

<Summary>

Relevance is high because the project was consistent with Guinea's development plans and needs and Japan's ODA policy at the time of the ex-ante evaluation. The targets for the quantitative indicators of effectiveness that are ① velocity of vehicles crossing the new Kaaka Bridge and ② vehicles' time of crossing were largely achieved, and the target for ③ daily average number of vehicles crossing was achieved. The qualitative indicator of effectiveness, ④ safety of vehicles and pedestrians, was only positioned as a reference, though it

was highly positive. Therefore, the project's objective is considered to have been achieved. The mean values of the annual average amount of night light in Kouria city and Tabili village increased after the opening of the Kaaka Bridge, compared to the values before, and therefore it is considered that the project has contributed to the regional economy's revitalization. Moreover, there is also an increase in the major minerals extracted from the mines in the east of the Kaaka Bridge and transported through the Bridge to the Conakry Port for exportation after the Bridge's opening, compared to the volume before, and therefore it is considered that the project has contributed to the socioeconomic development. Thus, effectiveness and impact are high. Project cost was within the plan and project period was as planned. The project cost and period were also appropriate when considering the reduction of an output, the removal of the existing bridge, which turned out to be unnecessary. Hence, efficiency is high. No major problems were observed in the institutional and organizational aspects of operation and maintenance of the Kaaka Bridge, whereas some minor problems were observed in the institutional and organizational aspect and the current status of the Bridge's operation and maintenance. Therefore, sustainability of the project is fair. In light of the above, this project is evaluated to be highly satisfactory.

| Overall Rating ¹ | A (Highly satisfactory) | Relevance | 3 ² | Effectiveness & Impact | 3 | Efficiency | 3 | Sustainability | 2 |
|--------------------------------|-------------------------------|-----------|-----------------------|---------------------------|---|------------|---|----------------|---|
|--------------------------------|-------------------------------|-----------|-----------------------|---------------------------|---|------------|---|----------------|---|

<Special Perspectives Considered in the Ex-Post Evaluation/Constraints of the Ex-post Evaluation>

Remote survey: The external evaluator himself planned to conduct the field survey. However, he decided to cancel it and conduct the survey remotely instead because the prospect of ending the COVID-19 was unseen in Japan, France (the waypoint to Guinea), and Guinea. Furthermore, there was an Ebola virus outbreak in Guinea two months before the external evaluator's visit.

1 Relevance

<Consistency with the Development Policy of Guinea at the Time of Ex-Ante Evaluation>

- The Five-Year Socioeconomic Development Plan (PNDES) 2011-2015 (2011) put the "Development of economic infrastructures" as one of the five pillars. It stated that in the transportation sector, it is important to contribute to economic development and poverty reduction by promoting inter-regional movement of people and goods. It also clearly mentioned the importance of smooth and safe transportation infrastructures and the significance of the Kaaka Bridge's construction.
- The National Transportation Plan (PNT) (2002) stated the correlations between isolation and poverty. It looked into the importance of developing a smooth and safe road network not only connecting the capital city of Conakry to the northern region, highland Guinea region, and woodland Guinea region with many isolated areas, but also connecting it to neighboring countries. It also clearly mentioned the necessity of expansion as well as rehabilitation and modernization of the road network. Furthermore, it explained the necessity of developing the National Route No. 1, including the Kaaka Bridge.
- *The Road Sector Program (PSR) (2005)* prioritized the road networks from 1st to 58th for the poverty reduction perspective. Moreover, it placed the Coyah-Kindia section on the National Route No. 1 (including the Kaaka Bridge) as the 7th in the priority list.

<Consistency with the Development Needs of Guinea at the Time of Ex-Ante Evaluation>

• The ex-ante evaluation stated that some of the bridges on the main trunk roads, including the Kaaka Bridge, not only impede smooth traffic with their narrowness, but also face dangers of collapsing when large vehicles that are expected to increase in the future run on them, adding to their deterioration.

