration of water quality of rivers by reinforcing the slope by planting, and restricting construction during the rainy season. (Source: preparatory survey report).

¹⁸ Source: Questionnaires to the executing agency and the Japanese consultant

agency planned to pay compensation to the target households and monitor the occurrence of accidents along the RAP. After the route changed during the project implementation stage, 159 people from 35 households were finally subject to relocation. In Phase 2, land acquisition was slightly delayed due to procedural issues, but there was no impact on the overall process. The executing agency paid land compensation to the target households as planned, and there were no problems with resettlement or land acquisition.¹⁹

(3) Increase in Traffic Accidents in the Target Section

While the implementation of the project has improved traffic safety overall, the number of traffic accidents has increased in the entire target section since 2016. Although detailed information on the causes of traffic accidents (e.g., who is to be blamed, drivers or pedestrians) could not be obtained, it was confirmed that serious and fatal accidents increased among traffic accidents.²⁰

Prior to the implementation of this project, the roads in the target section, which had been simply paved, were not suitable for smooth running of vehicles because there were many potholes and cracks in the road and damage to its shoulders. Since the possibility of an increase of accidents was foreseen at the planning stage,²¹ all measures were taken against speeding during the project implementation, such as installing regulatory signs (no overtaking, speed limit), danger notice signs (steep curve notice, steep slope notice), and gaze guidance fences with concrete posts to prevent vehicles from falling by identifying dangerous locations. Nonetheless, bus drivers, who are highly regarded for arriving at their destinations quickly, would overspeed. Since project completion, serious injuries have been increasing mainly on steep downhill sections. In particular, there are eight places where many accidents occur, indicated in green on the map below.²² In fact, most bus drivers (especially minibus drivers) drive at 100–120km/h, exceeding the legal speed of 70–80km/h.²³

¹⁹ Source: Questionnaires and interview to the Japanese consultant.

²⁰ Source: Interview with Transport Office of East Gojam Zone

²¹ The Environmental and Social Impact Assessment implemented at the time of the preparatory survey judged impact item “accidents” as “B”, stating that “Traffic safety will be secured due to alignment improvement, expansion of the road width and setting up sidewalks in the residential area. But on the other hand, increased speeding may cause fatal accidents. (Source: Preparatory Survey Report).

²² Source: Interview with Debre Markos Directorate of ERA.

²³ Source: Interview with Public Transport Office of East Gojam Zone

Table 12: Traffic Accidents that occurred in the Target Section

	2013	2014	2015	2016	2017	2018
Minor injury	19	22	21	21	25	24
Serious injury	13	21	17	21	36	41
Death	24	27	35	42	47	42
Property damage	66	52	41	27	46	49
Total	122	122	114	111	154	156

