

The Republic of Ghana

FY2016 Ex-Post Evaluation of Japanese Grant Aid Project

"Project for Rehabilitation of National Trunk Road N8"

External Evaluator: Noriyo Aoki, Alfapremia Co., Ltd.

## 0. Summary

The project was implemented to secure a smooth and stable traffic by improving the road between Assin Praso and Bekwai, thereby contributing to maintaining access of local residents to social services in the target area, and promoting the distribution of goods between the target area and the surrounding areas.

This project is highly relevant, as it is consistent with priority areas in the development policy of Ghana and Japan's ODA policy and the development needs are also high. Though the project cost was within the plan, the duration of the project slightly exceeded the plan; thus, the efficiency of the project is fair. Improvements in the roughness of the road surface resulted in smooth vehicle travel and improved average travel speed. Reduction of travel hour was realized. The effects such as an increase in traffic volume were also observed. This project improved the access of the residents to social services such as medical services, mitigated the cost of transportation services, and vitalized commercial activities and agricultural production in the area surrounding the road. For these reasons, the effectiveness and the impacts of the project are high. An operation and maintenance system for the road has been established. No problem was found with respect to the maintenance technical skills, and the current status of maintenance is mostly favorable. However, some concerns remain in terms of financial aspects; thus the sustainability of the effects emerged from this project is judged as fair.

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

## 1. Project Description



Project Location



Pedestrian on Crosswalk and Bus  
(Adansi South District)

## 1.1 Background

In Ghana, road networks are major keys for socio- economic activities. An economic zone surrounding the second largest city, Kumasi, exists along the target road section, which serves as a production site and logistical center for timber, cacao, gold, manganese, bauxite and so on. The National Trunk Road N8 is a major traffic route to Kumasi. Exports that accumulated at Kumasi are transported southbound by the N8 and are exported from the second largest port in Ghana, Takoradi, while imported goods are carried to Kumasi from Takoradi port via the N8. As shown in Figure 1 (p. 3), N8 links to N10, which leads north of Kumasi to the northern savanna area and Burkina Faso. When neighboring countries such as Burkina Faso and Côte d'Ivoire were politically unstable, N8 also functioned as an international logistical route to landlocked countries. At the time of the ex-post evaluation, its role as an international transport road decreased along with the stabilization of the political situations in neighboring countries. Instead, it has become a trunk road used primarily for domestic transport.

## 1.2 Project Outline

This project was implemented to secure smooth and stable traffic by improving the road between Assin Praso and Bekwai in the target area, thereby contributing to maintaining access of local residents of the target area to social services, and promoting the distribution of goods between the target area and the surrounding areas.

E/N Grant Limit or G/A Grant Amount /Actual Grant Amount	Detailed Design: 110 million yen/110 million yen Construction: 8,714 million yen/8,694 million yen
Exchange of Notes Date/ Grant Agreement Date	Detailed Design: Feb. 2009/Feb. 2009 Construction: Jul. 2009/Jul. 2009
Executing Agency	Ghana Highway Authority (hereinafter referred to as " GHA ")
Project Completion	December 2013
Main Contractor	Tokura Corporation
Main Consultant	Construction Project Consultants, Inc. Ingerosec Corporation (January 27, 2009: took over the duties from construction project consultants)
Basic Design	Basic Design Study: Mar. 2008
Related Projects	Japanese ODA Loan Project <i>Anwiankwanta-Yamoransa Road Rehabilitation Project</i> (1987–1994)

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Noriyo Aoki (Alfapremia Co., Ltd.)

### 2.2 Duration of Evaluation Study

Studies for this ex-post evaluation were conducted during the following periods:

Duration of Study: July 2016–February 2018

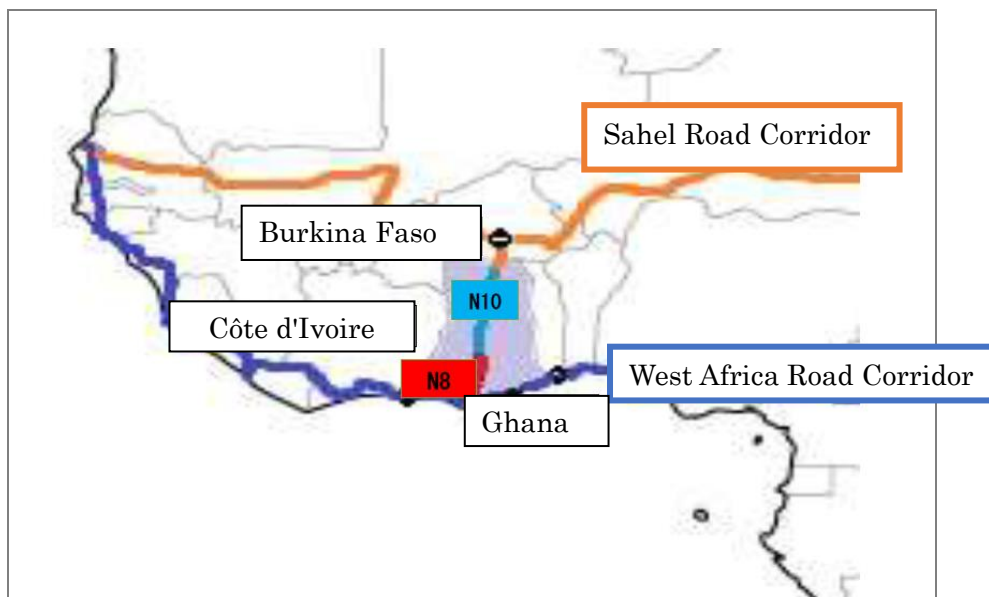
Duration of Field Study: October 17–November 1, 2016; February 5–10, 2017

### 3. Results of the Evaluation (Overall Rating: B<sup>1</sup>)

#### 3.1 Relevance (Rating: ③<sup>2</sup>)

##### 3.1.1 Consistency with the Development Plan of Ghana

The government of Ghana addressed promotion of transportation infrastructure development for the regional development as a main plan in the national plan *Long-Term Economic and Social Development Plan 1995–2020 (Ghana Vision 2020)* and *Strategies for Second Growth and Poverty Reduction 2006–2009 (Ghana Poverty Reduction Strategy II, hereinafter referred to as "GPRS II")*<sup>3</sup>. Under the *Road Sector Development Program 2002–2006*, the government also set a target on road improvement for the development of trunk roads and regional access roads<sup>4</sup>. In terms of the development of international roads, the development of N8 and N10 was regarded as a prioritized policy because both roads connect with the West Africa Road Corridor and the Sahel Road Corridor in the north-south direction, which is promoted by the Economic Community of West African States, hereinafter referred to as "ECOWAS"<sup>5</sup>.



Source: Illustrated based on the *Basic Design Study Report* pp. 1–3.

Note: National Trunk Road N8 and National Trunk Road N10 are noted as N8 and N10, respectively.