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

- The *ODA Charter* highlighted "the importance of developing the socioeconomic infrastructures that was critical in economic activities for supporting sustainable growth" in one of its prioritized agendas, "sustainable growth."
- The *Medium-Term Strategy for Overseas Economic Cooperation Operations* also emphasizes "developing socioeconomic infrastructures including roads and ports in the transportation sector" in one of its prioritized agendas, "sustainable growth."
- The *Country Databook* stated "providing assistance contributing to sustainable development with a focus on improvement of socioeconomic infrastructures" and "paying attention to the differences in ethnics and wealth among regions when providing the assistance."

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impacts

<Effectiveness>

(1) Quantitative Effects

* Quantitative indicators of effectiveness at the time of the ex-ante evaluation were ① velocity of vehicles crossing the new Kaaka Bridge and ② vehicles' time of crossing alone. However, this ex-post evaluation added ③ daily average number of vehicles crossing, to make a fair evaluation.

① Velocity of vehicles crossing the new Kaaka Bridge: 15 km/h (before the project) to

60 km/h (after the project)

There were no statistical data available on velocity. Thus, a local consultant measured velocity by driving his own vehicle on the new Kaaka Bridge on January 14, 2021. The average velocity on the outbound lane (downhill) and the inbound lane (uphill) were 50 km/h and 25 km/h, respectively. The 60 km/h target velocity was achieved on the outbound lane because it was more than 80% of the target velocity. On the other hand, it did not achieve the target velocity on the inbound lane because it was less than 50%. The reason for

| | Outbound lane | Inbound lane | | | | | |
|--|---------------|--------------|--|--|--|--|--|
| | (downhill) | (uphill) | | | | | |
| 1 st time | 50 km/h | 20 km/h | | | | | |
| 2 nd time | 45 km/h | 25 km/h | | | | | |
| 3 rd time | 55 km/h | 30 km/h | | | | | |
| Average | 50 km/h | 25 km/h | | | | | |
| Source: Driving data by a local consultant | | | | | | | |

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

² ③: High, ②: Fair, ①: Low

the slower velocity is that the inbound lane was uphill. As such, the performance of the vehicle used was strongly influenced by the gradient. In view of the measurement conditions and the issue of vehicle load, it would be appropriate to put higher values on evaluating velocity on the outbound lane (downhill). Therefore, it is judged that the target for the first indicator (velocity) has been largely achieved.

2 Time of crossing the new Kaaka bridge by vehicles: 108 seconds (before the project)

to 13 seconds (after the project)

There were no statistical data available on time. Thus, a local consultant measured time by driving his own vehicle on the new Kaaka Bridge on January 14, 2021. The average time on the outbound lane (downhill) and the inbound lane (uphill) were 15.9 seconds and 32.6 seconds, respectively. The results were inversely proportional to ① velocity. For the same reason as the first quantitative indicator of effectiveness (velocity), it would be appropriate to put higher values on evaluating time on the outbound lane (downhill). Thus, it is judged that the target for the second indicator (time) has been largely achieved.

| | Outbound lane (downhill) | Inbound lane (uphill) | | |
|----------------------|-----------------------------|--------------------------|--|--|
| 1 st time | 15.8 sec | 39.6 sec | | |
| 2 nd time | 17.6 sec | 31.7 sec | | |
| 3 rd time | 14.4 sec | 26.4 sec | | |
| Average | 15.9 sec | 32.6 sec | | |

Source: Driving data by a local consultant

3 Daily average number of vehicles crossing the new Kaaka Bridge

The Ministry of State in Charge of Public Works has not collected data on the daily average number of vehicles crossing the old and new Kaaka Bridge. However, the Ministry has been collecting data for 24 hours a day on the daily average number of vehicles on both outbound and inbound lanes of National Route No. 1 at Kouria city, four kilometers east of the Kaaka Bridge though the month when data are being collected varies every year. According to the data, the daily average number of vehicles has increased from 2013 to 2020, as shown in the tables below. The reason for the smaller average number of vehicles in 2016 is unknown. Conversely, the reason for the small average number in 2020 was the inter-regional movement restrictions to avoid spread of the COVID-19. Furthermore, when comparing the mean values of the daily average number of vehicles four years before (left table) and four years after (right) the opening of the new Kaaka Bridge with 2017 in between, it was confirmed that the average of 3,288 vehicles before the opening has increased to 3,831 after the opening. This is an additional 543 vehicles subsequent to the opening.