Source: Public Transport Office of East Gojam Zone

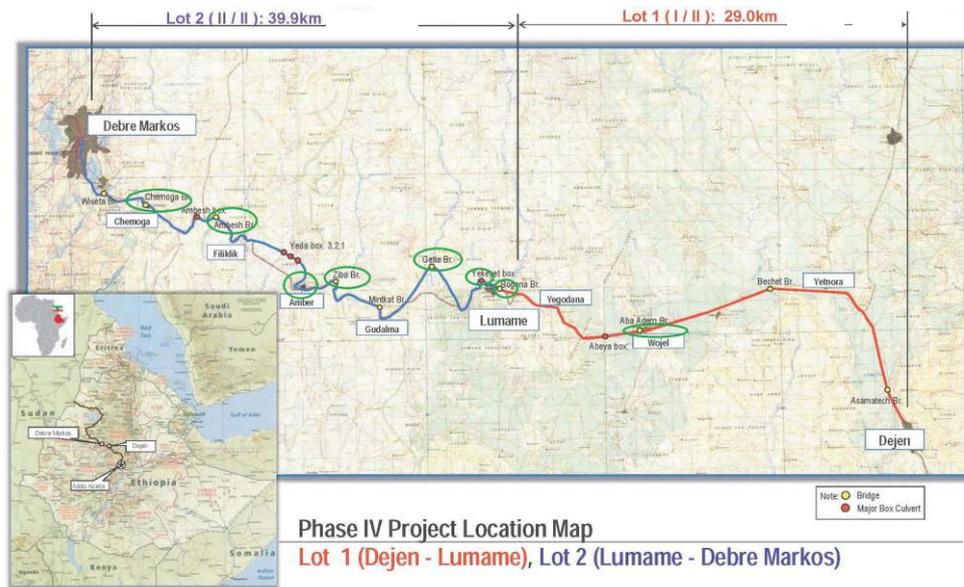


Figure 1 Frequently Accidents Occurred Points (circled with green)

Source: Prepared by the evaluator based on interviews with Debre Markos Directorate of ERA



Place where accidents occur frequently (Amber)



Place where accidents occur frequently (Around Ziba Bridge)

This project fully achieved its initial effect indicators such as shortening driving time and eliminating the flooding of roads. In addition, the increase in traffic volume generally achieved its target. The function of the route for international logistics has been strengthened to a certain extent. Access to medical/educational facilities for the local population has improved, as seen in greatly reduced transport times during emergencies and safe school attendance for students.

Furthermore, impacts on economic development supporting agricultural development were confirmed, such as an increase in the volume of livestock transport and the distribution of improved seeds and fertilizers. The impact of social development, such as improved convenience of public transportation inside and outside the target section, was also confirmed.

Improvements in traffic comfort led to excessive driving speeds for drivers, and an increase in traffic accidents has been observed, mainly on downward curves. In this ex-post evaluation, the effectiveness and impact of the project were evaluated, taking into account that risk-hedging against excessive speed was undertaken sufficiently.

In light of the above, this project has generally achieved its objectives. Therefore, the effectiveness and impact of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspect of Operation and Maintenance

The Road Asset Management Directorate of ERA (Figure 2, ①) is responsible for overall planning and budgeting. The Debre Markos Directorate (Figure 2, ②) conducts periodic road and bridge inspections. Repair works based on periodic inspections are undertaken by the Ethiopian Construction Works Company (ECWC) under contract with ERA.