Figure 1. Road corridor of the West Africa

*Ghana Shared Growth and Development Agenda 2010–2013*, hereinafter referred to as "GSGDA", was formulated as a plan in a similar position as GPRS II that was in place during the planning stage, and its successor, *Ghana Shared Growth and Development Agenda*

<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>2</sup> ③: High, ②: Fair, and ①: Low.

<sup>3</sup> *Basic Design Study Report* pp. 1–2.

<sup>4</sup> *Basic Design Study Report* pp. 1–2, Republic of Ghana *Anwiankwanta-Yamoransa Road Rehabilitation Project Preliminary Study Report* (2007) page 9.

<sup>5</sup> *Basic Design Study Report* pp. 1–3.

2014-2017, hereinafter referred to as "GSGDA II", was positioned as the *National Mid-Term Development Plan* at the time of ex-post evaluation.

Under GSGDA II, the government of Ghana set a goal in which its road network would serve as the center of transport in West Africa. The repair of damaged road infrastructure<sup>6</sup> was listed amongst the approaches. Along with GSGDA II, *Road Sector Medium-Term Development Plan 2014–2017*, hereinafter referred to as "SMTDP", was formulated and committed to the efficient and cost-effective development of a transport network that matched the needs of the society in a sustainable manner, thereby playing a role as the center of transport in West Africa. Specifically, *GHA Strategic Plan 2015–2017* was formulated, where road maintenance, axle load control and ensuring of transportation safety were identified as strategic pillars<sup>7</sup>. Additionally, GHA also formulated the *Ghana Highway Authority 20-Year Strategic Plan for 2017–2037*, which addresses that the first goal is timely road maintenance, the second goal is road development with guaranteed cost-effectiveness, the third goal is the efficient axle load control, the fourth goal is the improvement of road safety, and the fifth goal is the establishment of its own funding resource<sup>8</sup>.

In light of the above, this project was consistent with the development policies of Ghana both at the time of planning and ex-post evaluation.

### 3.1.2 Consistency with the Development Needs of Ghana

The N8 route which was developed through a Japanese ODA Loan Project from 1987 to 1994 (*Industrial Road Rehabilitation Project*)<sup>9</sup>, suffered from significant degradation of the pavement because of overloaded vehicle traffic and remained in a state in which safe and smooth transportation was inhibited and required immediate improvement<sup>10</sup>. N8 is an important transport route that connects the economic zone centered around Kumasi with the port of Takoradi, and development of the road was needed as it is also a part of the international road network that leads to landlocked countries such as Burkina Faso.

The Assin Praso Bridge, which was built 72 years ago, had suffered from significant damage even though the limit of load had been set because many vehicles with loads exceeding the limit had continued to pass over it, and the bridge needed to be replaced to ensure traffic safety<sup>11</sup>.

The urgent development need at the time of planning was satisfied by the project at the time of ex-post evaluation, and the priority and relevance of the target selection of the project was judged as high.

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<sup>6</sup> GSGDA II, pp. 79.

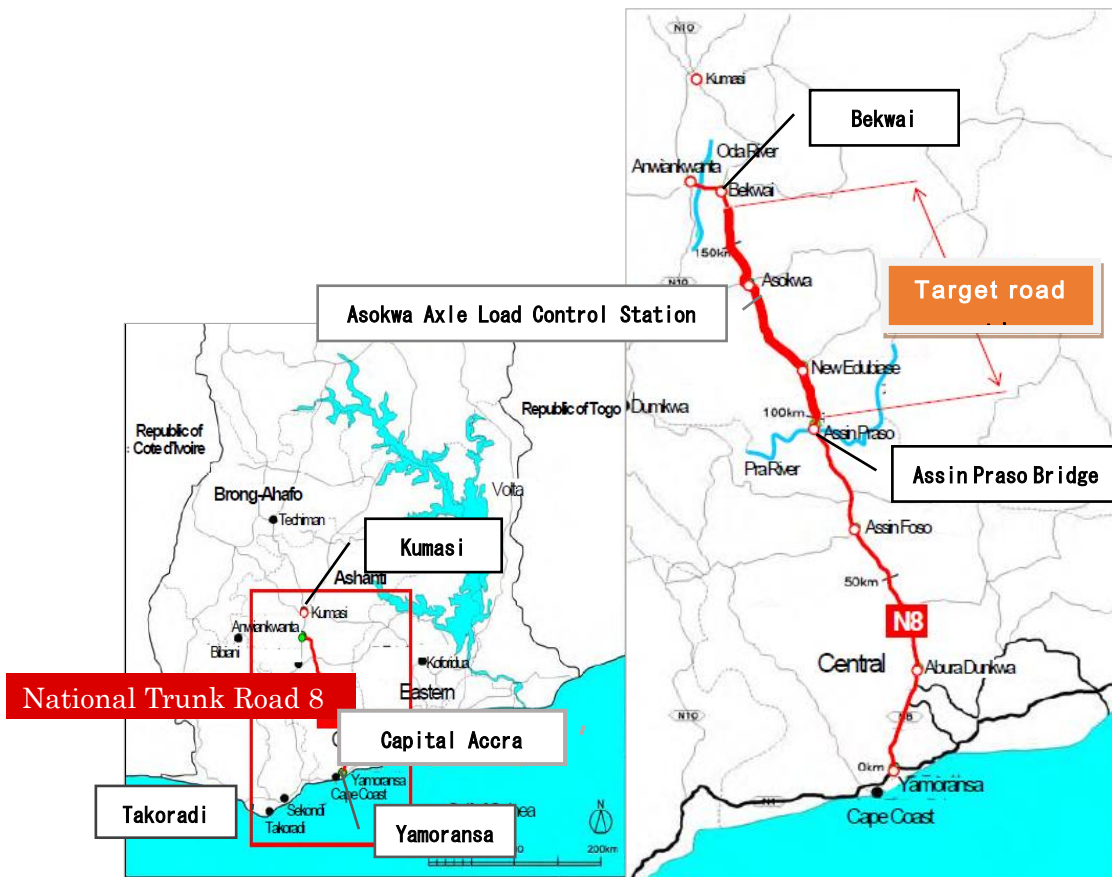
<sup>7</sup> *GHA Strategic Plan*, pp. 2.

<sup>8</sup> *Ghana Vision 2020* at the time of planning was no longer positioned as a national plan at the time of ex-post evaluation. Instead GSGDA II is the national development plan.

<sup>9</sup> N8 Yamoransa–Anwiankwanta, 175 km. Anwiankwanta is the name of a site in Bekwai.

<sup>10</sup> *Basic Design Study Report*, pp. 1–6.

<sup>11</sup> *Basic Design Study Report*, pp. 3–13.



Source: Formulated map based on that of *Basic Design Study Report*

Figure 2. Target road section along National Trunk Road N8

### 3.1.3 Consistency with Japan's ODA Policy

The government of Japan positioned the development of road networks as one of the development issues within its prioritized assistance area "improvement of the livelihood environment through development of basic infrastructure" in its *Country Assistance Plan for the Republic of Ghana* formulated in June 2000. The development of economic infrastructure including the road sector was designated as an important development issue to promote the development of the private sector from the perspective of industrial growth.

