Republic of Mali and Republic of Senegal

FY2021 Ex-Post Evaluation Report of
Japanese Grant Aid Project
"Projet de Construction des Ponts sur le Corridor du Sud
en République du Mali et en République du Sénégal" (Phase I, II, III)"

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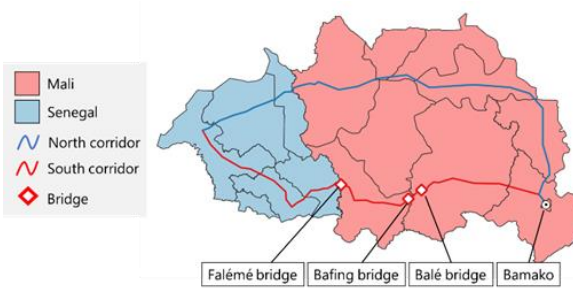
0. Summary

The objective of this project was to facilitate smooth traffic along the Southern Corridor connecting the capitals of Senegal and Mali by constructing three bridges on the corridor in Mali, thereby contributing to the economic development of roadside areas and the promotion of transport and trade between the two countries and with the neighbouring countries.

The relevance and consistency of this project are high as it was in line with the development plans and development needs of the two countries as well as with the Japan's assistance policy, and the bridges were integral parts of the Southern Corridor together with other road construction projects. The efficiency of the project is high as the project cost was within the plan while the project period was slightly longer than planned. The effectiveness and impact of the project are high because the objectives of the project, "to facilitate smooth traffic along the Southern Corridor" and "to contribute to the economic development of roadside areas and the promotion of transport and trade between the two countries and with the neighbouring countries," were generally achieved as planned. The sustainability of the project effects is moderately low as there are some financial problems in the operation and maintenance of the project due to the political instability in Mali.

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

1. Project Description



Project Locations
(Created by the ex-post evaluation team)

Bafing Bridge
(Photo taken by the local assistant)

1.1 Background

International roads are essential for foreign trade of Mali, a landlocked country. Due to the political crisis in Cote d'Ivoire, the port of Dakar in Senegal became Mali's main outer port replacing Abidjan, and the need of international roads connecting Mali and Senegal became even greater. The inland areas of the two countries lacked a well-developed road network. This hindered flow of people and commodities, and it was a major factor of socioeconomic underdevelopment and poverty. The government budget of the two countries was chronically in short due to external debt, and they were dependent on foreign assistance for the development of transport infrastructure including roads.

The construction of the Northern Corridor, starting from Dakar, the capital of Senegal, taking the northern route from Tambacounda to Bamako, the capital of Mali, was fully completed by 2007 with support of the European Union (EU) and other development organizations. The area along the Southern Corridor was blessed with fertile soil and water suitable for agriculture as well as industrial resources and tourist attractions, such as gold mines and national natural parks, but the road network was underdeveloped as this area was mountainous and many rivers did not have bridges. The construction of the Southern Corridor started with the support of international development partners, including Japan, in 2005. This grant aid project by JICA supported the construction of Falémé Bridge (Senegal-Mali border), Bafing Bridge, and Balé Bridge on the Southern Corridor.

1.2 Project Outline

The objective of this project was to facilitate smooth traffic along the Southern Corridor connecting the capitals of Senegal and Mali by constructing three bridges on the corridor in Mali, thereby contributing to the economic development of roadside areas and the promotion of transport and trade between the two countries and with the neighbouring countries.

