

Ethiopia

Ex-Post Evaluation of Japanese Grant Aid Project
“The Project for Rehabilitation of Trunk Road (Phase III)”

External Evaluator: Sachiko Matsumoto, FASID

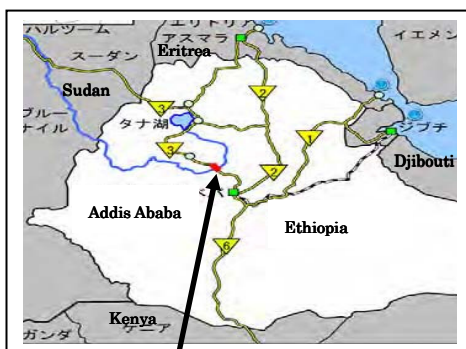
0. Summary

Through the rehabilitation of a 40km (approx.) section of National highway No.3 connecting Ethiopia’s capital Addis Ababa to the northwest regions of Ethiopia and the construction of a new Abay bridge (303m), this project aims to improve the transportation of goods and people and to ensure the road safety of the existing road network.

The objectives of the project are consistent with the strategy of the road development program of the Government of Ethiopia and the route (Goha Tshion – Dejen) is important for transporting agricultural products to the whole country as well as exporting and importing goods with the neighbouring country of Sudan, thus the relevance of the project is considered high. In terms of the project’s effectiveness; the following were confirmed at the time of this evaluation: improvement in driving speed, eliminating the day of closed road throughout the year, and invigoration of socio-economic activities. However, one of these improvements was strongly influenced by other projects implemented after the completion of this project. For that reason, the effectiveness of this project is fair. During construction a landslide caused the project to exceed its budget and therefore efficiency of the project is also fair. The sustainability of the project effects is high based on the appropriate operational skills and organized structure for the maintenance of the road and the bridge.

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

1. Project Description



(Project Location¹)



(Abay Gorge and Rehabilitated Road)

1.1 Background

In Ethiopia, after the military regime was put to an end in 1991, the interim administration began the

¹ Map from the report from “The Project for Operation and Maintenance of Trunk Road : Goha Tshion – Dejen across Abay Gorge (Equipment Supply)”

process of democratization and economic development. However, the civil war that lasted 17 years and several large-scale droughts caused the socio-economic conditions of the country to remain under extremely severe condition. The population living under the poverty line in 1999 is high: 44.2%². Also, 80% of the population live in agricultural areas, surrounded by poor living environment and they engage in agriculture. In addition, the road density is one of the lowest among the countries in Africa³. Under such circumstances, the Ethiopian Government regards food security as a matter of great importance and set the agricultural sector as its principal axis for promoting the industrial and third sector development.

As a result, in recent years the increasing numbers of investments in the agricultural sector and expansion of the service industry are seen as a trend in development. However, the domestic food supply is still insufficient and still urgently depends on food aid from foreign countries. For the development of the agricultural sector and to establish food security in Ethiopia, the maintenance of its road network is indispensable for social economic development and is an urgent matter.

The Ethiopian government conducted a road development study in 1996 and settled on a northwest highway maintenance plan (Addis Ababa – Debre Marcos section, approximately 300km). With a request of the Ethiopian Government, the Japanese Government has already carried out two phases of the road rehabilitation plan since 1998 from Addis Ababa to Goha Tshion (approximately 180km). This project is a road rehabilitation plan of the remaining section between Goha Tshion and Dejen including constructing a bridge across the Blue Nile River in the Abay Gorge⁴.

1.2 Project Outline

The objective of this project is to improve the transportation of goods and people and to ensure road safety of the existing road network by rehabilitating the road between Goha Tshion and Dejen (approx. 40km) and constructing a new Abay Bridge (303m).

Grant Limit / Actual Amount	4,832 million yen / 4,825 million yen
Exchange of Notes Date	May, 2005
Implementing Agency	Ethiopian Roads Authority (ERA)
Project Completion Date	January, 2009
Main Contractor	KAJIMA Corporation
Main Consultants	Oriental Consultants Co., Ltd.

² Millennium Development Goal Indicators, mdgs.un.org,
³ Road density of Ethiopia is 29.0km/1,000sq. Km (ERA, 2003). In Sub-Saharan Africa, among the 25 countries which have available data, Ethiopian Road Density is 21st. (World Bank Development Indicators)
⁴ The rest of the unpaved section from Dejen to Debre Marcos (65.5km), the road from Dejen to Rumame (30.5km) is currently under construction by “The Project for Rehabilitation of Trunk Road, Phase IV” (2011-2014).

	Japan Engineering Consultants Co., Ltd.
Basic Design	“The Project for Rehabilitation of Trunk Road (Phase III)” October 2003-March 2004
Detailed Design	August, 2004- March, 2005
Related Projects	<p>【Technical Cooperation】 Dispatch of an Expert “ERA Bridge Management” (2002.7-2004.7, 2004.7-2006.7) “Project for Capacity Building of the <i>Alemgena Training and Testing Center</i> of ERA” (2002.4-2006.3) “Capacity Development Project on Bridge Management” (2007.1-2012.7) “Experts for Landslide Countermeasure works and Horizontal Drainage Drilling”(2010-2011) “Project for Developing Countermeasures against Landslide in the Abay River Gorge” (2010.3-2012.3) “Capacity Development Project for Countermeasure Works for Landslide” (2011.6-2016.3)</p> <p>【Grant Aid】 “The Project for Rehabilitation of Trunk Road, Phase I” (1998-2001) “The Project for Rehabilitation of Trunk Road, Phase II” (2001-2004) “The Project for Rehabilitation of Trunk Road, Phase IV” (2011-2014) “The Project for Operation and Maintenance of Trunk Road : Goha Tshion – Dejen across Abay Gorge (Equipment Supply)” (2010.6-2012.5)</p>

2. Outline of the Evaluation Study

2.1 External Evaluator

Sachiko Matsumoto, Foundation for Advanced Studies on International Development

2.2 Duration of Evaluation Study

Duration of the Study: November, 2011- October, 2012

Duration of the Field Study: February 19th – March 4th 2012, May 28th – June 1st 2012

2.3 Constraints during the Evaluation Study

The road section of this project contains some parts which are easily damaged by landslides during the rainy seasons; however, the field study was conducted during the dry season. Thus the evaluator was not able to observe rainy season road conditions. In regards to rainy season road conditions, the evaluator gathered information by interviewing people who work at the road section as well as reviewing the written documents.