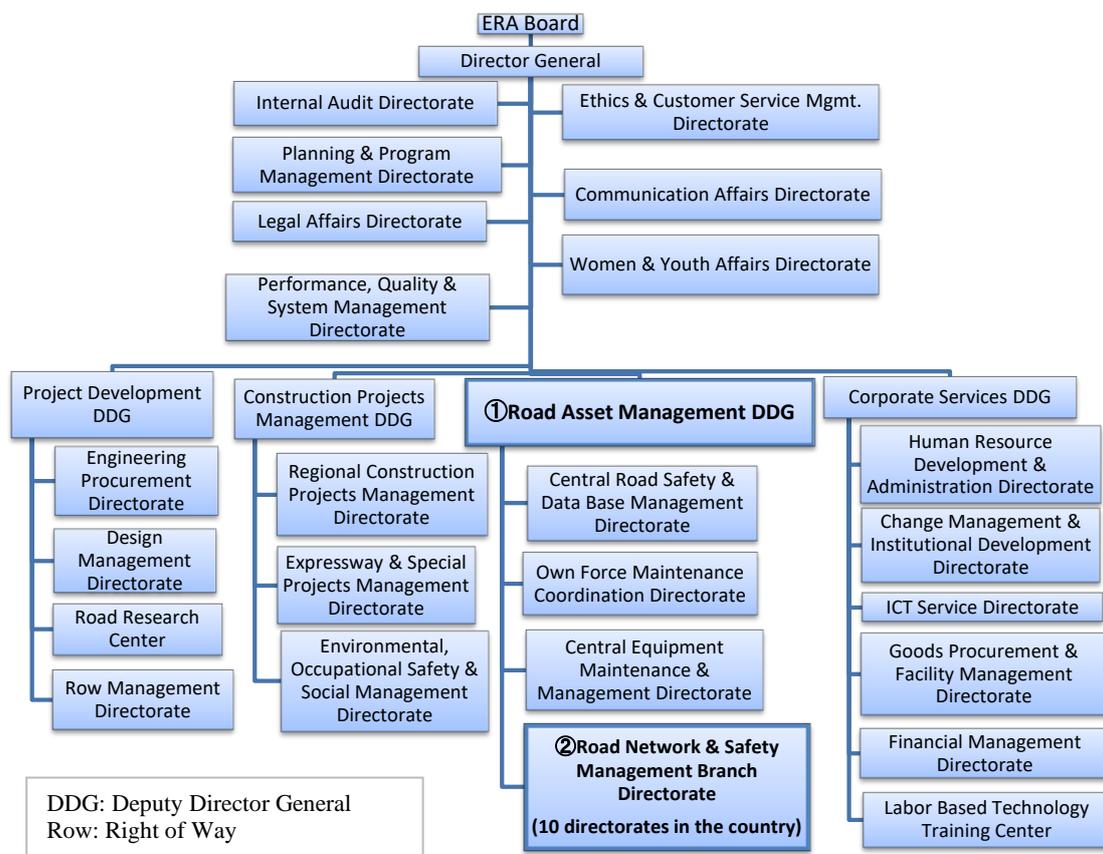


Figure 2: Organizational Chart of ERA

Source: Developed by the evaluator based on documents provided by the executing agency

Since the establishment of the new Ethiopian government in April 2018, the reorganization and integration of ministries and agencies have been carried out, and the organizational and personnel reshuffle is ongoing. At the time of the ex-post evaluation, the number of staff members at the Debre Markos Directorate of the ERA is 42, less than the number of positions to be satisfied, which is 127. This divergence is due to organizational reform after the establishment of the new government, but a certain number of engineers in charge of maintenance are secured and maintenance works can be handled by current personnel. The impact of personnel changes is not observed.²⁴

3.4.2 Technical Aspect of Operation and Maintenance

Operation and maintenance of this project were planned based on the following categories: (1) road surface (inspection and minor repairs), (2) shoulder and slope (surface treatment, vegetation and additional embankment), (3) side drainage (removal of debris and earth deposits and repairs of damage), (4) repainting of road marking, (5) guardrails (repainting and replacement), and (6) retaining wall (repair of cracks and stripping). For bridges, (1) cleaning of sediments in drainage pipes and (2) repairing handrail damage are planned.

The Debre Markos Directorate conducts a visual inspection once a month and a detailed condition survey once a year. Based on the results of these surveys, the ERA headquarters formulates maintenance and budget plans. The results of the detailed condition survey are summarized in a list (Excel sheet) that describes the date of implementation, locations of inspection, inspection results, and necessary measures. The manual “Technical Specification for Road Maintenance” prepared by ERA in 2003 is used as the maintenance manual.

The maintenance equipment owned by the Dejen section of ECWC in charge of maintaining roads and bridges rehabilitated by the project is 1 leveling machine, 1 loader, 1 excavator, 1 roller, 1 dump truck and 1 pickup. All of the equipment is in operation. ECWC plans to purchase new maintenance equipment at the request of ERA in order to repair roads without any delay.²⁵

Regarding the enhancement and maintenance of technical skills of staff concerned with operation and maintenance, the ERA training center regularly provides technical training for one to two months for ERA and ECWC staff, private contractors and private consultants. ERA has a system that can improve and maintain the technical capabilities of staff members by providing them with training opportunities receiving the request from staff members at annual personnel evaluations.

In this way, the personnel concerned with operation and maintenance have sufficient basic knowledge and skills on operation and maintenance. However, during the ex-post evaluation, it

²⁴ Source: Answers of questionnaire to ERA and interviews with ERA.

²⁵ Source: Interviews with ERA.

was found that this knowledge and these skills have not been fully utilized in operation and maintenance of the road. Specifically, there are issues related to the maintenance of road surfaces affected by black cotton soil (expansive soil) that is extensively found in the project area. Black cotton soil is widely found in the basalt region of East Africa and is preferred for agriculture, but not suitable for civil work because it causes swelling and shrinkage changes due to dry and wet conditions. In this project, as a measure against black cotton soil and in consideration of local knowledge and costs, the subgrade was replaced with a high-quality material of a certain thickness. Sealing sheets were applied in areas where insufficient drainage was observed.