| Before | | | | |
|-----------------|-------|-------|-------|-------|
| | 2013 | 2014 | 2015 | 2016 |
| | (Mar) | (Feb) | (Apr) | (Feb) |
| Family vehicles | 1,009 | 1,194 | 964 | 645 |
| Taxis | 588 | 772 | 730 | 461 |
| Mini buses | 866 | 995 | 1,044 | 923 |
| Large buses | 351 | 419 | 786 | 551 |
| Trucks | 100 | 110 | 311 | 121 |
| Trailers | 34 | 39 | 102 | 36 |
| Total | 2,948 | 3,529 | 3,937 | 2,737 |

| Aiter | | | | | | | | |
|-----------------|-------|-------|-------|-------|--|--|--|--|
| | 2017 | 2018 | 2019 | 2020 | | | | |
| | (Aug) | (Apr) | (May) | (Mar) | | | | |
| Family vehicles | 959 | 964 | 975 | 823 | | | | |
| Taxis | 845 | 730 | 761 | 647 | | | | |
| Mini buses | 1,084 | 1,044 | 1,073 | 909 | | | | |
| Large buses | 639 | 786 | 789 | 674 | | | | |
| Trucks | 269 | 311 | 355 | 316 | | | | |
| Trailers | 73 | 102 | 104 | 92 | | | | |
| Total | 3,869 | 3,937 | 4,057 | 3,461 | | | | |

Source: Ministry of Public Works

Source: Ministry of Public Works

(2) Qualitative Effects

④ Safety of Vehicles and Pedestrians

Since there were no statistical data available on the safety of vehicles and pedestrians, the local consultant went to the new Kaaka Bridge and interviewed five drivers and five pedestrians who knew the situation of the old Kaaka Bridge. The local consultant asked them if they recognized whether the safety of vehicles and pedestrians has changed or not. All the ten respondents answered that the safety of both vehicles and pedestrians had improved. The reasons were that the roadway got wider, the sidewalk was constructed, and the street lights were installed. It was dark at night and drivers needed to slow down their vehicles because there were no street lights at the old Kaaka Bridge. Therefore, armed robbery targeting vehicles and pedestrians were rampant at night. Now, with the street lights at the new Kaaka Bridge, there is no robbery. Although these are positive findings, they are treated only as a reference because of the small sample size.

<Impacts>

(1) Regional Economy's Revitalization

Regional economy's revitalization (especially east of the Kaaka Bridge) on National Route No. 1.

The impact study of the regional economy's revitalization was conducted using data on night light from a satellite (VIIRS Nighttime Day/Night Band Composites Version 1). The study was designed as follows:

- * Place: It was difficult to make a comparison of night light before and after the project because the surrounding areas of Conakry already had a large amount of night light in 2012 (see the satellite image on the right). Thus, Kouria city, located four kilometers east of the Kaaka Bridge along National Route No. 1, with a population of thousands, and Tabili village, located 20 kilometers east with a population of hundreds, were targeted.
- * Analysis: It is proved that the amount of night light has a statistically significant correlation with economic indicators such as the GDP growth rate³. Thus, it was judged that the project has contributed to the regional economy's revitalization if



³ Henderson, J. V., Storeygard, A., & Weil, D. N. (2012). Measuring economic growth from outer space. The American Economic Review, 102(2), 994-1028

there was an increase in the amount of night light in the targeted city and village from 2013 to 2020.