Grant Limit / Actual Grant Amount	Phase I: 940 million yen / 914 million yen Phase II: 1,340 million yen / 1,321 million yen Phase III: 1,528 million yen / 1,390 million yen
Exchange of Notes Date / Grant Agreement Date	Phase I: N/A / Detailed design January 2008, Construction May 2008 Phase II: Detailed design (Mali) February 2009, Detailed design (Senegal) January 2009, Construction (Mali) May 2009, Construction (Senegal) May 2009 / Detailed design (Mali) February 2009, Detailed design (Senegal) January 2009, Construction (Mali) May 2009, Construction (Senegal) May 2009 Phase III: July 2009 / July 2009
Executing Agencies	Direction Nationale des Routes (DNR), Ministère de l'Equipement et des Transports,

	Mali Agence Autonome des Travaux Routiers (AATR), Senegal
Project Completion	Phase I: January 2010 Phase II: July 2011 Phase III: November 2011
Target Area	Kayes Region, Mali
Main Contractor	Dai Nippon Construction
Main Consultant	Katahira & Engineers International
Basic Design/Preparatory Survey	Basic design: May 2006‐February 2007‐ Feasibility study (1): September‐October 2007, Feasibility study (2): March 2008‐January 2009 Detailed design: Phase I February 2008‐January 2009, Phase II March‐September 2009, Phase III July 2009‐March 2010
Related Projects	[Southern Corridor development projects (Mali): loan] - EU and Kreditanstalt für Wiederaufbau (KfW Germany) (2005‐2007) - Islamic Development Bank (Banque Islamique de Développement: BID) (2006‐2008) - African Development Bank (AfDB) (Banque Africaine de Développement: BAD) and West African Development Bank (Banque Ouest Africaine de Développement: BOAD) (2006‐2009) [Southern Corridor development projects (Senegal): loan] - BID (2006‐2007) - BAD, BOAD and JBIC (2006‐2009). JBIC "Road Improvement and Transport Facilitation Program on the Southbound Bamako-Dakar Corridor" (2005‐2009) was a part of it. [JICA Project for Rehabilitation of the Third Wharf in Dakar Autonomous Port (2017): grant aid]

2. Outline of the Evaluation Study

2.1 External Evaluator

Akemi Serizawa, Hiroshi Nishino, Juri Ishimoto,[1] TAC International, Inc.

2.2 Duration of Evaluation Study

[1] Nishino and Ishimoto (in charge of satellite data analysis) belong to Metrics Work Consultants, Inc. and participated as reinforcements.

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

Duration of the Study: November 2021–November 2022

Duration of the Field Study by the local assistants: February–July 2022

2.3 Constraints during the Evaluation Study

The Japanese evaluators could not travel due to the political instability and security situations in Mali, and local assistants were employed for information collection and field visits.

3. Results of the Evaluation (Overall Rating: B[2])

3.1 Relevance/Coherence (Rating: ③[3])

3.1. 1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plans of Mali and Senegal

The *Poverty Reduction Strategy Paper (PRSP)*, formulated as Mali's medium-term development policy (2002–2006), identified "promotion of industrial development and improvement of economic infrastructure" as one of its basic strategies, aiming at balanced regional development and infrastructure improvement, strengthening of transport to stimulate the economy, and enhancement of access to social services and markets. Its Road Improvement Project (Projet d'Amélioration des Couloirs Routiers) (2004–2007) identified the improvement of international roads including the Southern Corridor as its key objective. Senegal's *PRSP* (2003–2005) focused on "the promotion of the productive sector and investment for the economic growth," "expansion of basic social services," and "improvement of the lives of the socially vulnerable people," and identified the formation of a transport system as one of the specific measures to take. Its Transport Sector Programme II (Programme Sectoriel des Transports II) (2001–2006) also focused on road development. As for regional policies, the West African Economic and Monetary Union (Union Économique et Monétaire Uuest-africaine: UEMOA) prioritized the development of infrastructure to facilitate international logistics for regional revitalization and poverty reduction, and the development of the Southern Corridor was its most important project. The New Partnership for Africa's Development (NEPAD) also gave top priority to the development of the Southern Corridor in its short-term infrastructure action plan (*Plan d'Action à Court Terme*) for regional integration.