Particularly, in the section near Yet Nora (around 10km from Dejen), which is susceptible to black cotton soil, the road surface was damaged (cracks and settlement) over about 600m at the end of 2014. In May 2015, before the final inspection, the contractor repaired this section using the overlay (patching) method. At the time of the ex-post evaluation, road surface damage (deformation, cracks and settlement) due to black cotton soil was confirmed at the same location. Although no accidents caused by road surface damage have occurred, it has been pointed out by road users that it has hindered driving comfort. From December 2018 to May 2019, the road research center of ERA investigated the causes of road surface damage in this section.

According to the results of the ERA's investigation, causes of damage in this section are (1) softening of the subgrade by moisture, (2) clogging of cross-drainage structures, (3) low-quality construction materials and (4) differential movement between box culvert and pavement.

ERA headquarters asked the Debre Markos Directorate to repair the concerned section. In the near future, the Debre Markos Directorate is repairing damaged road surfaces with higher-quality construction materials.

Damage to the road surface which seems partly due to the influence of black cotton soil as shown in (1) above is unavoidable to some extent due to natural conditions and topographical characteristics. However, clogging of drainage, as in (2) above, is due to the sediment and debris inside ditches and culverts, which can be reduced by cleaning drains regularly.²⁶ In this regard, at the end of the final inspection, the Japanese consultant recommended that the executing agency clean side ditches to maintain correct drainage capacity. It can be highly evaluated that ERA conducted the investigation of the causes of damages and is proceeding with repairs. However, the repair of damaged parts identified during the annual detailed condition



Settlement of the road surface partly due to influence of black cotton soil

²⁶ Source: Interviews with the Japanese consultant.

survey is a sort of curative maintenance. Preventive maintenance to reduce the influence of black cotton soil seems to be insufficient, and enhancement of preventive maintenance is a future issue.

As described above, periodic road inspections have been carried out, and the technology is generally well-maintained throughout the target section. However, there is room for improvement in daily preventive maintenance to reduce the influence of the black cotton soil on the road surface.

3.4.3 Financial Aspect of Operation and Maintenance

The main budgetary sources for ERA are the general budget and the road fund.²⁷ The ERA headquarters' annual budget and expenditure from the project commencement to the time of the ex-post evaluation are continuously secured (Table 13). Of the expenditure, the rehabilitation of trunk roads accounts for 40–60% every year. So far, the ERA has had a deficit balance in 2014/2015²⁸ but has hardly experienced a deficit, and there is no problem with financial aspects.

Table 13: Overall Balance of ERA

Unit: Ethiopian thousand Birr

Item	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	
1 General Budget	21,950,372	32,071,642	32,059,050	33,386,127	46,394,721	45,849,819	38,916,307	
2 Road Fund	931,150	931,150	808,300	936,861	1,160,000	1,252,467	1,500,003	
3 Total of Budget (1+2)	22,881,522	33,002,792	32,867,350	34,322,988	47,554,721	47,102,286	40,416,310	
Details of Expenses	Rehabilitation of Trunk Roads and Upgrading of Trunk and link Roads	11,706,986	16,187,444	16,419,299	16,053,667	20,261,640	19,255,534	17,777,010
	Construction of Link Roads	8,368,889	10,791,681	9,977,881	13,893,894	21,702,586	21,458,812	17,103,127
	Ordinary Expenses	114,436	136,756	169,425	209,000	235,747	317,635	329,000
	Bridges	439,870	677,157	550,410	630,113	448,594	395,000	598,236
	Capacity Building	557,687	706,573	657,065	892,553	1,024,610	951,538	810,175
	Design, Feasibility, EIA	431,304	241,031	206,470	279,950	243,744	238,600	175,833
	Heavy Maintenance	331,200	331,000	1,078,500	1,426,950	2,477,800	3,232,700	2,122,926
4 Total of Expenses	21,950,372	29,071,642	29,059,050	33,386,127	46,394,721	45,849,819	38,916,307	
5 Balance(3-4)	931,150	3,931,150	3,808,300	936,861	1,160,000	1,252,467	1,500,003	

Source: ERA

Similarly, the annual budget of the ERA's Debre Markos Directorate is continuously secured, and a certain amount is also spent on the maintenance of roads and bridges including the section of the project.²⁹

²⁷ The Road Fund obtains revenue from fuel taxes and government subsidies and is a special expenditure fund which can only be used for road network maintenance (Source: Interviews with the executing agency).