The assistance for the economic infrastructure development was also addressed in the *Yokohama Action Plan* adopted during TICAD IV in 2008<sup>12</sup>.

### 3.1.4 Appropriateness of the Project Plan and Approach

In addition to the promotion of logistics, the target section was selected appropriately since many villages were found along the N8 and the road would have a great impact on the livelihood and economy of local residents. While these will be discussed later in the Project Outputs and the Effectiveness sections, planned designs for pavement structure, road shoulder

<sup>12</sup> TICAD IV Yokohama Action Plan, May 2008.

width, road width, bridge repair, alignment, and sight distance were appropriate for the target sites.

In light of the above, the implementation of the project fully conformed to the development policies and development needs of Ghana in addition to Japan’s assistance policy. The project plan and its approach were also appropriate; therefore, the project was highly relevant.

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

Table 1 shows the outputs developed and provided by Japan, and Table 2 shows the Ghanaian side duties.

Table 1 Outputs developed and provided by Japan (planned and actual)

Planned Item	Contents of Plan	Actual
<b>Road design</b>		
Planned target section	Assin Praso–Bekwai (59.9 km)	As planned
Road width	11.3 m (roadway, 3.65 m × 2; road shoulder, 2 m × 2; climbing lane, 3.5 m)	As planned
Design axle load	Design axle load: 13 t, cumulative 27 million standard load-bearing class	As planned
Climbing lane	Right lane: 1.68 km from the 43.5 km point Left lane: 1.29 km from the 45.2 km point	As planned
Pavement	Roadway pavement: 14 cm thick (4-cm asphalt concrete surface layer, 5-cm base layer, 5-cm leveling layer) Roadway base course 20 cm (crushed stone for mechanical stabilization) Roadway base course 20 cm (materials generated on-site)	As planned
Road shoulder surface layer	3 cm (asphalt concrete surface layer)	As planned
<b>Structure</b>		
Cross drainage structure	127 locations	As planned
Bridge (Assin Praso Bridge)	One location (three spans, 98 m in total length) Repair details: Replacement of an existing bridge (Existing bridge remains on site to be used as a pedestrian bridge by Ghanaian side)	As planned
<b>Incidental facilities</b>		
Drainage ditch	Concrete waterway, unlined waterway	As planned
Guardrail	Rigid protective wall, guard post	As planned
Improvements on intersection	Major intersection between endpoints: one location (42.4 km from starting point)	As planned
Traffic safety facilities	Road surface markings, humps, crosswalks, road signs	As planned
Bus stop	40 locations (3.5 m width, 30 m length) Two locations (3.5 m width, 100 m length)	As planned
Slope protections	Drainage berms, culverts, sodding (45.4 km from starting point)	As planned

Source: Results from interviews with Ashanti Regional Office, and documents provided by implementing consultants.

Table 2 Items of duties of Ghanaian side (planned and actual)

Planned	Actual
1) Relocation of obstructing buildings for road construction	As planned
2) Resettlement of houses within road site for road construction	As planned
3) Land acquisition and land rental for construction yard in some sections for alignment improvement	As planned
4) Relocation of electric wires, telephone poles, and water pipes	As planned
5) Registration of local construction vendors	As planned

Source: *Basic Design Study Report* (pp. 3–55), results from interviews with stakeholders, and documents provided by implementing consultants.

Outputs developed and provided by Japan were almost delivered as planned. Design for the retaining wall of a cut section was altered from masonry style to large concrete blocks. The reason is that a retaining wall was constructed in a steep mountainous section where large vehicles had to take detours for safety precautions during construction and construction had to be efficient. Retaining walls for the inlet and outlet of pipe culverts were also changed from masonry to reinforced concrete. These changes were intended to minimize the impact on general traffic since the pipe culvert to be changed was located at a key traffic congestion point. In addition, a request was made by the project implementing agency to minimize the impact on the general traffic and resulted in a change in surface protection of the earthen gutter from masonry to concrete. In either case, no impact on cost or construction time was found.

As a result of a slope collapse during the rainy season within the construction period in a mountainous area, another survey and design was needed to convert the temporary soil retention measures into a permanent solution. Cost of the survey and design increased by 5.24 million yen, but it did not affect the construction time. Fundamental measures were taken against landslides by adding preventive measures in areas where mountainous slopes had collapsed. For these purposes, 46.98 million yen was spent additionally, but the expenditure was fully covered by the contingency within E/N agreement, and the constructions had appropriate changes despite their impact on the construction period.

Duties of the Ghanaian side were executed as planned. The procedures for resettlement of residents and land acquisition were completed as planned before construction began but payment for land acquisition was delayed in some areas<sup>13</sup>.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The planned project cost for the Japanese side (E/N grant limit) was 8,824 million yen, while the actual project cost was 8,804 million yen. Since the actual cost was 100% of what was planned, it was within the plan.

The estimated project cost on the Ghanaian side was approximately 109 million yen (983,000 GHC<sup>14</sup>)<sup>15</sup>, but the actual cost was approximately 71 million yen (1,347,000 GHC) or

<sup>13</sup> From an interview with implementing consultants, payment was delayed in some areas because of a delay in expenditures by Ghana Ministry of Finance.

<sup>14</sup> Calculated using the following average exchange rate from November 2007 to April 2008: 1 USD = 107.97 JPY, 1 GHC = 110.71 JPY (GHC: Ghanaian cedi) (from *Basic Design Study Report*). Ghanaian cedi can be noted as GHC, GHc, or GHS; this report uses GHC.

65% of the planned cost<sup>16</sup>.

The actual total project cost combining the Japanese and Ghanaian costs was 99% of the planned value \*(Table 3, ②÷①), which did not exceed the planned budget.

Table 3 Comparisons between planned and actual project costs

Item	Planned	Actual
Japan		
Detailed design	110 million yen	110 million yen
Main construction	8,714 million yen	8,694 million yen
<b>Total of Japanese side</b>	<b>8,824 million yen</b>	<b>8,804 million yen</b>
Ghana		
Land acquisition cost, etc.	109 million yen	71 million yen
(in Ghanaian currency)	(983,000 GHC)	(1,347,000 GHC)
<b>Total cost of both countries</b>	<b>8,933 million yen ①</b>	<b>8,875 million yen ②</b>

Source: GHA

### 3.2.2.2 Project Period

The project period was planned for 51 months (from the start of the detailed design to the completion of construction)<sup>17</sup>, but the project was delayed by 7 months<sup>18</sup>, exceeding the planned period by 14%. The actual detailed design and tender period was 9 months while the planned period was 12 months. The construction period took for 46 months while the plan was for 42 months. The major reason for the delay was the time required to implement preventive measures for slopes in the mountainous area, and particularly that construction was avoided during the rainy season. As described earlier, delays of payments for land acquisition in some areas also caused construction delay.

In the light of the above, though the project cost is within the plan, since the project period exceeded the plan, its overall efficiency is fair.