At the time of the ex-post evaluation, Mali's *Strategic Framework for Economic Recovery and Sustainable Development (Cadre Stratégique pour la Relance Economique et le Développement Durable: CREDD[4])* (2018–2022) aims to reduce poverty and inequality by the promotion of inclusive and sustainable development. It identifies the improvement of transport infrastructure

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[3] ④: Very High、③: High, ②: Moderately Low, ①: Low

[4] https://www.maliapd.org/wp-content/uploads/2019/07/Version-Finale-CREDD-2019-2023.pdf

including roads as one of its specific goals. This policy is maintained under the current transitional government since 2021. *Senegal Emerging Plan (Plan Sénégal Émergent*[5]) (2014–2035) aims to make Senegal one of the emerging countries by 2035, and its mid-term plan (2018–2023) is implemented in each sector in accordance with the three pillars: transformation and growth of the economic structure; human resources, social security and sustainable development; and governance, institution, peace and security. Roads are recognized as basic infrastructure vital for industrial development, regional development, improved access to social services, and trade development with the neighbouring countries. In addition, the UEMOA's Regional Economic Programme (Programme Economique Régional: PER[6]) (2006–) emphasizes the development of road infrastructure, and the Programme for Infrastructure Development in Africa (PIDA[7]) (2012–) of the African Union (AU) and other development organizations supports the development of infrastructure, including roads, with the aim of regional integration of Africa and regional economic development.

Based on the above, at the time of the ex-ante and ex-post evaluations, the project was consistent with the national development plans of Mali and Senegal as well as with the regional development policies in West Africa, all of which recognized roads as vital infrastructure for economic growth and poverty reduction.

3.1.1.2 Consistency with the Development Needs of Mali and Senegal

As described in the "Background " section, Mali, a landlocked country, has a great need of international roads leading to Dakar, Senegal as its outer port. The road network along the Southern Corridor was underdeveloped, but its Mali part was constructed between 2005 and 2009 with the support of the EU and other development organizations. This JICA project constructed three bridges on the Southern Corridor. Prior to the construction of the bridges, traffic was inconvenient as crossing of the river at the location of the new bridges was restricted to the dry season and only for four-wheel drive vehicles. People had to use boats to cross the river, which was time consuming and posed the risk of falling into the river.

At the time of the ex-post evaluation, the need for the Southern Corridor between Mali and Senegal was remained. According to the executing agencies of Mali and Senegal, use of the Southern Corridor increased from 2017 to 2019 because it is approximately 200 km shorter than the Northern Corridor and because the condition of the latter had deteriorated over time. For Senegal, Mali is its top export partner by value, and the volume of exports from Senegal to Mali was increasing since 2011. At the same time, for Mali, Senegal is its top import partner by value. Mali experienced two coups by the military regime in August 2020 and May 2021, and the

[5] https://www.economie.gouv.sn/en/dossiers-publications/publications/pse
[6] http://www.uemoa.int/fr/system/files/per_info_no1_janvier-juin2017.pdf
[7] https://au.int/en/ie/pida

Economic Community of West African States (ECOWAS) imposed sanctions on Mali from January to July 2022, including an embargo on all but basic necessities. As a result, the volume of trade and traffic to and from Mali is estimated to have decreased,[8] but the need for the Southern Corridor has not been impaired.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

At the time of the ex-ante evaluation, infrastructure development to contribute to the economic development of Mali and the neighbouring countries was a priority area of Japan's development assistance policy for Mali. The priority areas of Japan's cooperation for Senegal were "improving the livelihoods of the poor in rural villages" and "building a foundation for sustainable economic growth". Therefore, this project was in line with the development assistance policies for Mali and Senegal.

3.1.2.2 Internal Coherence

JBIC's "Road Improvement and Transport Facilitation Program on the Southbound Bamako-Dakar Corridor" (2005‐2009), co-financed by the African Development Bank (Banque Africaine de Développement: BAD) and the West African Development Bank (Banque Ouest Africaine de Développement: BOAD), constructed a part of the Southern Corridor between Kédougou and Saraya in Senegal. In addition, the third wharf, which was developed under the grant aid "Project for Rehabilitation of the Third Wharf in Dakar Autonomous Port" (2017), mainly handles cargo bound for Mali, and was expected to contribute to the expansion of logistics to Mali. Both projects, together with this Project, were expected to improve the logistics system between Senegal and Mali.