3. Results of the Evaluation (Overall Rating: B⁵)

3.1 Relevance (Rating: ③⁶)

3.1.1 Relevance with the Development Plan of Ethiopia

In Ethiopia, "Agricultural Development Led Industrialization" (ADLI) was introduced by the interim administration after the military regime collapse in 1991, and a development strategy aiming at industrial development led by the agricultural sector had begun. "Development, Peace, and Democracy Programme" (also known as the "Five-Year Plan") and other development policies from when the start of the Federal Democratic Republic in 1995 placed agriculture in their top priority issue in conformity with a basic policy of ADLI and raised the issue of poverty reduction of the rural regions and assurance of food security. In "Sustainable Development and Poverty Reduction Program" (SDPRP) (2002/03-2004/05), which was the mid-term development program at the time of the appraisal, the road sector was counted as one of the five top priority issues⁷ for accomplishment of poverty reduction. It was also specified in the policy paper that the road development carries a decisive role for improvement of agricultural productivity and rural development promotion. As transportation, particularly road transportation, is a success factor for many other socio-economic sectors such as agriculture, manufacturing, mining, tourism, education and health it is prioritized in the mid-term development program at the time of ex-post evaluation, "Growth and Transformation Plan" (GTP) (2010/11-2014/15).

Additionally, in the road development policy of Ethiopia, the "Road Sector Development Program" (RSDP) was introduced in the Five-Year Plan of 1995, and concrete targets were set in regards to expansion of road network and improvement of quality of road. RSDP has been carried out since 1997, from phase I (1997/98 - 2001/02), phase II (2002/03 - 2006/07), phase III (2007/08 - 2009/10) and phase IV (2010/11 - 2014/15) and the improvements are steadily seen in the road network expansion and maintenance works of Ethiopia. RSDP phase IV has become a main strategic pillar of GTP, aiming to improve rural network expansion and capacity building for the administrative body's organizational management.

The project of this evaluation study is the road rehabilitation of the main highway (National highway No. 3) to link Ethiopian agricultural regions in northwest to the capital city, and the objective is consistent with the Ethiopian development policy and the road sector development program at the time of both the appraisal and the ex-post evaluation.

3.1.2 Relevance with the Development Needs of Ethiopia

This project road is a section of national highway No. 3 which is the only national highway

⁵ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁶ ③: High, ②: Fair, ①: Low

⁷ Five top priorities sectors are Agriculture, Water, Road, Education and Health

connecting the active agricultural regions of the northwest and the capital Addis Ababa, as well as the Sudanese border. Therefore this route is very important for domestic and foreign goods transportation, and the needs of the road maintenance are extremely high from the viewpoint of food security and international trade. The northwest regions (Amhara and Oromia regions) that National highway No.3 cuts across, the domestic production of cereals is high as of 35% of the whole country at the time of appraisal (2003/04) and 36% at the time of ex-post evaluation (2010/2011)⁸, thus the route is important to manage the steady supply of food for the country as a whole. In addition, since this highway leads to the Sudanese border, it became the most suitable land route for trade with Sudan (the import of oil products and the export of agricultural products and daily necessities). As a result, there is heavy traffic including tank lorries and large size trucks. However, the road surface before the rehabilitation was heavily damaged and the road consisted of many narrow and sharp curve sections, which limited the driving to lower speeds. The Abay Bridge was also at risk of collapse due to its deteriorated condition, thus only one vehicle was allowed to pass at one time. Considering Ethiopia's economic growth and related increase in transportation needs, the needs to rehabilitate the section of the road -and construct the new Abay Bridge is still very high.

3.1.3 Relevance with Japan's ODA Policy

At the time of appraisal in 2003, the Government of Japan did not make an assistance plan of the Ethiopian country, but the basic policy of assistance in Ethiopia is to respect the needs and ownership of Ethiopia⁹. Thus, the assistance project went along well with the development program of Ethiopia. This project section is part of the northwest highway maintenance plan that Ethiopia conducted in 1996 (Addis Ababa – Debre Marcos section, approximately 300km), and Japan has already been carrying out a road rehabilitation program (Addis Ababa – Goha Tshion section, approximately 180km) since 1998. The policy priority and the needs for road development in Ethiopia were very high, and Japan's assistance to Ethiopia reflected such policy and the needs of Ethiopia. The economic infrastructure development including road development was one of the five important areas set by the ODA taskforce of Ethiopia in 2003. With the diplomatic aspect, "the third Tokyo International Conference on African Development" (TICAD III¹⁰) was held during the same period of this project planning in 2003, and this project was part of Japan's assistance to African countries announced Prime Minister Junichiro Koizumi. In TICAD III, Japan presented one of the three pillars of assistance as "poverty reduction through economic growth" and placed infrastructure in the priority issues. In addition, the bridge designed by this project is high in durability and easy for maintenance which demonstrates the high level of Japanese bridge construction technology.

⁸ The Central Statistical Agency (CSA) of Ethiopia

⁹ Ethiopia Country Assessment Report (2004, Chapter2.p34)

¹⁰ TICAD III was held in Tokyo from 29th September 2003 ~ 1st October 2003. Ethiopian Prime Minister Meles and 23 Prime Ministers and former Prime Ministers, total of 89 countries and 47 organizations participated.



(Abay Bridge (New/front, Old/back))

This project at the time of the appraisal is consistent with Japanese policy and Japanese technical superiority in conducting this type of project is high.

This project has been highly relevant with the country’s development plan, development needs, as well as Japan’s ODA policy, therefore its relevance is high.

3.2 Effectiveness¹¹ (Rating: ②)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The operation and effect indicators set at the time of the appraisal and the actual data at the time of the ex-post evaluation are shown in the table 1.

Table 1 Effect Indicators

Type of Indicators	Base Year (2003)	Goal Year (2012) 3 years later	Actual (2012)
Driving Speed 【Normal】 【Heavy】	20-30 km 10-15 km	40-60 km 20-30 km	<u>40-60 km</u> <u>20-30 km</u> ¹² 5- 15 km ¹³
Driving Time (Goha shion-Dejen) 【All Types】	2-4 hour/ one way	1-2 hour/ one way	<u>1-2 hour/ one way</u> ¹² 3-4 hour/ one way
Frequency of closed road traffic (Day)	6-8 day/ year	0 day/ year	<u>0 day/ year(2011)</u>

Source: Data of the base year and goal year is from Basic Design, actual data of diving speed and time were measured during this study, the day of closed road traffic is the interview result of a consultant of “Capacity Development Project for Countermeasure Works for Landslide”.

As shown in Table 1, shortening of the driving time (during the dry season), improvement in the driving speed, elimination of road closing days in 2011 were all accomplished at the time of the ex-post evaluation, therefore, it is considered that the transport efficiency of goods and people of this road is improved. On the other hand, during the rainy season (June to September), there were 40-50 cases of vehicles getting stuck due to road subsidence at large-scale landslide points (Near Sta.1 and

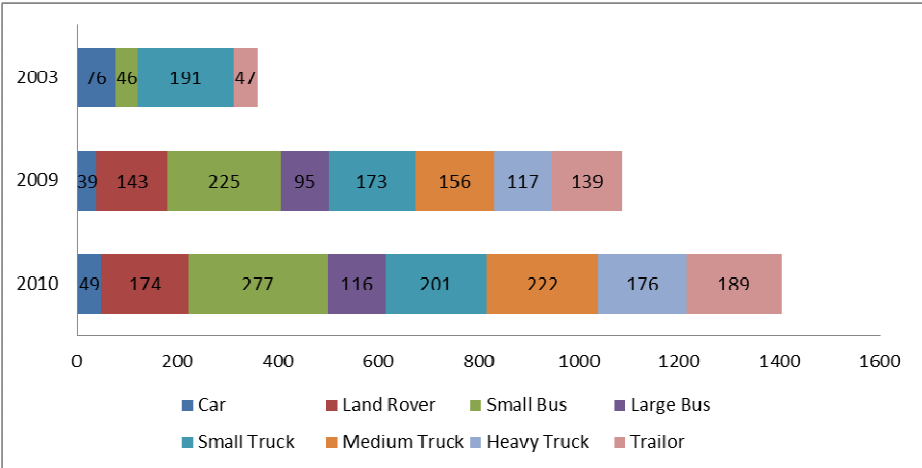
¹¹ Sub-rating for Effectiveness is to be determined in consideration of Impact