## 3.3 Effectiveness (Rating: ③)

### 3.3.1 Quantitative Effects (Operation and Effect Indicators)

#### 3.3.1.1 Improved Roughness

As shown in Table 4, there was 9 km of distance that faced difficulty in passing because of issues of roughness, but the roughness of the target section is improved by this project as

<sup>15</sup> *Basic Design Unit 1*, pp. 3–55.

<sup>16</sup> Calculated using the average exchange rate of 1 GHC = 53.01 JPY from March 2009 to December 2013. The GHC fell from 1 GHC = 110.71 JPY at the time of planning and was weaker during project implementation. The Ghanaian cost increased because of soaring prices that was caused by GHC being a weaker currency against US dollars, while a drop in the calculated cost after conversion to yen was because of the downfall of the GHC against the US dollar and the Japanese yen that continued to be weak during the implementation period (GHA).

<sup>17</sup> Calculated as 51 months, including detailed design and bidding as well as the construction period in the project planning period from the project implementation scheduling chart in the *Basic Design Study Report*. However, the project period did not include the period for administrative procedures from the date of the G/A to the start of the detailed design, and the ex-post evaluation defined the starting point of the project as the start of the detailed design which was clearly identifiable for both plan and actual.

<sup>18</sup> 58 months from the beginning date of the detailed design (contract conclusion with consultants) in March 2009 to the completion date in December 2013.



shown in Table 5. The international roughness index, hereinafter referred to as "IRI<sup>19</sup>", measured at the sites decreased from 3.8 at the time of planning to 1.3 after project completion, thereby improving the roughness. According to both the road users in the target section and GHA Ashanti Regional Office staff, severe damage found before the project was improved, eliminating the subduction of front and back of culverts, puddles on the road, potholes, bumpy patches, and alligator cracks, thereby improving the roughness of the road. According to the results of the beneficiary survey, every respondent said that road roughness improved<sup>20</sup>.

Table 4 Changes in distance that is difficult for passage because of road roughness

Indicator	Baseline (2008)	Target (2013)	Actual (2013)	Actual (2016)
	Planned Year	Completion Year	Completion Year	Ex-post Evaluation
Distance that is difficult for passage because of roughness	9 km	0 km	0 km	0 km

Source: GHA

Table 5 Changes in the IRI for the target section

Indicator	Planning Stage (2008)	After Completion (2014)
Assin Praso–Bekwai <sup>1)</sup>	3.8	1.3

Source: Road Condition Registry for Year (GHA)

1) Average value of sectional measurements

### 3.3.1.2 Improved Travel Speed and Reduced Travel Time

As Table 6 shows, running speed was 10 km/h at the time of planning, and the target was set at 80 km/h. Twenty-two villages were scattered on both sides of the road throughout the target section, and crosswalks were made near schools, health centers, and district halls. Speed-control tables were established at 45 locations between Assin Praso and Bekwai (59.9 km) for the safety of local residents, which required the drivers to take time for deceleration and acceleration. Where residents cross the road frequently, the speed limit had been set at 50 km/h since 2013. Establishment of these speed-control tables and crosswalks were decided based on the road surface construction completion and before the beginning of service after discussions between the Road Safety and Environment Department of GHA, the Ashanti Regional Office, the local administrative institutions (mainly district halls adjacent to the target section), and resident representatives. Police checkpoints for maintaining public security and traffic safety were established in two locations. Vehicles having to stop temporarily slightly influenced the fact that sections of road on which vehicles can travel at the planned 80-km/h target speed were limited. For these reasons, as shown in Table 6, vehicle speed was

<sup>19</sup> An indicator that measures the roughness of a road surface.

<sup>20</sup> Beneficiary surveys were conducted by defining the target population as users of the target road and by using a quota sampling method. The surveyed population consisted of effective responses by drivers of 40 freight vehicles, 14 minibuses, 4 motor coaches, 16 sedans, 5 motorcycles, 2 bicycles, 1 tractor, and 40 pedestrians. A total of 122 effective responses were obtained; 96 respondents were male and 26 were female. All of the female respondents were pedestrians. Female vehicle drivers could not be found as a sample target.

in the range of 50–80 km/h at the time of ex-post evaluation. The baseline value of a safe travel speed on the bridge at the time of planning was 10 km/h and the target speed was 80 km/h, but the actual speed remained at 50 km/h at the time of ex-post evaluation. This was largely because a 50-km/h speed limit was set in the areas surrounding the bridge to maintain safety, as a market had been developed in a relatively large area surrounding the bridge.

Table 6 Major operations and effect indicators

Indicator	Baseline (2008)	Target (2013)	Actual (2013)	Actual (2016)
	Planned Year	Completion Year	Completion Year	Ex-post Evaluation
Vehicle driving speed	10 km/h	80 km/h	50–80 km/h	50–80 km/h
Safe driving speed on bridge section	10 km/h	80 km/h	50 km/h	50 km/h
Travel time required in the section	90 min.	47 min.	NA	61 min.

Source: *Basic Design Study Report*, GHA. Travel time required between the section was measured with 4WD vehicles both at the time of planning and ex-post evaluation.

As shown in Table 6, the baseline of the time required to travel through the section was 90 minutes at the time of planning, and the target was 47 minutes at 80 km/h, but the road required for 61 minutes to travel at the time of ex-post evaluation. This is because of the speed-control tables and crosswalks established across the road, police check points that required vehicles to stop temporarily, and the speed limit at 50-km/h in residential areas. However, while the three indicators above did not reach the target values, actual values at the time of ex-post evaluation did improve compared to the baselines at the time of planning.

### 3.3.1.3 Increased Traffic Volume

As Table 7 shows, daily average traffic volume was 2,143 vehicles at the time of planning, while the number was 3,748 at the time of ex-post evaluation, exceeding the planned target value of 2,600–3,000 vehicles. Among vehicle types, daily average traffic volume of motorcycles significantly increased by 5.7 times of the initial volume because of the traffic safety ensured by establishing the road shoulders. The number of general vehicles such as passenger cars, pickups, and 4WDs increased by 2.5 times of the initial volume.

Table 7 Daily average traffic volume

Indicator	Baseline (2008)	Target (2013)	Actual (2013)	Actual (2016)
	Planned Year	Completion Year	Completion Year	Ex-post Evaluation
Daily average traffic volume (number of vehicles)	2,143 <sup>1)</sup>	2,600–3,000	NA	3,748 <sup>2)</sup>

Source: Traffic volume survey at Assin Praso at the time of basic design and ex-post evaluation

1) Baseline for the plan year was 2,577 vehicles at Assin Praso at basic design, but the traffic was measured from 8:00 am Friday to 8:00 am of the following Saturday, and the number was adjusted using a coefficient for days of a week based on actual measurements by GHA.

2) Actual value at the time of ex-post evaluation was measured from 8:00 am Monday to 8:00 am of the following Tuesday, and the number was adjusted using a coefficient for days of a week based on actual measurements by GHA.