²⁸ The reason for the deficit in 2014/2015 was inquired to the executing agency, but the reason could not be confirmed.

²⁹ However, specific actual amount was not obtained since it was difficult for the execution agency to extract data for individual sections when the execution agency was asked to provide such data.

Table 14: Overall Balance of Debre Markos Directorate

Unit: Ethiopian thousand Birr

Item		2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019
Details of Budget	1 Total of Budget	84,780	86,678	63,263	184,023	185,812	162,971	394,337
	Routine Maintenance	34,080	24,035	23,035	25,290	35,220	35,220	57,000
	Periodic Maintenance	49,200	33,400	26,000	44,760	60,541	60,541	40,700
	Bridge Repair Works	1,500	2,200	1,500	2,000	3,542	3,542	3,000
	Heavy Maintenance		27,043	12,728	111,973	86,509	63,668	293,637
2 Total of Expenses	60,833	77,311	93,440	121,420	85,606	137,849		
3 Balance	23,947	9,367	-30,177	62,603	100,206	25,122		

Source: ERA

The Ethiopian government plans to continuously allocate a certain budget for road development in line with GTP II and RSDP V, which places importance on road development.

As mentioned above, because the maintenance budget is continuously secured and there is no particular shortage, there are no financial issues.

3.4.4 Status of Operation and Maintenance

From visual inspection during the ex-post evaluation field survey, damages to a part of bridge handrails and guard posts were observed, but almost all of the rehabilitated roads and bridges are maintained in good condition. As described in Section 3.4.2, road surface damage (deformation, cracks and settlement) that seems to be caused by black cotton soil has not caused any accidents, but from interviews with users, it was confirmed that driving comfort was slightly affected.

Prior to the implementation of this project, roads on Trunk Road Route 3 were rehabilitated from Addis Ababa to Dejen under the first to third phases of Japanese grant aid projects. In this ex-post evaluation, the maintenance status of these past projects was also confirmed as reference information for road maintenance. In the target sections of the first phase (Addis Ababa–Debre Tsige, 95km), the second phase (Debre Tsige–Gohatsion, 91km), and the third phase (Gohatsion–Dejen, 20km), there are places where damage is conspicuous due to aging degradation; but in all cases, repair work was being carried out, and it can be said that operation and maintenance are generally appropriately carried out.

As described above, as of the ex-post evaluation, the roads and bridges rehabilitated by the project are generally well-maintained.

In light of the above, although no problems have been observed in institutional/organizational and financial aspects, some minor problems have been observed in terms of the technical aspect and current status. Therefore sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented to strengthen the functions of the route for international logistics and to improve access to medical/educational facilities and food for the local population by rehabilitating the deteriorated section of Trunk Road Route 3, Dejen-Debre Markos in Amhara Region, Ethiopia, thereby contributing to the development of economic and social infrastructure that will support the realization of agricultural development and industrialization.