3.1.2.3 External Coherence

Each section of the Southern Corridor was constructed as planned and has been operating without problems since its opening, together with the three bridges constructed by this project. For the Sustainable Development Goals (SDGs), transport supports food security, health, energy, economic growth, infrastructure, as well as livelihood bases of people, and is recognized as a cross-cutting contributor to the achievement of development goals related to these issues.

Table 1 Construction of Southern Corridor in Mali

Section	LOT 1 Falémé Bridge at the border−Bafing Bridge	LOT 2 Bafing Bridge−Balé Bridge−Sekokoto	LOT 3 Sekokoto−Kita	LOT 4 Kita−Kati

[8] Trade and traffic data since 2022 was not available at the time of ex-post evaluation.

Length of the section	156.0 km	71.7 km Bafing−Balé 29.7 km Balé−Sekokoto 34.0 km	38.0 km (including construction of Bakoi Bridge)	162.0 km
Cost	25,663 million CFA francs (5,540 million yen)	15,124 million CFA francs (3,270 million yen)	6,760 million CFA francs (1,460 million yen)	19,235 million CFA francs (4,150 million yen)
Source of finance	(LOT 1 and LOT 2) BAD: 39,103 million CFA francs BOAD: 7,000 million CFA francs Government: 5,000 million CFA francs Total 51,103 million CFA francs		BID: 5,949 million CFA francs Government: 811million CFA francs	UE: 14,735 million CFA francs KFW: 4,000 million CFA francs Government: 500 million CFA francs
Construction	January 2008−June 2010	January 2008−December 2009	October 2006−June 2008	October 2005−May 2008

Source: documents provided by JICA

Table 2 Construction of Southern Corridor in Senegal

Section	LOT 1 Kédougou−Saraya	LOT 2 Saraya (PK.0 km)−PK.30 km	LOT 3 PK.30 km−Falémé
Length of the section	61.0 km	30.0 km	21.3 km
Cost	11,300 million CFA francs (2,430 million yen)	7,640 million CFA francs (1,640 million yen)	5,750 million CFA francs (1,240 million yen)
Source of finance	(LOT 1 and LOT 3) BAD: 5,650 million CFA francs BOAD: 5,000 million CFA francs JBIC: 4,690 million CFA francs Government: 1,710 million CFA francs Total 17,050 million CFA francs	BID: 4,750 million CFA francs Government: 2,890 million CFA francs	(Included in LOT 1)
Construction	January 2008−August 2009	April 2007−April 2008	January 2008−August 2009

Source: documents provided by JICA

The project was in line with the development plans and development needs of Mali and Senegal as well as with Japan's development assistance policies for the two countries. The bridges constructed by the project were an integral part to complete the Southern Corridor together with other road construction projects. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

The Bridges of Balé (110.15 m long), Falémé at the border (274.30 m long) and Bafing (273.80

m long) were constructed in Phase I, II, III of the project respectively. From the information provided by the executing agencies and the site visits in the ex-post evaluation, it was confirmed that all the outputs of the project were produced as planned.

Falémé Bridge
(Photo taken by the local assistant)

Falémé Bridge
(Photo taken by the local assistant)

Balé Bridge
(Photo taken by the local assistant)

Balé Bridge
(Photo taken by the local assistant)

3.2.2 Project Inputs

3.2.2.1 Project Cost

Only the planned and actual costs borne by Japan were compared, and the total actual cost of

Phase I, II and III was within the plan (95%). Since the project cost borne by Mali and Senegal was only bank charges and very small, it was ignored in the comparison. According to the project consultant, the cost was smaller than the plan because the same Japanese construction company carried out the work throughout the three phases of the project and the machinery and personnel were shared among the three phases as the construction periods overlapped.