Table 8 Daily average traffic volume by vehicle type (measured 24 hours)

Indicator	Planning Stage1) (2008)	Ex-post Evaluation Stage (2016)
Motorcycle	64	<b><u>365</u></b> <sup>5)</sup>
General vehicle 2)	728	<b><u>1,807</u></b>
Minibus 3)	470	<b><u>662</u></b>
Motor coaches 4)	420	<b><u>518</u></b>
2-axle truck	163	<b><u>219</u></b>
3-axle truck	29	<b><u>45</u></b>
4-axle truck	<b><u>64</u></b>	52
5-axle truck	<b><u>113</u></b>	42
6-axle truck	<b><u>92</u></b>	38
Total	2,143	3,748

Source: Traffic volume survey of *Basic Design Study Report* (pp. 2–6), and traffic volume survey results at the time of ex-post evaluation

1) Traffic volume reported by the *Basic Design Study Report* adjusted by the coefficient based on measurements by GHA.

2) Taxis, sedans, pickup trucks, 4WDs and so on.

3) Includes station wagon omnibuses.

4) Medium- and large-sized buses.

5) Bold underlines suggest a different trend in traffic volumes between the time of planning and ex-post evaluation.

Comparison between types of vehicle at the time of planning and those at the ex-post evaluation shows that while the number of buses, two-axle trucks, and three-axle trucks increased, the number of large-freight vehicles with four axles or more decreased. This is because of a decrease in the number of transport freights to Burkina Faso via inland Ghana as a result of subsided conflicts in neighboring countries (Côte d'Ivoire and Togo), an increase in vehicles that chose to avoid Ghana and take a long-distance transport route in neighboring countries, the establishment of police checkpoints for maintaining public security and traffic safety, and

establishment of the new speed-control tables in the country<sup>21</sup>. In particular, large-load vehicles are affected by the increased fuel costs when they pass through the speed-control tables as they have to decelerate and accelerate, and the larger the freight, the more likely they take a route other than that in Ghana<sup>22</sup>. Compared to neighboring countries, regulations on axle loads are stricter in Ghana and amount of penalties is higher<sup>23</sup>.

A comparison of changes in traffic volume across Ghana and the target section were attempted, but according to GHA, statistics on the number of registered vehicles and vehicles entering and leaving Ghana lacked reliability, and a comparison could not be made.

As shown in the daily traffic volume distributions in Table 8, the volume of vehicles with three or less axles increased, but the volume of large-freight vehicles with three or more axles decreased. During the interviews with drivers of large-freight vehicles at the time of the beneficiary survey, the majority of vehicles with four or more axles were used for long-distance transport<sup>24</sup>. As for trucks with three axles or less, the intended promotion of distribution of goods in the target region and surrounding areas was confirmed despite a decline in international long-distance logistics since goods distribution to and from the Kumasi regional economic zone was plentiful<sup>25</sup>.

#### 3.3.1.4 Smooth Travel by Installing Climbing Lanes in Mountainous Area

As the result of installing climbing lanes for large vehicles whose speed decreases in mountainous area, congestion in the climbing section was solved and smooth vehicular travel except large scale vehicles was secured. Road alignment and sight distance between mountainous sections were also improved.

#### 3.3.1.5 Secured Sight Distance during Passage by Improving Intersection

Through the improved design of this project, the outlook at the three-way junction intersection at Obuasi -Asokwa improved, thereby improving the sight distance for pedestrians and vehicle drivers and decreasing collisions at the crossing.

#### 3.3.1.6 Smooth Passage by Replacing Bridge

On the old bridge, road width was limited and there was only a single lane, resulting in frequent congestion of vehicles waiting to cross the bridge. The road width on the new bridge was expanded as well as the road shoulder to secure safe passage.

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<sup>21</sup> From interviews with GHA, and road & traffic experts.

<sup>22</sup> From interviews with axle load control station operators and large-freight truck drivers.

<sup>23</sup> Examples of overload fines: 500 GHC for 14 tons per 1 axle (over 2.5 tons); 1,500 GHC for 16 tons per 1 axle (over 4.5 tons); and 3,000 GHC for 18 tons per 1 axle (over 6.5 tons).

<sup>24</sup> For example, vehicles for long-distance transport from southern Ghana near Abidjan to northern Ghana, from Burkina Faso to southern Ghana, and from southern Ghana to northern Nigeria.

<sup>25</sup> Distribution to and from the economic zone around Kumasi was confirmed by the beneficiary survey, but it was also confirmed by bus drivers at the minibus stop near Assin Praso.

Waiting time was no longer required, and the waiting hours to cross the bridge was reduced from 1/3 to 1/2<sup>26</sup>. Stores and residences surrounding the old Assin Praso Bridge and the connecting roads were submerged under water about three times a year. The new bridge was constructed at a higher position and flooding no longer influences vehicle travel<sup>27</sup>. According to the results of the beneficiary survey, 99% of respondents said that its convenience improved.



New (left photo) and old (right) Assin Praso Bridge

The new bridge has specifications based on the B-live load of the technical standard *Road and Bridge Specifications* formulated by the Ministry of Land, Infrastructure, Transport and Tourism of Japan<sup>28</sup>, which also satisfies Ghanaian bridge standards<sup>29</sup>.

### 3.4 Impacts

#### 3.4.1 Intended Impacts

##### 3.4.1.1 Suppression of Traffic Accident Occurrence

While the number of traffic accidents was not confirmed at the time of planning, there was no clear increase in the number of traffic accidents after project completion compared to the construction period. Of the effective responses in the beneficiary survey, 96% said that traffic accidents decreased, 2% said there was no change, and 3% said the number of accidents increased<sup>30</sup>. According to interviews with district police and local residents, the incidence of traffic accidents was suppressed by the presence of speed-control tables. Improved road shoulders (2 meter per one side) also contribute to the safe travel of pedestrians and motorbikes. According to interview with police, many of the accidents occur when vehicles and motorcycles entering from roads connected to the target road section made contact with the vehicles traveling on the target section. While detailed data on the accident rate could not be obtained, changes in the rate of fatal accidents from the rollover of speeding vehicles did not increase compared to one before the project although there was an increase in traffic

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<sup>26</sup> From interviews with road users and surrounding residents.

<sup>27</sup> Old bridge still exists as a walkway.

<sup>28</sup> Standards used for bridges with heavy large-vehicle traffic. Specifications applied to speedways, national trunk roads, and prefectural roads.

<sup>29</sup> Information from an interview with implementation consultants.

<sup>30</sup> Those who said the accidents increased were pedestrians. The sum of effective respondents was not 100% because each numbers was rounded.

volume<sup>31</sup>.

Table 9 Number of traffic accidents in target section (2011–2015)

Year	Fatal Accidents 1)	Minor Accidents 2)
2011	48	117
2012	44	122
2013	50	110
2014	55	136
2015	53	113

Source: GHA, number of reports to district police stations.

1) Serious accidents with significant damage to the brain, internal organs and so on.

2) Accidents in which a person was injured and required time for treatment and recovery.