¹² Heavy vehicles are large buses and trucks

¹³ Tank lorries and heavy trailers are not included because they are driven slowly regardless of road conditions

Sta.28¹⁴). During the rainy season road conditions become unpleasant, however, these road sections are carefully patrolled by the ERA local office staff and traffic police several times every day and they perform traffic control immediately when they encounter stuck case to let other vehicles pass in alternation using one traffic lane, therefore smooth traffic is secured without the road being closed.

The traffic on this road increased greatly indicating an invigoration of socio-economic activities in the project area and in areas neighbouring the project. Figure 1 shows a change in the volume of traffic before the project (2003) and after the project (2009 and 2010)¹⁵. The means of transportation has increased remarkably in the project area, which indicates that transportation of people and distribution of goods has also improved. Especially noticeable are that there are many more minibuses and that the movement of people from the local areas to the cities and vice versa has become easier. In addition, the newly constructed Abay Bridge ensures a safe road network. Previously, large trucks avoided using this road¹⁶ for fear that the bridge may collapse, but since the project constructed the new Abay Bridge, there is no need to restrict vehicles one side at a time. At the field visit during this study, multiple vehicles were able to be driven on the bridge at the same time without any problem.



Source: ERA
 Note: The categories of 2003 differ from 2009 and 2010. Car (Dark Blue) includes Car and Land Rover, Small Bus (Green) includes Small and Large Bus, Small Truck (Blue) includes Small, Medium, and Large Truck.

Figure 1 Annual Average Daily Traffic (Goha Tshion – Dejen)

3.2.2 Qualitative Effects (Improvement of the road safety, less road damages by improving the drainage facilities)

In regards to road safety, the danger of collision and minor collision was lowered by; widening the width of the road at sharp curve sections, improving road alignment, and installing safety facilities

¹⁴ The start point of construction in Goha Tshion is numbered as 0(zero), then 2km distance point is Sta.2, and 2.5km point is Sta.2+500.
¹⁵ A traffic target figure was not set at the appraisal
¹⁶ Interview with the Deputy Director General, Road Asset Management Directorate of ERA

such as guard posts, road traffic signs and painting section lines. In addition, paving the road has improved visibility by reducing dust during the dry season which provides greater safety for drivers and pedestrians¹⁷.

In regards to the road condition, the severe road environment such as landslides, a high temperature, a steep grade, the overloaded vehicles damage the pavement surface and some parts are deformed. The poor road condition was reported as 23% (approximately 9km)¹⁸ in January 2012, and through the visit of this study, it is observed that 70-80% of the damage is related to Rutting¹⁹ and Corrugations²⁰. Rutting and corrugations lower driving comfort compared to flat sections, but the level of damage is not a major obstacle for normal driving. In the landslide section, a gradual slope exists due to road subsidence²¹. Although drivers need to reduce their speed for safe passage, the road is fine to be driven.

In addition, concern over road damage from water was one of the main issues prior to the project, the road damage from water has been reduced by installing gutters and crossing pipes to function as drainage for handling rainwater.

Thus, at the time of the ex-post evaluation, although some damage to the road exists, all sections of the road are passable and the project has already brought the effects assumed at the time of the appraisal.

3.3 Impact

3.3.1 Intended Impacts

(1) Invigoration of Socio-economic Activities (Agriculture and International Trade)

Agriculture is the main industry in the area where National highway No. 3 cuts across, the Amhara region and Northwest Shewa of the Oromia region, in which cereal production is prosperous. Those agricultural products produced in the regions are transported to the markets of Addis Ababa over this project road. The amount of cereal production for the year 2010/2011 almost doubled in comparison to the 2003/2004 year. Although this project cannot be credited for the increase in production, it can undeniably be credited for the smooth distribution of these agricultural products. In addition to the smooth distribution of agricultural products, this road also functions as a means for transporting people, goods, and information. The improvement in agricultural productivity is also evident in that it

¹⁷ Interview with the Head, Goha Tshion Woreda Police Station and School Director, Filiklik Elementary School

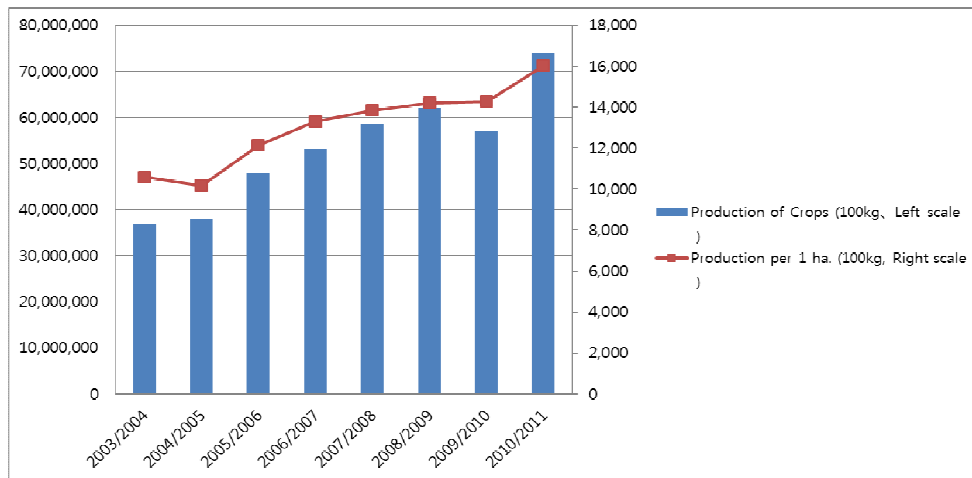
¹⁸ The road condition is described in page.17, Sustainability 3.5.4.Current Status of Operation and Maintenance

¹⁹ A rut is a depression or groove worn into a road by the travel of wheels. It tends to appear on roads which have heavy loaded traffic

²⁰ A corrugation is a series of parallel ridges and furrows that occur on the road surface When it occurs at one place it triggers a chain reaction

²¹ At the time of ex-post evaluation, 8-9 gradual slopes up to 30 cm were observed (The first field visit in February 2012)

provides easier access to imported fertilizers and new farming techniques²².