Table 3 Comparison of planned and actual project costs

			Plan (million yen)	Actual (million yen)	Ratio actual/ plan
Phase I	Cost borne by Japan	Detailed Design	26	26	
		Construction	914	888	
		Total cost borne by Japan	940	914	97%
	Cost borne by Mali	(Bank charges: 9.44 million CFA francs= 2 million yen)[9]	2	No information	
	Total		942	No information	
Phase II	Cost borne by Japan	Detailed Design, Mali	15	36	
		Detailed Design, Senegal	15		
		Construction, Mali	655	1,285	
		Construction, Senegal	655		
		Total cost borne by Japan	1,340	1,321	86%
	Cost borne by Mali	(Bank charges: 4.85 million CFA francs= 1 million yen)[10]	1	No information	
	Cost borne by Senegal	(Bank charges: 4.85 million CFA francs= 1 million yen)	1	No information	
	Total		1,342	No information	
Phase III	Cost borne by Japan		1,528	1,390	91%
	Cost borne by Mali	(Bank charges: 11 million CFA francs= 3 million yen)	3	No information	
	Total		1,531	No information	
Total		Cost borne by Japan	3,808	3,625	95%

Source: documents provided by JICA

3.2.2.2 Project Period

The total actual project period from Phase I to Phase III was slightly longer than planned. According to the project consultant, this is because the planned project periods of Phase I and

[9] Phase I: CFA franc1 = JPY0.216
[10] Phase II and III: CFA franc 1= JPY0.244

Phase II were described in the feasibility study report without taking into account the period between the contract of consultant after the signing of the G/A (E/N) of the detailed design and the start of detailed design, which is usually one to two months.

Table 4 Comparison of planned and actual project period

		G/A（E/N）	Plan	Actual	Ratio (actual/ plan)
Phase I	Detailed Design (E/N)	January 2008	23 months including detailed design and tender	Completion of construction: January 2010. 25 months since the E/N of the detailed design	109%
	Construction (E/N)	May 2008			
Phase II	Detailed Design, Mali	February 2009	29 months including detailed design and tender	Completion of construction: July 2011. 31 months since the G/A of the detailed design	107%
	Detailed Design, Senegal	January 2009			
	Construction, Mali	May 2009			
	Construction, Senegal	May 2009			
Phase III		July 2009	From July 2009 to December 2011 (30 months including detailed design and tender)	Completion of construction: November 2011. 29 months	97%
Total			82 months	84 months	102%

Source: documents provided by JICA

While the project period slightly exceeded the plan, the outputs of the project were produced as planned and the project cost was within the plan. Therefore, efficiency of the project is high.

3.3 Effectiveness and Impacts[11] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The operation indicators of the project have been achieved at all times immediately after the bridges were completed, without any change over time or difference between the rainy and dry seasons. According to the executing agencies and the communities around the bridges, the passage of the bridges has never been hindered since the openings. ECOWAS sanctions were imposed against Mali from January to July 2022, and Falémé bridge at the border was operated as follows, although it was physically passable as usual:

- Border crossing was by foot or moto taxi only. Vehicles were not allowed to pass through in principle.

[11] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

- International bus service was suspended. Passengers had to get off the bus before the border, walk or take a moto taxi through the border, and board another bus at the other side.
- Embargo was in place against Mali except for basic necessities. Trucks carrying necessities entered Mali from Senegal once a day.