As a result of the analysis on the amount of night light in Kouria city and Tabili village from 2013 to 2020, it was confirmed that there was an increasing trend in the amount of night light in these places. As mentioned earlier, the project completion was in May 2019. However, the new Kaaka Bridge had opened in June 2017. Hence, the years from 2013 to 2016 were set as the situation before the opening of the Bridge. On the other hand, the years from 2018 to 2020 were set as the situation after the opening, with 2017 in between. Having compared the mean values of the annual average amount of night light in each group, it was confirmed that in Kouria city, the amount of night light had increased approximately 3.6 times more after the opening, compared to the values before, and in Tabili village, the amount of night light had increased approximately 2.5 times more.



Source: VIIRS Nighttime Day/Night Band Composites Version 1



Source: VIIRS Nighttime Day/Night Band Composites Version 1

(2) Socioeconomic Development in Guinea

Amount of Major Mineral Resources and Crops Exported from the Conakry Port

Bauxite, a major mineral resource, extracted from the mines⁴ in the east of the Kaaka Bridge and transported through the Bridge to the Conakry Port for exportation increased after the opening of the Bridge. The percentage in the world's production also increased after the opening. On the other hand, major crops such as coffee, cacao, and cotton increased or decreased after the opening in 2017. Thus, no consistent trend was observed.

| Major mineral resource exported from the Conakry Port Opening of Kaaka Bridge | | | | | | | | | |
|--|-----------|--------|--------|--------|--------|-----------------|---------|---------|---------|
| Product | Unit | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Bauxite | | | | | | | | | |
| (Percentage in | 1,000 ton | 12,156 | 19,832 | 19,289 | 20,010 | 33,360 | 58,006 | 62,457 | 77,813 |
| the world's | (%) | (4.3%) | (8.1%) | (6.6%) | (7.3%) | (10.8%) | (17.7%) | (17.4%) | (21.0%) |
| production) | | | | | | | | | |
| Source: Guinea Customs | | | | | | | | | |
| | | | | | | | | | |
| Major crops exported from the Conakry Port | | | | | | | | | |
| Opening of | | | | | | | | | |
| | | | | | | Kaaka Bridge | | | |
| Product | Unit | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Coffee | 1,000 ton | 6,050 | 3,360 | 1,847 | 4,041 | 10,610 | 12,405 | 7,333 | 3,251 |
| Cacao | 1,000 ton | 4,470 | 6,515 | 22,845 | 14,383 | 2,362 | 4,163 | 6,206 | 8,803 |
| Cotton | 1,000 ton | 1,096 | 1,416 | 4,790 | 5,300 | 4,002 | 2,533 | 3,200 | 2,124 |
| Source: Guinea Cu | istoms | | | | | | | | |

(3) Environmental and Social Impact

The Ministry of State in Charge of Public Works has not prepared and submitted environmental monitoring sheets (on water quality such as pH, turbidity, color, and electrical conductivity) after the project completion due to a lack of funds. When the local consultant visually inspected the water quality of Barandi River during his visit to the new Kaaka Bridge, he found that water was highly transparent and there was no problem. The compensation of approximately 1.76 million yen was paid to the man farming on 1.5 hectares of farmland in 2013, soon after the project started. No problem has occurred since then. There have been no other land acquisitions and resettlements.

<Evaluation Result>

Quantitative effects of effectiveness, (1) and (2), have been largely achieved, while (3) has been achieved. With due considerations of it, it is judged that the project's objective has been achieved. Also considering that the mean values of the annual average amount of night light in Kouria city and Tabili village increased after the opening of the Kaaka Bridge, it is judged that the project has contributed to the regional economy's revitalization. In addition, the major mineral resources that are extracted from the mines in the east of the Kaaka Bridge and transported through the Bridge to the Conakry Port for exportation are an increasing trend after the opening. Thus, it is considered that the project has contributed to the socioeconomic development in Guinea. Therefore, the effectiveness and impact of the project is high.

⁴ According to the Ministry of Mines and Geology in Guinea, there are eleven major mines, namely Boke, Kindia Fria, Boffa, Tougue, Pita, Mali, Mamou, Dalaba, Dinguiraye, Dabola, and Siguiri. Eight of them, namely Tougue, Pita, Mali, Mamou, Dalaba, Dinguiraye, Dabola, and Siguiri, are located in the east of the Kaaka Bridge and their mines are largely transported through the Bridge to the Conakry Port.