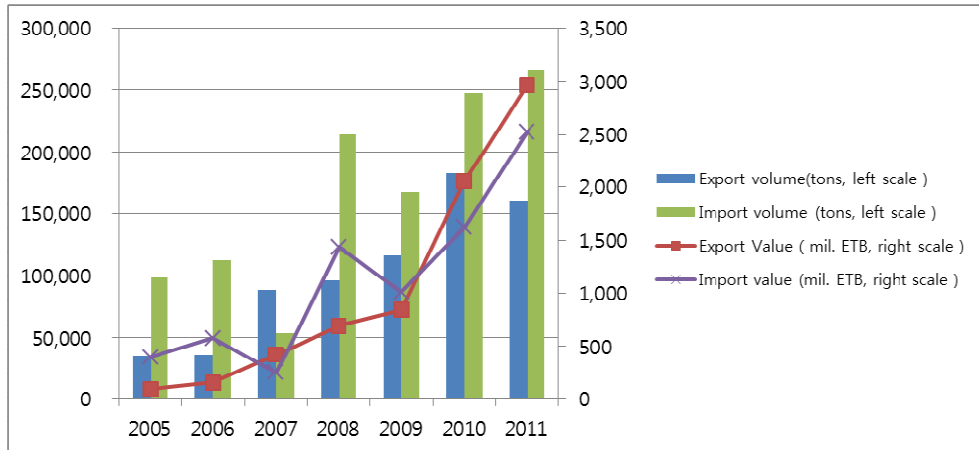


Source: The Central Statistical Agency of Ethiopia

Figure 2 Trend of Crop Production (Amhara Region and Northwest Shewa of Oromia Region)

Furthermore, the impact to the socio-economic condition by this project is not limited to the surrounding towns of the project area but has spread throughout Ethiopia. Trade with the neighbouring country of Sudan is one such example as land transportation between the Sudanese border and Addis Ababa rely on this project road as well as the road of the phase I, II, and IV to bring goods to the market of Addis Ababa then to circulate them to the rest of Ethiopia. Imports from Sudan increased approximately 2.7 times from 98,667 tons in 2005 (monetary value as 399 million ETB) to 266,080 tons in 2011 (2,528 million ETB) (figure 3). Since July 2011, Ethiopia has imported 100% of its gasoline from Sudan so this highway has also become an important route for the steady supply of the gasoline for the country. Exports to Sudan such as agricultural products, domestic animals, luxury goods and daily necessities have also increased approximately 4.7 times between 2005 and 2011. In this way, the rehabilitation of National highway No. 3 (including the section covered by this project) is contributing greatly to the economic development of Ethiopia.

²² Interview with the Deputy Head, Office of Agriculture, North Shoa Zone



Source: Ethiopian Revenues and Customs Authority

Figure 3 Ethiopia – Sudan Import and Export Trend (Overland Only)

(2) Improvement of the access to schools and medical institutions

The project area includes two towns (Goha Tshion and Dejen) and 2 villages (Filiklik and Kurar) in which schools and health centres exist.

Since both elementary and junior high school students go to school on foot, no change in the access to schools was found which could be attributed to the road rehabilitation. In terms of access to high schools; however, some improvement was found. Because the number of high schools is limited in the area, about half of all high school students are from distant villages²³. On weekdays, students from distant villages generally stay in lodgings around the high school and return to their parents' house on the weekend and/or during vacation. With more available transportation such as minibuses, the time to spend for traveling has been shortened for those who previously had a hard time to find appropriate modes of transportation. Thus, it can be said that the access to high schools has been improved for students from distant villages.

In regards to access to medical institutions, commuting time by car and minibus for patients needing emergency procedures was reduced. Although the health centres of the towns and the villages do not own an ambulance, in emergency cases, patients are conveyed to the health centre in town office vehicles or in any car happening to be on the road. Cases of patients being referred to a larger medical institution in a town or city from the health center of the village and conveyed by the project road include: Tuberculosis, bleeding of pregnant woman, and traffic accident injuries²⁴.

(3) Income increase of community people by being hired for road construction

Before the road project, income sources other than agriculture were limited so that during the

²³ No high school in villages, and only in towns (Goha Tshion and Dejen)

²⁴ Referral record of Kurar Health Center (September to December in 2011)

construction period, many local residents were employed as construction workers. As for the number of employed people, 300-800 people per day were employed for approximately 24 months²⁵. Not only men but also women were employed. Their main works were piling-stones and undertaking work required to produce concrete asphalt materials. The cash income earned by this employment was used to repair houses and to purchase daily commodities such as clothing, food and daily necessities²⁶. Some residents were still being employed as road maintenance workers after the project had ended.

3.3.2 Other Impacts

(1) Impacts on the natural environment

The whole area of the project site does not have high trees, and shrubs grow in some spots. Since this project made use of existing road alignment for rehabilitation, the felling of trees was minimized. Planting after construction was not carried out. No particular negative influence on animals and plants were reported.

(2) Landslides

A landslide occurred in February 2006. It started as a pavement crack near Sta.2 during the construction and afterwards spread to a wider area. Since there was a history of landslides in this section, laying earth increased load and the heavy rainfall in 2006 on such ground condition, which exceeded the yearly average, caused a large-scale landslide. Since then, especially during the rainy season, landslides occurred repeatedly at several sites. The main landslide incidents during the construction and the response of both governments are shown in table 2. During the construction, the contractor removed earth and repaired the damage to secure traffic. Although the scale of the landslide which occurred during the project was large, it did not cause any human damage and damages to houses and other facilities was also minimal. The project area's slope instability is such that damage (such as slope collapse and the mud flood) is limited to the rainy season when rainfall is most intense. Normally, landslide cause the earth to move slowly to the lower part and it starts with some signs such as cracks on the land surface. The main damage is to the road facilities due to road subsidence and rise of the surface with the earth movement, but so far no human deaths or casualties have taken place among residents, drivers, and the construction workers. There is also no reported damage to houses primarily because there are no houses located in the areas affected by the landslides. As for a negative effect on the community, a local church which stood on the hill of Dejen's town entrance collapsed when the sliding of the earth progressed at the time of construction during the rainy season in 2007 (the church already had cracks on its wall from a previous landslide)²⁷.

Prior to the construction, this area has experienced slope instability problems including landslides, and

²⁵ Interview with the officer in charge of the construction from KAJIMA Corporation

²⁶ Interview with the Head of Office, Goha Thion Woreda Administration, and the Head, Dejen Woreda Administration

²⁷ Currently the community is constructing a new church.

in order to avoid traffic problems the ERA had to carry out restoration works such as earth removal and the repair of the gabions. Due to the technical limitation of the ERA, landslide mitigation measures were not previously performed and neither the scale nor the causes of landslides in the area were studied. The details of landslide investigation and prevention measures considered or taken at the time of this project appraisal will be explained in the next criteria under efficiency.