Table 5 Operation Indicators

Balé Bridge Indicators	Baseline value 2006	Target value 2010	Actual value 2010	Actual value 2022
		Completion year	Completion year	Ex-post evaluation
Period in which vehicles cannot cross the river	Approximately 4 months per year	None	None	None
Type of vehicles that can cross the river	Four-wheel drive vehicles only (crossings on the riverbed during dry season)	Large vehicles (trucks and buses) can cross the river year-round	Large vehicles (trucks and buses) can cross the river year-round	Large vehicles (trucks and buses) can cross the river year-round
River crossing time for pedestrians	Approximately 20 minutes (by canoe)	Approximately 2 minutes (on foot)	Approximately 2 minutes (on foot)	Approximately 2 minutes (on foot)

Falémé Bridge Indicators	Baseline value 2008	Target value 2011	Actual value 2011	Actual value 2022
		Completion year	Completion year	Ex-post evaluation
Period in which vehicles cannot cross the river	Approximately 7 months per year	None	None	None
Type of vehicles that can cross the river	Four-wheel drive vehicles only (crossings on the riverbed during dry season)	Large vehicles can cross the river year-round	Large vehicles can cross the river year-round	Large vehicles can cross the river year-round
River crossing time for pedestrians	Approximately 20 minutes (by canoe)	Approximately 3 minutes (on foot)	Approximately 3 minutes (on foot)	Approximately 3 minutes (on foot)

Bafing Bridge Indicators	Baseline value 2008	Target value 2011	Actual value 2011	Actual value 2022
		Completion year	Completion year	Ex-post evaluation
Period in which vehicles cannot cross the river	Throughout the year (at the location of the bridge)	None	None	None
Type of vehicles that can cross the river	Large vehicles could not cross the river	Large vehicles can cross the river year-round	Large vehicles can cross the river year-round	Large vehicles can cross the river year-round
River crossing time for pedestrians	Approximately 20 minutes (by canoe)	Approximately 3 minutes (on foot)	Approximately 3 minutes (on foot)	Approximately 3 minutes (on foot)

Source: documents provided by JICA, information from the executing agencies, site visits and interviews of the community

As the effect indicator of the project objective “to facilitate smooth traffic along the Southern Corridor”, the project documents listed "an increase in traffic volume in the area along the Southern Corridor". However, there were no baseline values set, and no traffic volume statistics or satellite data were available at the ex-post evaluation.[12] The communities around the bridges, however, recognized an increase in traffic after the construction of bridges and roads. It is assumed that the traffic volumes have reduced due to ECOWAS sanctions in 2022.

3.3.1.2 Qualitative Effects (Other Effects)

Those listed as qualitative effects in the ex-ante evaluation sheet were treated as impacts by reviewing the logic of the project. See the "Impact" section.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The following effects were expected at the time of ex-ante evaluation:

- Economic revitalization of the roadside areas of the Southern Corridor
- Promotion of transport and trade between Senegal and Mali and those with the neighbouring countries
- Securing safe routes to school for children and increase in school enrolment and attendance rates
- Securing access to health facilities and increase in the number of emergency transportations
- Reduction of transport time to neighbouring markets

Based on the questionnaire responses from the executing agencies, interviews in the communities around the bridges[13] and site visits, it was confirmed that the construction of the

[12] Referring to a previous case study, we attempted to detect the operation of large vehicles using satellite data (Sentinel-2). However, we found it challenging to do so in this ex-post evaluation. The reasons are as follows. A published paper (Fisser, H., Khorsandi, E., Wegmann, M., & Baier, F. (2022). Detecting Moving Trucks on Roads Using Sentinel-2 Data. Remote Sensing, 14(7), 1595.) reported that the performance of the analysis varied widely among the countries and regions analyzed. An analytical article by Data Science Campus (August 2021), which attempted to replicate the method used in a previous case study in East Africa, also concluded that they did not obtain robust results. Thus, we concluded that the method is not reliable at this time and that it is not possible to verify the performance of the analysis using actual data.

[13] About five persons per bridge were interviewed and they were mainly influential personages in the villages as follows:
Near Balé Bridge: Balinda with a population of 500. Three men (two farmers and a member of village assembly) and two women (housewives) were interviewed.
Near Falémé Bridge: Mahina-Mine in Mali with a population of 3,000. Two men (village chief and a member of village assembly) and a woman (president of the women's association in the village) were interviewed.
Moussala in Senegal with a population of 2,000. Two men (Imam of the mosque and a member of village assembly) were interviewed.
Near Bafing Bridge: Badougouto Droite, also known as Sitahéto, with a population of 5,000. Two men (elders of the village) were interviewed.

bridges and roads had the anticipated impacts as follows. Numerical data, such as school attendance rate and the number of emergency transportation to the health facilities, were not available.