3 Efficiency

(1) Project Outputs

The old Kaaka Bridge that was supposed to be removed, if necessary, was retained due to its historical value. The other project outputs were as planned.

(2) Project Inputs

1 Project Cost

Japanese side:

The planned cost was 1,606 million yen (1,254 million yen before the amendment*), whereas the actual cost was 1,559 million yen, which is 97% of the planned cost.

*During the project period, an Ebola pandemic occurred, causing the suspension of civil work in Guinea from August 2014 to March 2016. As a result, increases of contractor's fee and consultant's fee were expected. Therefore, the limit amounts of E/N and G/A were amended.

Guinean side:

The planned cost was 401 million Guinean Francs, whereas the actual cost was 328 million Guinean Francs. The planned 401 million Guinean Francs included the cost of 73 million Guinean Francs for the removal of the old Kaaka Bridge. However, it turned out that the removal of the old bridge was unnecessary. Therefore, the planned cost was redefined at 328 million Guinean Francs excluding the removal cost. This makes the actual cost equal to the planned cost. Meanwhile, the actual cost needs to be converted into yen based on the average IFS rates during the project period according to the ex-post evaluation references. It then becomes approximately 4.35 million yen, or 112% of the planned cost.

The planned total project cost on the Japanese side and Guinian side was 1,609.87 million yen (= 1,606 million yen + 401 million Guinean Francs (3.87 million yen)), whereas the actual cost was 1,563.35 million yen (= 1,559 million yen + 401 million Guinean Francs (4.35 million yen)), or 97% of the planned total cost, making it within the plan.

Project Period

The planned project period was 25 months from June 2013 (G/A) to June 2015 (completion date), whereas the actual project period was 72 months from June 2013 (G/A) to May 2019 (completion date of the re-pavement)*. However, the declaration of the Ebola outbreak in Guinea caused a 20-month evacuation period from August 2014 to March 2016. Moreover, there was also a 4-month preparation period from April 2016 to July 2016 for resuming civil work after the Ebola outbreak ended. Both periods will not be considered as delays since both of them were caused by external factors. Furthermore, another 23 months from July 2017 to May 2019 were used for solving the problem of ruts on the road surface found during the defect inspection period. A major factor causing the ruts is believed to be the rise in the annual average temperature (27.3°C in 2013 to 31.0°C in 2018)**. Because this is considered as an extreme natural disaster, the period will not be considered either as a delay based on the definition of "external factors" in the ex-post evaluation. Therefore, the actual project period was 100% of the planned period.

* The construction was completed on June 28, 2017. However, the occurrence of ruts on the road surface was confirmed in March 2018 during the defect guarantee period. As such, the contractor repaired them in May. However, they occurred again after that and the problem remained unsolved for a year after the completion until the defect inspection period in July. Therefore, the project solved the problem by removing the asphalt concrete pavement slab and repaving the road surface with concrete from December 2018 to May 2019, using the balance within the E/N limit in order to improve the flow property resistance of the road surface. Therefore, it is considered that the project was completed on May 16, 2019 when the re-pavement work was completed.

** According to the UNDP Climate Change Country Profiles – Guinea (2010), the annual average temperature in Guinea from 1960 to 2006 increased by 0.18°C every 10 years. Given that, it can be said that the rise of 3.7°C in a short period from 2013 to 2018 is a natural disaster beyond the expected range.

In sum, the project cost was within the plan and the project period was as planned. They also corresponded to the reduction of the output, i.e., removal of the old Kaaka Bridge. Therefore, the efficiency of the project is high.