Table 2 Landslide Occurrence and measures taken by Ethiopian and Japan Side

Occurrence	Landslide Area	Damages	Ethiopian Side		Japan Side
			Emergency work/ Geological Survey (2007)	Restoration Work (2008)	Design Change of this Project
Feb.-Sept. 2006	Sta.2+570-2+940	Crack, Subsides, Rock fall, mud flood	○	-	Change of Alignment
	Sta.4+880-5+160	Destructio of Guard Walls, Pavement Damages	○	○	Spec.down of Pavement, Asph.curb installation
June-Sept. 2007	Sta.0+800-1+080	Subsides, Pavement and Gutter Damage	-	○	Spec.down of Pavement Elimination of Small bridge Alignment Change, Repair of Pavement and Drainage Facilities
	Sta.26+840-28+600	Subsides, Pavement, Gutter, Pipe Damage	-	○	Spec.down of Pavement Alignment Change, Repair and Add of Drainage Facilities
	Sta.30+700-31+500	Subsides, Pavement and Gutter Damage	-	○	Spec. down of Pavement
	Sta.33+340-33+640	Subsides, Pavement Damage	-	○	Spec. down of Pavement
June-Oct. 2008	Sta.10+455, 10+660	Subsides, Pavement Damage	-	-	Repair of Pavement
	Sta.22	Pavement Damage by Hill side destruction	-	-	Alignment Change
	Sta.26+340, 26+540, 26+680	Subsides, Pavement Damage	-	-	Repair of Pavement
	Sta.31+600, 31+800,31+900	Subsides, Pavement Damage	-	-	Repair of Pavement
	Sta.32+250-32+400	Gutter cracks from Hill side destruction	-	○	-

Source: The Evaluator's composition based on the documents of design changes (November 2008)

Despite the fact that the topography of the area is threatened by landslide problem, it is considered that this project destabilized ground condition at several sites. The site studies after landslide occurrence reported that one of the causal factors for landslides occurred at Sta.1, Sta.2, Sta.5, Sta.33 of Table 2 is construction works of this project. On the other hand, having been confronted with these landslide issues, both the government of Ethiopia and Japan decided to devise and implement a medium-and-long term plan for landslide measures in the Abay Gorge. After this project completion, the Ethiopian Government set up the "Landslide Task Unit" (LTU) to make a plan for landslide countermeasures and "Emergency Work unit" (EWU) to carry out restoration and maintenance works, as well as guarantee a special budget for landslide measures. The Japanese Government also granted equipment for conducting landslide measures, began to assist in detail investigation (geo-technical and geophysical) to find out the landslide mechanism, and also started a technical cooperation project for five years to strengthen the LTU staff's capacity to develop a plan for landslide measures and manage the construction works, which as a whole has become a comprehensive program for the landslide

mitigation measures²⁸.

(3) Land Acquisition and Resettlement

Since this project designed to make use of existing road alignment to rehabilitate, removal for the right of way was restrictive such as the walls of residents' houses in Dejen town and telephone poles. Project site acquisition was conducted by the ERA according to their rule by which the article affected by the right of way is compensated for and new land is provided. Thus, there was no problem about the site acquisition occurred.

In addition, measures led by the contractor to prevent the spread of HIV were carried out during the construction²⁹ therefore an increase in the HIV infection rate among residents during and after the construction period was not reported.

As described above, the effect indicators for determining the effectiveness have been accomplished and therefore the project purpose has been achieved with the improvement of transport of people and distribution of goods with high increase in traffic, and the invigoration of socio-economic activities. However, about the elimination of "the day of closed road" among the effect indicators, although there was no closed day in 2011, it cannot be considered an effect of this project since this achievement was heavily dependent on the equipment which was procured after this project was completed. In April of 2009 just after the completion of this project, a study report about the landslide condition of this project site pointed out that due to the large-scale landslide which occurred during this project, there were four spots which become hazardous and potential obstacles for traffic. Some of those hazardous points were highly threatened by slope instability problems which needed to be dealt immediately to avoid losing a road function such as closing of the road³⁰. To avoid such a situation, the study team concluded that heavy construction equipment should be stationed near the landslide site for immediate restoration work. In June 2010, necessary equipment was provided through a grant aid by the Government of Japan. Landslides occur during rainy seasons up to now and elimination of the day of closed road would not have been possible without this equipment at the landslide spot of the project site. Therefore, when considering the effect of this project, it is appropriate to consider the improvement of the driving speed³¹, and the driving time and safety of transport across the bridge as effects but not the elimination of road closing days because elimination of road closing days relied heavily on the external factor, additional equipment, after the completion of the project.

²⁸ The landslide related projects are 4 projects (2009 – 2011) from the related Projects in page 3 and Ethiopian road restoration project conducted by using the Counterpart Fund.

²⁹ The hygienist of the contractor (KAJIMA Corporation) conducted HIV prevention education and distributed contraceptives to the construction workers.

³⁰ Feasibility Study Report of Abay Gorge Landslide Measures Project, p.7-8, 30 (April 2009)

³¹ Driving Speed during dry season is achieved at all sections of the project road during the dry season. During the raining seasons, driving speed is achieved at all the sections excluding the landslide part (approx. 37km) (Interview with the Deputy Director of Road Asset Management ERA)

As stated in the above, this project has somewhat achieved its objectives, therefore its effectiveness is fair.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

Road rehabilitation and bridge construction were carried out as shown in the table below.

There were a number of specification changes from the plan, due to the landslides³² including: the exclusion of small bridges; changes in alignment and the repairing of the damaged pavement; the addition of drainage facilities; and change in specifications of the parking area in the Dejen town due to the lack of cement materials. Those countermeasures were examined appropriately according to the situation at the time of construction and decisions were made based on the discussions with ERA, thus the procedures and the contents for the changes were appropriate.

Table 3 Comparison of Plan and Result

	Plan	Result	Difference from the Plan
Road Rehabilitation	Section Goha Tshion - Dejen Road Length 40.60km Width (Standard) 10m=(Shoulder)1.5 m+(Driveway)+3.5 m x2+(Shoulder)+1.5 m Pavement Asphalt Concrete Drainage Cross Pipe(D900-1200) U Shape Gutter(600 × 600) Stone Gutter	Section Same as Planned Road Length ³³ 40.45km Width Same as Planned Pavement Same as Planned Drainage Cross Pipe(D1000-2000) U-Shaped Gutter(600x600) Stone Gutter, Box Culvert(H2.5xW2.5)	(1) Alignment Change (2) Spec. down of Pavement at 5 Landslide Section(3.42km) (3) Exclusion of 2 small bridge construction from the plan (4) Pavement and Gutter Repair and Additional Drainage Facilities (5) Change of Pavement Type used for the Parking Space of Dejen Town
Bridge Construction	Bridge Length 303m Width 9m=(Shoulder)1 m+(Drive way) 3.5mx2+(Shoulder)1m Foundation Method 5 Spread Foundation Super Structure PC 3 Extra dosed bridge Sub-Structure Rigid Framed Abutment1, Wall Piers 1, V-Shaped Pier 2, Reverse T Pier 1	Same as Planed	Same as Planned

Source: Plan is Basic Design Study Report, Result is JICA Internal Report

³² Due to the influence of the landslide, the asphalt pavement was repeatedly damaged with subsiding and uprising of the road surface and the pavement works were unable to be completed. Thus, the landslide affected damages were excluded from the defect objects.