- Economic revitalization of roadside areas: It became easier to go to the other side of the river and other areas. This contributed to the increase in the transport volume of commodities and to the economic revitalization.
- The satellite data analysis confirms the manifestation of “economic revitalization of roadside areas” in the Southern Corridor on the Mali side. All complementary indicators (nighttime light, population, and urban area) have increased within a roughly 20 km distance from the Southern Corridor on the Mali side (see [column] below for details). In particular, the increase peaked in the area around 10 km from the Southern Corridor. On the other hand, we observed no increase in these indicators on the Senegalese side.
- Traffic and trade between the two countries and with the neighbouring countries: traffic volume had increased compared to the time of the ex-ante evaluation. According to the statistics of Senegal, the volume of trade between Senegal and Mali had been increasing since 2011 (see Table 6), but it is estimated that it has decreased due to the ECOWAS sanctions in 2022.
- Access to schools and change in school enrolment and attendance rates: Access to schools on the other side of the river has improved in terms of time required and safety compared to when canoes were used. The school attendance rate was quite high at around 90% according to the perception in the community, but it is not clear to what extent the new bridges had impact on the school attendance rate.
- Access to health facilities and markets: Many residents usually use health facilities and markets on the other side of the river. Access was improved by the new bridges. Data on transport times was not available.
- Income sources and annual income of the community: Income sources of the residents are commerce, agriculture, animal husbandry, gold mining, and fishing, and remain the same as before the project. Annual income increased slightly from about 1 million CFA francs before the project to about 1‐3 million CFA francs at the time of the ex-post evaluation, but considering inflation, the annual income remains the same level as at the time of the ex-post evaluation. The residents' income is supported by strong cotton shipments and an increase in small-scale commercial activities by women, among others.

Badougouto Gauche with a population of 400. A man (village chief) was interviewed.
Sitandinkoto with a population of 3,000. Three men (farmer, tailor and merchant) and a woman (housewife) were interviewed.

Table 6　Trade volumes between Senegal and Mali

(Unit: ton)

Year	Export from Senegal to Mali	Import from Mali to Senegal
2010	1,906,025	2,501
2011	1,779,140	11,588
2012	1,868,491	5,797
2013	1,540,222	5,480
2014	1,607,147	7,214
2015	2,501,219	8,515
2016	2,653,844	8,112
2017	2,857,135	9,962
2018	2,721,598	4,040
2019	2,984,417	2,381
2020	2,946,232	1,452

Source: Agence Nationale de Statistique et de la Démographie, Senegal. *Note d'Analyse du Commerce Extérieur* (versions from 2014 to 2020)[14]

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Natural Environment

Phase III of this project was classified as Category C based on the *Guidelines for the Environmental and Social Consideration* (April 2004). There were no ex-ante evaluation sheets for Phase I and II, and categories of them were not specified. An environmental impact assessment for the Southern Corridor construction projects was conducted in 2002 with the support of the Islamic Development Bank (BID), and UEMOA conducted a supplementary study in 2005. According to the executing agencies, no negative environmental impacts were observed during the construction of the project, as environmental and social protection measures were taken based on the results of these studies, such as watering to reduce dust, controlled working hours of construction to reduce the impact of noise and vibration, and slope improvement along the riverbank to prevent soil erosion. In the interviews during the ex-post evaluation, the communities pointed out dust, noise, and air pollution due to increased traffic after the construction of the bridges.