#### 3.4.1.2 Access to Medical and Social Services

According to interviews with local residents, transport or access to general hospitals outside the section became easier, as well as to district hospitals located along the road. Visits during illness and transport of women for pregnancy tests and childbirth became possible with private cars as well as motorcycles<sup>32</sup>. Local residents are able to choose and receive medical services from several nearby medical institutions. The commute to the district office along the road for submission of various administrative forms also became easier. The results of the beneficiary survey showed that 98% of respondents responded that access to medical and other social services improved. Convenience of access to educational facilities improved with an increase in the number of bus traveling services.

#### 3.4.1.3 Transport Cost

Transport cost can be separated into the cost for vehicle maintenance and fuel cost. According to the beneficiary survey, 100% of respondents who drive vehicles said that the cost of vehicle maintenance had reduced. Fuel consumption may have reduced because of an improvement in travel performance, but the fluctuation of fuel cost could not be verified through the survey considering the significant inflation in recent years, fluctuations in crude oil prices, and the fact that there are speed-control tables and other areas in which a vehicle needs to decelerate and then accelerate.<sup>33</sup>

#### 3.4.1.4 Changes in Number of Bus Travel Services in the Section

According to minibus drivers at bus stops in Assin Praso, the number of minibus service companies that commute between Assin Praso and Etobiase (19 km) increased, and the amount of minibus traffic quadrupled since the planning stage. Users were now able to choose a bus company in search for a better service. However, bus charges did not change, as they are determined by the Ghana Private Road Transport Union, hereinafter referred to as GPRTU. According to an interview at a bus stop in Kumasi operated by GPRTU<sup>34</sup>, the number of minibus services between Kumasi and Elubo (a point along the national border towards

<sup>31</sup> From an interview with police at a police station.

<sup>32</sup> After improvement, rickshaws (tricycles used as makeshift taxis) started to provide services on road shoulders.

<sup>33</sup> 15.5% in 2014, 17.2% in 2015 (IMF, World Economic Outlook Database).

<sup>34</sup> Kumasi Afaso Station.

Abidjan, the capital of Côte d'Ivoire) doubled since the planning stage. The coach service between Kumasi and Elubo, which did not exist at the time of planning, is now offered twelve times a day by a new bus company founded in 2012 along with the opening of the target section<sup>35</sup>. As a result of this project, long-distance bus traffic and commutes by residents in the surrounding area are triggered to increase.

#### 3.4.1.5 Impacts on Local Industries by Improving Travel Performance

Approximately 90 percent of local residents in the target section work in the agricultural industry, cultivating cacao, oil palm, and plantains (a staple food), which serve as a source of income through sales on the roadside and at periodic markets in various locations within the target section. According to interviews with local residents, post-harvest loss (loss through disposal of agricultural products because of a decline in freshness or damage at the distribution stage) decreased because of the improvement in logistics<sup>36</sup>. In the beneficiary survey, 93% of respondents said that damage caused by transport decreased. Transport of goods to other regions became possible, and the area in which products were sold was expanded. According to local residents<sup>37</sup>, revenue from the sale of products increased after the project completion<sup>38</sup>. Daily necessities, miscellaneous goods, and crops produced in the surrounding areas that could not be purchased before the project were now sold in nearby areas, and local residents were now able to choose what to purchase from a diverse selection of goods. According to roadside sellers, trade among local industries became active, and the local economy was revitalized after the project completion. However, greater trade activities at markets that were opened periodically within the target section also caused a wait period of a few minutes to pass the road, since the stores sprawled on both sides of the road, although it has not been causing a traffic congestion.

#### 3.4.1.6 Induction of Newly Developed Local Business by Improving Road Reliability

While an increase in cacao and oil palm production within the target section was confirmed, the induction of new businesses could not be verified through interviews with the head of district hall and the mayor of Bekwai. It was confirmed that a newly established bus firm joined into the bus business and it induced a competition.

### 3.4.2 Other Positive and Negative Impacts

#### 3.4.2.1 Impact on Natural Environment

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<sup>35</sup> The creation of a new bus company was confirmed from interviews with bus operators.

<sup>36</sup> Ten local residents who sell goods at long-distance bus stops and trade goods at market were interviewed.

<sup>37</sup> Ten people who sell goods on the roadside and retailers (repair parts for motorcycles and bicycles, electrical appliance repair, and processed farm produce) around the Assin Praso Bridge were interviewed.

<sup>38</sup> Degree of increase in income could not be confirmed (the results from interviews).

Scrap from the removal of existing structures (crisscrossing drainage structures) was disposed of at a designated processing plant. Stripped asphalt was taken by city and district governments and reused for parking spaces at public facilities such as a police station and health centers. For measures against turbid runoff from the road and bridge construction, a shallow sump was installed for water plumbing and treatment of the runoff. Surplus soil was unloaded to a spoil bank to be reused. Construction was limited to daytime hours to minimize the impact of noise, vibration, and dust on surrounding residents. Dust was controlled by spraying water periodically from a sprinkler truck.

Based on the results of the environmental impact assessment, implementation consultants and construction vendors implemented the aforementioned measures for items which may cause impacts on the environment, and GHA monitored the environmental impact during the construction and after the commencement of the service.

As a result, there was no negative impact on the natural environment.

#### 3.4.2.2 Resettlement and Land Acquisition

Land was acquired by a committee consisting of GHA Environment Division, Land Evaluation Division, local government representatives, and a land-evaluation committee. Acquired land reached up to 88.8 acres and 203 households and businesses were affected<sup>39</sup>. Many houses that needed to be resettled were moved to the backyard of their unused land. According to interviews with the owners of houses and businesses around the Assin Praso Bridge who had to relocate themselves, compensations were sufficient, and complaints, protests against measures and lawsuits, etc., were not reported.

#### 3.4.2.3 Safety Measures during Construction

Construction was conducted on one side of the road at a time to avoid traffic severance as much as possible, and traffic control personnel were placed to guide and give cautions to passing vehicles. However, speed-control tables were not in place on the roadway because the roads had been just completed, and some vehicles on the new paved road were involved in accidents because of the accelerated velocity. To prevent accidents, construction guide and notice boards warning of the danger of speeding were placed in appropriate places to prevent accidents. For measures against HIV and other infections among construction laborers, GHA staff handed out preventive goods for HIV infections and gave cautions against infections by parasitic guinea worms and other means<sup>40</sup>.

In relation to the effectiveness, the driving and transport time required to pass the rehabilitated road did not reach the planned target because of the introduction of 50-km/h speed-limit, etc. The project provided a great improvement in road roughness, smooth travel by vehicles, elimination of waiting time to cross a new bridge, and a large increase in traffic

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<sup>39</sup> From interviews with GHA employees.

<sup>40</sup> Human immunodeficiency virus.



volume of motorcycles, general vehicles, and freight trucks with three or less axles and so on.

Overall, the expected project effect was generally achieved except for the effect indicator that was not achieved because of safety measures.

In relation to the impact, the negative impact of the road rehabilitation was mitigated by traffic-accident prevention measures taken based on discussions of the appropriate parties. In addition, positive impacts included improved access to social and medical services, reduced vehicle maintenance costs, positive effect on local industries, reduced post-harvest loss of agricultural produce, revitalization of local commercial activities and agricultural production, the entry of new business into transportation industry and ensued competition, and revitalization of logistics with surrounding regions. There was no negative impact on the natural environment.