³³ The slight difference of the Road Length (150m) is the difference between the measurement taken for the BD and the actual measurement

The main responsibilities of the Ethiopian side, including construction site acquisition, clearance of the construction road, transference and the compensation for the right of ways were carried out as scheduled. The water current meter facility near the Abay Bridge was left at the site since there was no approval for its removal as it was under the jurisdiction of the ministry of water, but its removal did not pose an obstacle for the bridge construction. Additionally, some activities that were not in the original plan such as the repair works of the road facilities damaged by landslides (seven locations, with a total of 4.4km) were carried out. Specifically, earthworks (removal of earth and weight laying by earth), removal of the earth off the road, repair of gutters and pipes, re-pavement of the damaged pavement and a landslide survey (Drilling investigation) were carried out.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The results of the total expense of this project, 5,629 million yen, is higher than the planned amount of 4,841 million yen (the actual is 116% of the plan)³⁴. In total project expense, the exchange of notes (E/N) ceiling was 4,832 million yen for the Japan side and the Ethiopian budget was 9.8 million yen, whereas the actual expenses were 4,825 million yen for Japan and 804 million yen for Ethiopia³⁵.

There are two reasons for the increase in cost for the Ethiopian side. One is that the amount of the compensation paid for the clearance of the right of ways exceeded the planned amount of 9.6 million yen with the actual cost of 68 million yen. The other is that the expenses for additional activities for restoration and countermeasures for landslides which were not in the plan but implemented by using the Counterpart Fund of Ethiopia³⁶. The reason for the excess cost for the removal was that by widening of road in Dejen town more numbers of inhabitants' facilities such as walls needed to be compensated. The Counterpart Fund allocated during the construction for landslide damages was 387 million yen in 2007 and 349 million yen in 2007. As the additional expenditure related landslides is particularly large, the process for studying landslide measures at the time of appraisal is explained in the section below.

(Study of landslide measures at the time of appraisal)

The project section between Goha Tshion – Dejen forms special gorge topography. Indications, even at the initial appraisal stage, were that road rehabilitation would be difficult. The risk of landslides and

³⁴ Additionally, the contractor (KAJIMA Corporation) also bore the cost of repair and emergency work from the initial period of landslide occurrence in Feb.2006 to March 2007. However, this cost was not added to the project cost because it was difficult to separate the additional cost from the originally planned cost. After March 2007, road restoration work was carried out mainly by using the Counterpart Fund of Ethiopia.

³⁵ To calculate the planned cost for the Ethiopian side in the BD, the exchange rate 1ETB=12.99 Yen was used and for the actual cost used the exchange rate of project completion month was 1ETB=9.257Yen.

³⁶ Counterpart Fund is a sum of money accrued in a local currency arising from goods or services received from the Government of Japan (through loan and grant aid project). It can be used by developing countries for socio-economic development projects within the country.

the need to measure such risks were pointed out in the field study by the person in charge of grant aid project in 2000, and during the preliminary investigation in 2003. While suggesting the landslide measures should be kept to a minimum amount (since covering the entire section would be enormously expensive), the report mentions the possibility of large-scale landslides and falling rocks in the area. At the time of the appraisal, the risks of natural disasters including landslides were investigated and some measures were considered during the Basic Design study, and, as a result, it was suggested to conduct further study during the Detailed Design such as additional drilling and the study of underground water level. Landslide measures were scrutinized by the disaster mitigation expert at the Detailed Design. As a result, some mitigation measures planned in the Basic Design was considered as difficult for implementation and expensive thus other measures which were low cost and effective for landslide mitigation were implemented. However, the alternative solution could not reduce underground water which caused a landslide at the same section³⁷. At the time of construction, the instruction about landslide risk was not given to the contractor and the monitoring of the rainfall and the underground water level was not carried out until a landslide occurred.

There were discrepancies between the Basic Design and the Detailed Design, however since the topography and the geological feature of this project site is complicated and it is also difficult to point out potential landslide spots³⁸, even if some activities which were indicated in the Basic Design had been performed it is uncertain to what extent the measure could be effective for predicting or preventing the landslides.

3.4.2.2 Project Period

The project period was slightly longer than the planned period of 42.5 months to 43.3 months (102%). During construction, it took approximately one year to decide how to deal with landslide sections but since the contractor dealt with the repair work during that period voluntarily, the schedule of the whole construction period was not affected. The extension of the project period for about one month was due to the construction of additional drainage facilities for the sections that were damaged by the landslide which occurred during the rainy season in 2008.

Both the project cost and the project period slightly exceeded the plan, therefore efficiency of the project is fair.

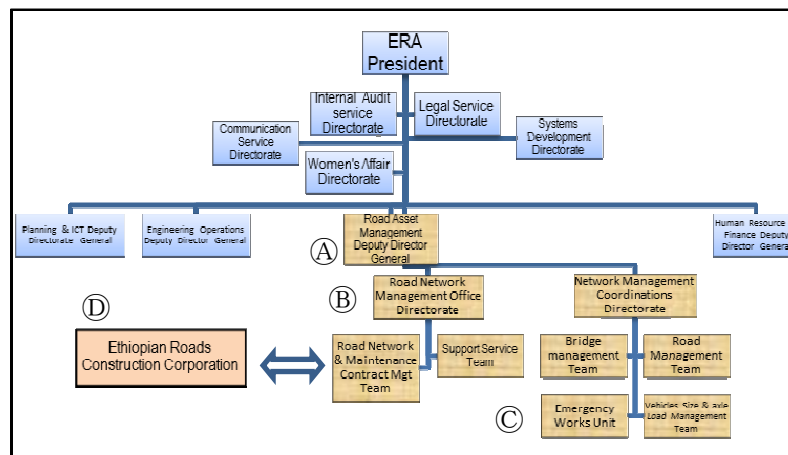
³⁷ In addition, the horizontal boring measure around Sta.28 which was deleted in the Detailed Design is being carried out through the above-mentioned technical cooperation project.

³⁸ According to the experts from “Project for Developing Countermeasures against Landslide in the Abay River Gorge” and “Capacity Development Project for Countermeasure Works for Landslide”, it is found from the analysis of landslide mechanism performed after 2010 that the special geological feature and topography cause small and medium scale landslide in the whole area, and it is almost impossible to prevent landslides around the gorge.

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

Since the ERA underwent organizational restructuring in 2010 and 2011, the current organizational arrangement for maintenance is different from the assumptions made at the time of the appraisal. At the time of the ex-post evaluation: regarding road network maintenance, the road asset management directorate (figure 4, ①) performs a master plan; regarding on-site maintenance plan, development and construction control are carried out by the ERA Alemgena Road Network Administration Office (②), and the ERA Emergency construction unit (EWU³⁹, ③) possess and manages the equipment of landslide measures given by the Japanese grant aid after this project's completion, the Alemgena Office of the Ethiopian Roads Construction Corporation (ERCC⁴⁰) (④) undertakes maintenance work and the repair. Because the ERA cooperates with the ERCC in regards to maintenance, there is no problem in particular in securing necessary human resources and equipment and operating the maintenance system.



Source: ERA

Figure 4 Organizational Tree of the maintenance work related departments (ERA and ERCC)

In addition, around 60-130 people per month are employed from the local community as maintenance workers to clean and conduct repair works so that the on-site work staff also does not have a problem.