This project is highly consistent with Ethiopia's development policy and sector plan, which regards road development as the foundation of economic growth and social development, the development needs of Ethiopia, and Japan's aid policy. Although the project outputs were produced as planned and the project cost was within the planned budget, the project period exceeded the plan. Therefore, project efficiency was fair. Improvements in road stability and driving comfort were achieved after rehabilitation of the target section. As a result, among the effect indicators, improvement in driving speed and reduction of road closures due to flooding in the rainy season fully achieved their targets; annual average traffic volume almost achieved its target value. The function of the route for international logistics has been strengthened to a certain extent. In addition, impacts such as improvements in access to medical/educational facilities were also confirmed for the local population and those on economic development and supporting agricultural development (such as increases in the volume of livestock transport and distribution of improved seeds and fertilizers). Improvements in comfort of transportation have led to excessive driving speeds for drivers and an increase in the number of traffic accidents in some locations of the target section. The ex-post evaluation took into account that risk-hedging against speeding was sufficiently implemented by the project, and its effectiveness and impact were judged to be high. The section targeted by this project is regularly inspected by the Debre Markos Directorate of ERA. Although there are currently no problems in terms of organizational and financial aspects of the operation and maintenance of the target section, there are some problems in technical aspects and operation and maintenance status related to minimization of the impact of swelling of soil (effects of black cotton soil) on the road surface in the target section. Sustainability of the project's effects is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Preventive Measures in Locations with Frequent Traffic Accidents

Necessary measures, such as the installation of guide posts and signs to prevent excessive speeding, were sufficiently taken in this project. However, after its completion, as the driving

comfort of the target section improved, traffic accidents mainly caused by excessive speed have increased. For instance, as traffic accidents frequently occur on downward curves, it is recommended to paint slanted lines on the road to guide vehicles to drive in the middle of the lane before the curve. We recommended that the ERA Debre Markos Directorate identify locations where accidents occur frequently and investigate whether signs and guideposts are properly installed in the fiscal year 2019, then include the necessary budget for taking preventive measures against traffic accidents in the fiscal year 2020 budget plan. These measures include painting road markings within the year, replacing damaged guardrails with new ones and attaching reflectors to the guardrails.

(2) Immediate Repair of the Road Surface damaged due to the Influence of Black Cotton Soil and Future Reinforcement of Preventive Maintenance

Although the road surface damaged partially by the influence of black cotton soil has not led to a serious accident at the moment, it is recommended to conduct repair work on damaged parts within the fiscal year 2019: Road users point out that the damaged portion influences driving comfort.

In addition, due to natural conditions and topographical characteristics, it is inevitable that the road surface is deformed to some extent under the influence of black cotton soil. It is desirable that the ERA Debre Markos Directorate strengthen preventive maintenance such as the cleaning of gutters and box culverts during monthly visual inspections.

4.2.2 Recommendations to JICA

(1) Monitoring on the Progress of Road Repair Works

Regarding road surfaces damaged partially due to black cotton soil, it is expected that the repair works will be implemented because ERA headquarters has already asked the Debre Markos Directorate for repairs. It is assumed that it will take some time to complete the repairs, including the selection of contractors and procedures such as contracts. It is recommended that JICA Ethiopia office contact ERA periodically to confirm the progress of repairs. If possible, it is desirable to check the damaged site directly when repairs are completed.

4.3 Lessons Learned

(1) Strengthening Preliminary Measures against Accidents Foreseen in Road construction/rehabilitation projects

At the planning stage of this project, the possibility that accidents due to excessive speeds would increase after road rehabilitation was foreseen to some extent. Risk-hedging against accidents, such as installation of regulatory signs (prohibition of overtaking, speed regulation), danger warning signs (steep curve notices, steep slope notices) and gaze guidance fences with

concrete posts to prevent vehicular falls, was performed. However, the improvement in driving comfort after paving the road has led to excessive driving speeds by drivers, and many traffic accidents have occurred, particularly on sharp curves, after project completion. In future road construction/rehabilitation projects, it is desirable to take all possible measures, not only to install traffic signs but also to paint road markings to indicate the location of curves before drivers reach them. In this project, the number of traffic accidents did not increase very much at the time of final inspection carried out one year after project completion in 2016. However, in final inspections conducted one year after project completion in similar future projects, it is desirable that the number and location of traffic accidents should be monitored. Depending on the situation, the Japanese consultant can make recommendations to the executing agency to take measures to reduce the occurrence of accidents. It is also assumed in similar projects that improvement in driving comfort will lead to excessive speed of drivers. In this regard, it is desirable that the JICA overseas offices conduct a survey on the occurrence of traffic accidents in addition to the road surface condition and encourage the executing agency to take the above measures according to the situation when conducting the ex-post condition survey.