In light of the above, the effectiveness and impact were high.

### 3.5 Sustainability (Rating: ②)

#### 3.5.1 Institutional Aspects of Operation and Maintenance

GHA was the executing agency of this project and is positioned under the Ministry of Roads and Highways, which is the government ministry in charge<sup>41</sup>. GHA manages the construction and maintenance of national roads, regional roads, and inter-regional roads in Ghana<sup>42</sup>. GHA consists of a headquarters and 10 regional offices. The target section of this project was under the jurisdiction of the Ashanti Regional Office.

The Road Maintenance Division of the Maintenance Department at GHA headquarters plans and allocates budgets for the maintenance of trunk roads. Long-term and large-scale repairs are managed by the headquarters, and road repair work is outsourced through a bidding process. Other maintenance work is handled by the regional offices across the country, of which 90% is being performed through outsourcing. The Ashanti Regional Office which is in charge of this project plans maintenance schedules, outsources work, and performs periodic inspections.

After evaluation, the total number of GHA staff was 1,480, of which 309 were engineers, 94 were technicians<sup>43</sup>, and 1,077 were general staff. At the time of planning, the total number of staff was 1,995, of which 242 were engineers, 107 were technicians, and 1,646 were general staff. The number of staff decreased to 75% since the planning stage. The number of staff decreased naturally through retirement and those that left their jobs, in addition to cuts in the number of public employees across the entire Ghanaian government. The decline in the staff

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<sup>41</sup> The Ministry of Roads and Highways consists of the Department of Feeder Roads and the Department of Urban Roads.

<sup>42</sup> Total trunk road extension under the supervision of GHA is 14,047 km. The breakdown is 4,426 km for national trunk roads, 2,738 km for regional roads, 6,203 km for inter-regional roads, and 680 km for town roads. National trunk roads connect the capital with regional centers as well as strategic sites such as ports and airports and include roads that connect to neighboring countries.

<sup>43</sup> Technicians with a diploma.

number did not affect the work because the amount of outsourced work increased. The number of engineers increased because some technicians were encouraged to obtain a degree and become engineers, while staff with technical skills at which level is as high as that of engineers were being hired preferentially. There were no changes in the maintenance administrative system from the planning stage to the ex-post evaluation stage, and according to GHA, there was no impact on structural reform by the IMF for loan purposes<sup>44</sup>. The staff number at the time of planning could not be verified by the Ashanti Regional Office, but the number at the time of ex-post evaluation was 128, of which 29 were engineers and 8 were technicians. According to the Ashanti Regional Office, the staff number decreased compared to the planning stage, but the quality of staff for the work of maintenance and supervision had been secured by an increase in outsourcing and supervision of outsourced vendors.

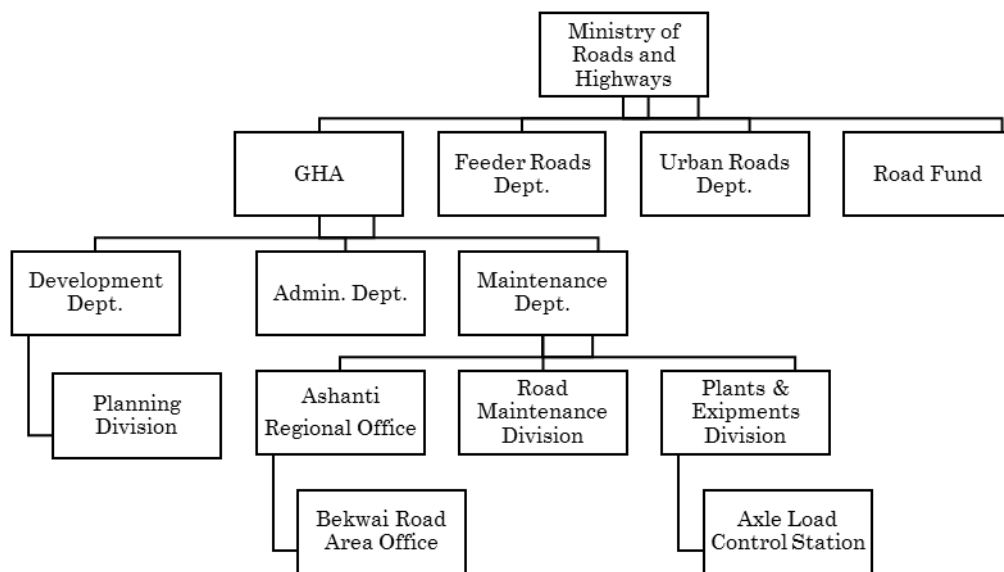


Figure 3. GHA and related ministry & departments

### 3.5.2 Technical Aspects of Operation and Maintenance

Engineers with college degrees and technicians with diplomas accounted for 27% of GHA staff, and according to local road experts and implementing consultants, the technical level for operation and maintenance was at a certain level of expertise. Regional staff were also deemed to be at a similar level. According to regional office staff, outsourced vendors have sufficient knowledge for early damage repair and were competent to conduct daily checks and inspections. Training and technical guidance for basic knowledge of road maintenance and improvement of supervising capabilities were introduced by the other donor, and training on new maintenance management techniques was also provided. For example, a pavement maintenance and management system, hereinafter referred to as "PMMS", was introduced, and

<sup>44</sup> Owing to the fact that reduction in government expenditure is included as a condition for loan by the IMF (3-year loans for financial relief, starting from 2015).

staff were trained to use the system. As for manuals, Maintenance Operating Manuals (February 2001) and a Surface Dressing Technique Manual (May 2005) were developed through the cooperation of the other donors and are still in use today.

### 3.5.3 Financial Aspects of Operation and Maintenance

#### 3.5.3.1 GHA

GHA sources of revenue are general government accounts, road funds, and donors. Taking inflation into account, the source of revenue has been increasing every year<sup>45</sup> even though it has not been significant. For 2016, however, donor funds decreased as Ghana is now categorized as a "lower middle income country," and total revenue has decreased.

Table 10 GHA revenue <sup>1)</sup> (Unit: million GHC)

	2013	2014	2015	2016
Government general account	606.9	780.0	920.7	1019.7
Road funds	104.5	198.7	247.0	326.5
Donors	249.2	730.9	744.2	317.3
Total	960.6	1709.6	1911.9	1663.5
		YoY 1.78	YoY 1.19	YoY 0.87

Source: GHA

1) Fiscal year is from January to December.

The major sources of revenue for road funds are fuel tax, tolls, vehicle licensing, inspection fees, and national border tolls and are used mainly to cover road maintenance costs; however, some revenue is allocated to other institutions apart from GHA, such as the Department of Urban Roads and the Department of Feeder Roads. Road funds are also allocated as the budget for the National Road Safety Authority and the Driver and Vehicle Licensing Authority. GHA receives 25.1% of road funds as its budget (average budget for the road funds from 2011 to 2015).