3.5.2 Technical Aspects of Operation and Maintenance

The technical skills for maintenance work for this project road is categorized into three as described in the table.

³⁹ EWU was founded in November 2011 with a mission to take charge of landslide repair works and mitigation measures of the whole country of Ethiopia.

⁴⁰ ERCC was separated from ERA at the reorganization in 2010. Up to 2010, ERCC was named District Road Maintenance Contractors (DRMC) and worked as the department in charge of construction works and maintenance works.

Table 4 Technical Skills for Maintenance Work

Type of Maintenance Work	Work Description	Technical Skills of ERA and the contractors at the moment
(1) Daily and regular maintenance work	Making a maintenance work plan and implementation of regular road condition checking, cleaning and regular repair works	There is no technical problem in regards to the planning by ERA and the maintenance work by the ERCC
(2) Repair Work for Corrugation	Making a plan for pavement testing, analysis of test result and repairmen work with the quantity of most suitable asphalt	ERA has knowledge about the pavement test, but no experience with construction control. However, depending on the scale and technical difficulty of the testing and the repair work, ERA is able to employ a consultant so that there is no technical problem.
(3) Restoration and Landslide Mitigation Measure	Conducting the landslide investigation, earth work for road restoration, planning and conducting landslide mitigation measures	ERA has technical skills for earth work for the road restoration. As for the long-term landslide mitigation measures to reduce the landslide incidents, technical skills of ERA staff are insufficient, but the technology transfer is being carried out now by JICA technical cooperation project.

(1) Daily and Regular Maintenance Work

There is no issue as the ERA and contractors such as ERCC have enough knowledge, technical skills and experience to conduct daily and regular maintenance work.

(2) Repair Work for Corrugation

Testing appropriate pavement materials is the most important point in repairing corrugations and the ERA has the knowledge to conduct appropriate examinations and understands the necessity to undertake this work⁴¹. In addition, the technical proposals was submitted from the project consultant to ERA at the completion of the project, in which the repair method taking into consideration this road section's special road environment is described. ERA staff do not have the field experience to supervise large-scale corrugation repair work however, the ERA can employ appropriate outside consultants to cover for any technical or human resource shortage, so that there will be no problem implementing repair work when necessary.

(3) Restoration and Landslide Mitigation Measure

Although landslides occur frequently during the rainy season, since completion of the project, there

⁴¹ Interview with the Directorate Director, Alemgena Road Network Management, ERA

has been no loss in road function or in human life. The technical skills necessary to maintain the road effect of this section is mainly removal of earth around the road facilities and to deal with vehicle stuck during the rainy season. Before this project, roads had been kept functioning by the landslide repair work of ERA, so ERA staff do have the technical skill necessary to sustain the road's effect. In addition, there is the equipment to deal with the stuck case stationed at the project site and ERA staff and ERCC staff are capable of operating the equipment so that there is no technical problem for clearing obstacles from the road.

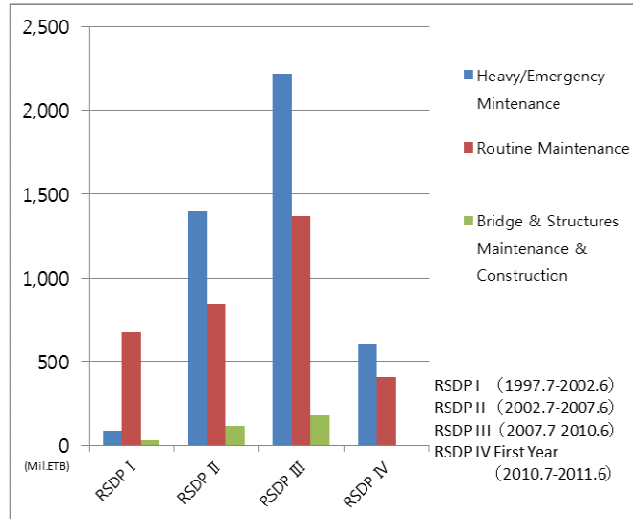
Although the above mentioned restoration work is an immediate remedy and is enough to maintain the project's effect, longer term landslide mitigation measures to reduce the risk of landslide disaster has been introduced from July 2011 by JICA in a technical cooperation project called " Capacity Development Project for Countermeasure Works for Landslide " and technical skills are being transferred to ERA staff. At the time of ex-post evaluation, ERA staff does not yet have the technical skills to conduct landslide investigations and mitigation measures by themselves, however, through the current technical cooperation project, they will become capable of reducing the risk of landslide in this section in future which will further ensure the sustainability of this project⁴².

For the maintenance of the bridge, large-scale repair work is designed to be conducted approximately 20 years later. At this moment, the periodic checking up and cleaning of the river wall and the base part of the bridge are carried out appropriately, and there is no technical problem.

3.5.3 Financial Aspects of Operation and Maintenance

Basically, the budget for national road maintenance work in Ethiopia comes from the "Road Fund". 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. As for the road fund, stagnation was a concern due to the rise and fall of the fuel consumption, but, the total sum tends to increase every year. The actual expenditure in the maintenance of RSDP (Ethiopian road development program) I~IV is shown in figure 5. (Phase IV only shows the first year (2010.7 - 2011.6))

⁴² This technical cooperation project targets Landslide Task Unit to perform a landslide study, make plan of mitigation measures, make budget and instruct contractors (2011-2016)

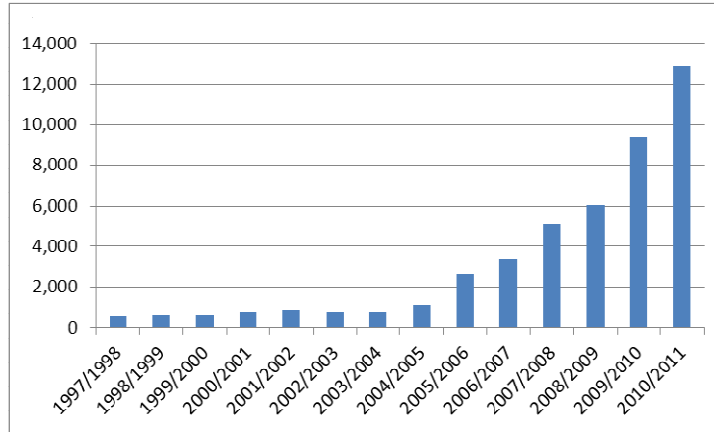


Source: Assessment of 14 years performance road sector development program, p7-12

Figure 5 Expenditure for Road and Bridge Maintenance in RSDP I~IV

However, different resources other than Road Fund are used for this project road since the maintenance cost exceed the budget scale of the Road Fund due to the repair work necessary for landslide damage and corrugation works. After this project's completion, a Counterpart Fund (41.6 million ETB, approximately 312 million yen⁴³) was approved in September 2009, and as of January, 2012, 40 million ETB of this fund was expended mainly for landslide measures of this section. About the budget after 2012, it is decided to allocate Ethiopian Government money, not from the Road Fund. The policy priority of Ethiopian Government on road development is high, and the recent Government expenditure has increased for accomplishment of RSDP (the figure 6, Ethiopia Government expenditure results). The Ethiopian Government set a special budget for landslide measures in 2011, and 80 million ETB has been allocated for six landslide measures projects of the country in the year of 2011/2012. This project site did not use the expenditure from this special budget in the year of 2011/2012 since the above mentioned Counterpart Fund has been used, but for the year of 2012/2013, 25 million ETB has been requested for this road section. After landslide incidences are reduced, the maintenance expense is going to be paid through the normal Road Fund budget. About the financial affairs of the road network maintenance, the ERA has a strong will to work on maintenance including landslide measures, and there is a special government budget thus there are no particular financial problems.