4 Sustainability

<Institutional/Organizational Aspects>

The National Direction of Infrastructure (DNI) of the Ministry of State in Charge of Public Works was in charge of implementing the project, whereas the National Direction of Road Maintenance (DNER) is in charge of operation and maintenance of the new Kaaka Bridge after the project. Cleanings of the Bridge are to be carried out once a year by a private company outsourced by DNER. Inspections are to be carried out quarterly by DNER, and repairments are to be carried out by DNER as needed. There are 80* employees working at DNER. This number seems to be sufficient to manage the operation and maintenance of the Bridge. However, as described later, it is difficult to say that the institutional and organizational systems for cleanings, inspections, and repairments are fully functioning. This is because there are asphalt damages in some parts of the roadway and wastes left on the sidewalk.

*35 engineers, 23 assistant engineers, 1 civil officer, 1 legal officer, 7 clerks, 9 assistant clerks, 3 drivers/janitors, and 1 other personnel.

<Technical Aspects>

The DNER has more than 34 technical manuals, including the Technical Guidelines for Monitoring and Maintenance of Bridge Structures, Bridge Repair Guides, and Concrete Pavement Repair Guides. These technical manuals are utilized when needed. Training is also provided as needed. Because the new Kaaka Bridge is made of concrete, which is easy to maintain and requires no special techniques for maintenance, and DNER also says that there is no problem with maintenance, there is no technical problem with the operation and maintenance by DNER.

<Financial Aspects>

The annual cost of cleanings, inspections, and repairments of the new Kaaka Bridge (USD 10,164) will be financed by the Road Maintenance Fund (FER). The source of the fund is gasoline tax, separate from the budget of the Ministry of State in Charge of Public Works. The FER budget for the last three years is shown in the table on the right. The amount rose from 99,349 million Guinean

| | 2018 | 2019 | 2020 |
|-------------------------------------|--------|---------|---------|
| FER budget (mil. Guinean Francs) | 99,349 | 126,753 | 133,366 |

Source: Ministry of Public Works

Francs to 133,366 million Guinean Francs (\Rightarrow USD 11,025,000 to USD 14,521,000). Thus, there is no financial problem regarding the annual maintenance cost of the Bridge.

<Status of Operation and Maintenance>

There are asphalt damages in some parts of the roadway and wastes left on the sidewalk (see the photo below). There has also been a report on problems with streetlights.

<Evaluation Result>

There is no technical and financial problem with operation and maintenance. However, given that there are asphalt damages in some parts of the roadway and wastes left on the sidewalk, in addition to the report on problems with streetlights, it is difficult to say that DNER's institutional and organizational systems for cleanings, inspections, and repairments are fully functioning. Therefore, the sustainability of the project is fair.

III. Recommendations & Lessons Learned

Recommendations to Executing Agency:

Considering that there are asphalt damages in some parts of the roadway and wastes left on the sideway of the Kaaka Bridge and that there has also been a report on problems with streetlights, it is expected that DNER would clean and inspect them with more appropriate frequency and content and repair them as needed. It is also expected that the DNER would carry out enlightenment activities to prevent vehicles running on the Kaaka Bridge from throwing away their wastes.

Recommendations to JICA:

In April 2013, the Ministry of State in Charge of Public Works agreed to prepare and submit environmental monitoring sheets (on water quality, such as pH, turbidity, color, and electrical conductivity) to JICA every six months for three years after the completion of the project. However, it turned out that at the time of the defect inspection, the Ministry had not submitted the reports. Thus, JICA requested DNER to prepare and submit the reports. At present, there is no record that JICA has proactively followed up on the matter, while the Ministry has not prepared and submitted the reports until the time of the ex-post evaluation. It is, therefore, expected that JICA should request the Ministry to prepare and submit the reports, based on the agreement, until May 2022, which is the last month of three years after the completion of the project.

Lessons Learned for JICA:

The rise of the annual average temperature in Guinea is said to be 0.18°C every 10 years. However, the rise was 3.7°C from 2013 to 2018. The project was designed and constructed in consideration of the changes in the weather due to climate change, but it is considered that such a rise in the annual average temperature was unpredictable. Although it is difficult to make an accurate prediction about the rise of the annual average temperature for similar projects in the future, it is important to carry out more resilient design and construction, keeping in mind that changes in the weather may become severer.