Annual maintenance costs calculated during the planning stage equaled to 0.9% of the annual maintenance cost of GHA<sup>46</sup>, but as Table 11 shows, only 0.11%, 0.11%, and 0.18% of the budget were secured in 2014, 2015, and 2016, respectively. In 2017, the budget increased slightly to 0.35%, but GHA considered it would be difficult to secure 0.9% of the annual maintenance budget as planned for the target road because of the high priority given to the maintenance of other road sections of the Ashanti Regional Office.

<sup>45</sup> According to the World Economic Outlook Database by IMF, the average inflation rate from 2012 to 2016 was 13.7%.

<sup>46</sup> *Basic Design Study Report*, pp. 3–56.

Table 11 GHA maintenance budget (Unit: million GHC)

	2014	2015	2016 <sup>2)</sup>	2017 <sup>3)</sup>
Routine maintenance <sup>1)</sup>	22.500	18.700	13.580	57.531
Periodic maintenance	60.200	70.100	71.616	88.144
Total <sup>②</sup>	82.700	88.800	85.196	145.675
Budget secured for target road <sup>①</sup>	0.091	0.093	0.153	0.508
<sup>①</sup> ÷ <sup>②</sup>	0.11%	0.11%	0.18%	0.35%

Source: GHA

1) Routine maintenance cost includes the cost of maintaining the surroundings, such as mowing grass and cleaning ditches.

2) Budget for construction was greater since it was a presidential election year. Maintenance budget was cut.

3) Larger budget was secured the year after the presidential election because it included the maintenance that was cut the previous year.

While the overall budget for GHA is on the rise, securing the budget for annual road maintenance as defined at the time of planning is difficult, and minor issue remains in terms of financial sustainability.

### 3.5.4 Current Status of Operation and Maintenance

#### 3.5.4.1 Road Maintenance

From visual observation, the road is maintained in a generally favorable state and the PMMS data show that road surfaces are in a good condition. As noted in Table 12, periodic and routine maintenance operations are being performed favorably by outsourced contractors. Contractors handle periodic maintenance such as cleaning drainage structures and trimming grass and shrubs on the road shoulder every quarter. Surface dressing, road shoulders, drainage structures, guardrails, and bus stops are all in good condition. However, letters on the speed-limit signs have faded and the white markings for crosswalks and speed-control tables are starting to fade in some places. In the beneficiary survey, 100% of road users, including pedestrians, said that road signs were easy to understand and were installed at appropriate locations.

Table 12 GHA maintenance system (At the time of ex-post evaluation)

Maintenance Type	Frequency and Commission Type	Maintenance Details	Condition
Occasional maintenance	Once every few years Outsourced	Pavement repair, partial painting repair	Good
Routine maintenance (includes periodic maintenance)	Frequent checks of road surface For routine maintenance, as needed (periodic maintenance is once every quarter) Outsourced	Checks for pot holes and patching (periodic maintenance includes grass mowing and ditch cleaning)	Good

Source: Questionnaire responses

According to the beneficiary survey, 96% of road users believed that road repairs and maintenance were being performed periodically.

### 3.5.4.2 Supervision at Axle Load Control Station

An axle load control station measures the weight of large vehicles 24 hours a day and enforces a 12-ton limit per axle load. Fines are imposed on vehicles that exceed this limit. Supervision of overloaded vehicles is thorough. Information on fined vehicles is sent to GHA headquarters electronically, and overloaded vehicles must transfer the fine to a designated account of GHA headquarters. Overloaded freights are ordered to pay a fine at this point, but they continue to travel in an overloaded state without unloading any cargo, which may cause asphalt deformation in speed-control tables. However, the degree of overload on the target road is not significant compared to that before the project, and little road damage has been inflicted by such vehicles.



Adansi Asokwa  
Axle load control station  
(located 42 km from Assin Praso)



Axle load control station  
Excess charge bill



Speed-control table within  
target section  
(Adansi South District)

In the light of the above, no issues were found regarding the maintenance of the project from both systematic and technical perspectives, and the state of operation and maintenance are generally favorable, but minor financial concerns remain in terms of securing a budget for maintenance costs. Therefore, the sustainability of the effects of this project is deemed fair.

## 4. Conclusion, Lessons Learned and Recommendation

### 4.1 Conclusion

The project was implemented to secure a smooth and stable traffic by improving of the road between Assin Praso and Bekwai in target area, thereby contributing to maintaining access of local residents to social services in the target area, and promoting the distribution of goods between the target area and the surrounding areas.

This project is highly relevant, as it is consistent with priority areas in development policy of Ghana and Japan's ODA policy and the development needs are also high. Though the project cost was within the plan, the duration of the project slightly exceeded the plan; thus, the efficiency of the project is fair. Improvements in the roughness of the road surface resulted in smooth vehicle travel and improved average travel speed. Reduction of travel hour was realized. The effects such as an increase in traffic volume were also observed. This project improved the access of the residents to social services such as medical services, mitigated the

cost of transportation services, and vitalized commercial activities and agricultural production in the area surrounding the road. For these reasons, the effectiveness and the impacts of the project are high. An operation and maintenance system for the road has been established. No problem was found with respect to the maintenance technical skills, and the current status of maintenance is almost favorable. However, some concerns remain in terms of financial aspects; thus the sustainability of the effects emerged by this project is judged as fair.

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

## 4.2 Recommendation

### 4.2.1 Recommendation to Implementing Agency

#### Markings on crosswalks, center lines, and kilometer signs

White markings such as crosswalks, centerlines, and speed-limit signs were not repainted since the completion of the project and are beginning to fade. The road needs to be maintained more thoroughly by periodic repainting of the signs on the road surface so that both pedestrians and vehicles can see them clearly. The Ashanti Regional Office needs to apply for and secure funding for maintenance of this project from the Maintenance Department at GHA Headquarters, hire outsourcing vendors to ensure that such repairs will be performed appropriately, and supervise the vendors. Such periodic maintenance would enhance safe travel over the road.

### 4.2.2 Recommendation to JICA

None.

## 4.3 Lessons Learned

### Prevention of increase in traffic accidents right after the road opening

Fatal accidents caused by speeding usually increase after roadwork is completed. There are also cases in which accidents occur as vehicles speed up before the work is completed and before speed-control tables are established. Speeding vehicles' hazardous overtaking, contact accidents with vehicles in the opposite lane, and rollover accidents are likely to occur. In particular, residents in villages surrounding a new road are at risk while walking along the road shoulder or crossing the road.

After completion of the road construction and before service began, a discussion took place between GHA Road Safety and Environment Division, local police department, Ashanti Regional Office, regional administrative institutions (mainly districts adjacent to the target section), and representatives of the residents to decide on the placement of crosswalks, speed-limit signs, and speed-control tables. Opinions of district halls and residents were formed regarding safety measures in the target section based on traffic accident statistics provided by the police department (data on points and areas of frequent accidents). With the appropriate safety measures in place, safe vehicular and pedestrian travel were secured without an increase in fatal accidents.

Such safety measures can prevent fatal accidents on roads where residents live in surrounding areas and where schools, district halls, health centers, and hospitals are located.