⁴³ The exchange rate of 1ETB=7.520Yen (September 2009)



Source: ERA

Figure 6 Expenditure of Ethiopian Government for RSDP I~IV⁴⁴

3.5.4 Current Status of Operation and Maintenance

The whole section of this project road and bridge function throughout the year. In regards to road maintenance work, the ERA implements a road condition survey three times a year. In addition, especially during the rainy season when the slope instability problem becomes imminent, the ERA, the ERCC and the traffic police work together for the maintenance of the road patrolling the road and traffic conditions every day and carrying out repair work whenever necessary. However, since the earth at the landslide point undergoes continuous movement, after conducting repair work the surface of the road changes its form so that frequent repair is necessary. At the time of the ex-post evaluation, 8-9 subsided road points were observed, but the road condition did not cause trouble for normal driving. At some of the road subsidence points, road markings were provided so that drivers would be warned in advance.

The road condition for January 2012 is as shown in table 7 (the left figure): good section was 51.63%, fair section was 25%, and poor section was 23.37%. The ratio of good road conditions kept for this road is slightly less than the average condition of the whole country in 2011 (figure 7, the right figure), but considering the special topography of the gorge and the technical difficulty for maintaining this section due to landslide damage, it is fair to claim that the maintenance level of this road falls within the range that can be considered average road condition for Ethiopia. Rutting and corrugations account for between 70-80% of the poor section of the road.

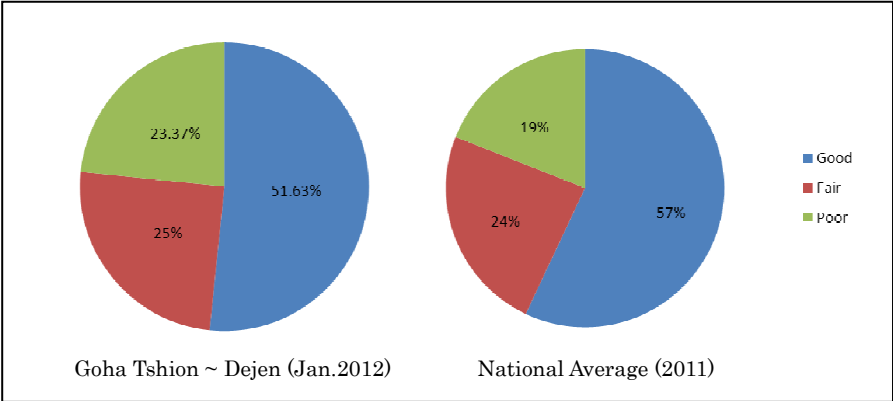
Although the ERA recognizes the necessity of corrugation repair⁴⁵, priority for repair work has been given to the landslide section and repairing corrugation has not yet started due to its relatively low level of emergency. It should be said that although rutting and corrugations reduce driving comfort, they do not cause trouble in regards to the flow of traffic. Therefore, although poor sections exist, they

⁴⁴ The road rehabilitation, upgrading and maintenance works are included in the expenditure

⁴⁵ Interview with the Director, Planning & Program Management Directorate and the Deputy Director General, Road Asset Management Directorate of ERA

have not spoiled the highway function and maintenance work is being performed to sustain the road’s positive effect brought on by this project.

There is no sedimentation such as garbage and the state of the river wall and the base of the bridge have not changed since the completion, so the maintenance situation of the bridge is good.



Source: (Left) Alemugena Road Network Management Office, (Right) Assessment of 14 years performance road sector development program, p.25

Figure 7 Road Conditions of the Project Site and National Average

No major problems have been observed in the operation and maintenance system, therefore the sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

Through the rehabilitation of a 40km (approx.) section of National highway No.3 connecting Ethiopia’s capital Addis Ababa to the northwest regions of Ethiopia and the construction of a new Abay bridge (303m), this project aims to improve the transportation of goods and people and to ensure the road safety of the existing road network.

The objectives of the project are consistent with the strategy of the road development program of the Government of Ethiopia and the route (Goha Tshion – Dejen) is important for transporting agricultural products to the whole country as well as exporting and importing goods with the neighbouring country of Sudan, thus the relevance of the project is considered high. In terms of the project’s effectiveness; the following were confirmed at the time of this evaluation: improvement in driving speed, eliminating the day of closed road throughout the year, and invigoration of socio-economic activities. However, one of these improvements was strongly influenced by other projects implemented after the completion of this project. For that reason, the effectiveness of this project is fair. During construction a landslide caused the project to exceed its budget and therefore efficiency of the project is also fair. The sustainability of the project effects is high based on the appropriate operational skills and

organized structure for the maintenance of the road and the bridge.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Within this project section, it is recommended to repair the pavement where it subsides. It is also desirable to increase the frequency of undertaking road condition surveys and repair works, since the ground where landslide influences is unstable and road surface subsidence needs frequent repair. When it is not possible to make immediate repairs for reasons such as a large scale landslide or a technical issue it is suggested to reduce the risk of accidents by painting road marking so that drivers are warned of irregularities in advance. In addition, it is desirable that the ERA refer to the technical proposal which was submitted by the project consultant and thoroughly discuss the methodology of corrugation repair works at the time of ordering construction work.

4.2.2 Recommendations to JICA

Nothing in particular.

4.3 Lessons Learned

In this project, the risk of landslide occurrence was pointed out prior to its implementation and as a landslide did occur, it influenced the effectiveness and the efficiency of this project. Thus, when a project takes place where there is a risk of natural disasters such as landslides, 1) the findings of the preliminary investigations and other related documents of the project site should be shared among the people concerned and landslide mechanisms and disaster occurrence should be analysed during both the Basic Design study and the Detailed Design study. In addition, based on the result of the study, 2) specific instructions during construction and a countermeasure should be stated, and a disaster prevention activity item should be examine in detail with a contractor in order to figure out the best management method together. During the course of dealing with natural disasters such as landslides, decisions on measures should be made in timely manner. Thus, it would be effective to decide in advance how to deal with disaster situations such as cost disbursement for landslide measures⁴⁶, and foresetting the criterion for suspension and postponement of construction.

⁴⁶ In regards to establishing a cost disbursement method, an emergency budget for investigation and emergency works which can be disbursed immediately through a simple application at the time of an emergency is useful. When making a judgment, it is effective if there is a rule to stop the construction work when the cost of additional work by disaster damage exceeds the planned budget of that section.