2)　Resettlement and Land Acquisition

At the time of the feasibility study in 2007, one resettlement was planned within the scope of Phase III of the project, and the Government of Mali had already paid compensation for the resettlement and had assured that the removal of the residence would be completed by the end of March 2009. At the time of the ex-post evaluation, DNR Mali confirmed that one well was subject to relocation, the compensation of 350,000 CFA francs was paid by February 2008, and the relocation was completed by the end of 2008. No resettlement occurred on the Senegalese side according to the executing agency.

3) Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and

[14] http://www.ansd.sn/index.php?option=com_ansd&view=titrepublication&id=15&Itemid=289

Human Rights

According to interviews in the community, the increased traffic and more active human flow have resulted in a deterioration of public safety, including an increase in traffic accidents and incidents of theft, robbery, and violence. While small-scale commercial activities by women have increased, prostitution and sexual crimes have been reported to be on the rise.

The outcome of this project, "smooth transport along the Southern Corridor" and the expected impact, "contribution to regional economic development and promotion of transport and trade between the two countries and neighbouring countries" were generally achieved as planned. Although it is estimated that the volume of traffic and trade has decreased due to economic sanctions against Mali in 2022, this is an external factor of the project. On the other hand, an increase in traffic accidents, environmental pollution, and deterioration of public security have been reported around the bridges. Based on the above, this project has generally achieved its objectives. Therefore, effectiveness and impacts of the project are high.

[Column] Utilization of Satellite Data

Although multiple quantitative and qualitative sources are required to verify the manifestation of project effects, there are some situations, especially in terms of impacts, where quantitative indicators have not been established, and statistical data disaggregated at the target area level have not been available. Even in such cases, quantitative data necessary for evaluation can be collected by utilizing satellite data. In this ex-post evaluation, similarly, by utilizing free satellite data, more objective verification was possible by supplementing the information obtained through conventional methods (e.g., interviews with project officials and residents).

Below is a description of the specific areas analyzed, the data used, the analytical methodology, and the results. The analysis area was western Mali and eastern Senegal, including the Southern Corridor and surrounding areas (see Figure 1). The figure also shows the locations of the three bridges developed by the project.

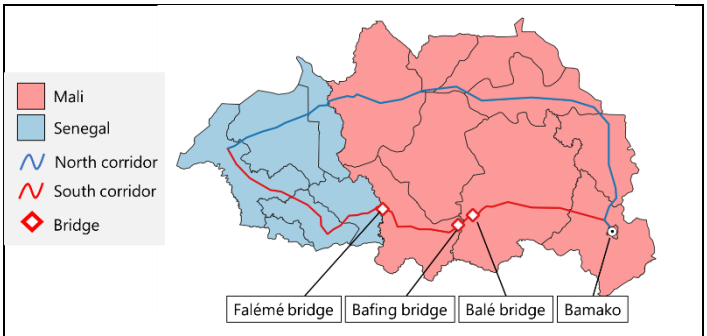


Figure 1 Project location

The data used were

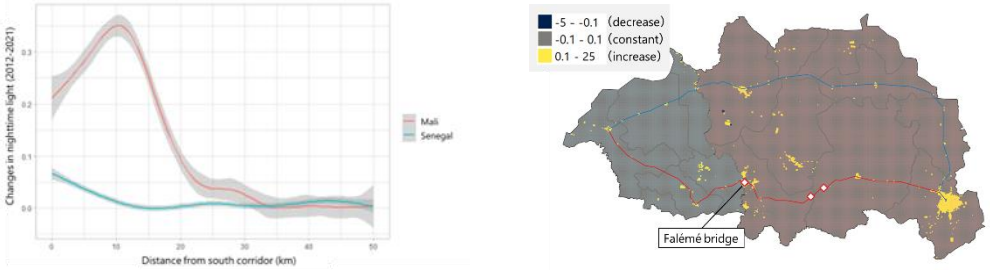
nighttime light,[15] population,[16] and urban area.[17] Nighttime light has been found to be correlated with local economic activity.[18] However, nighttime light does not readily reflect economic activity, especially in developing countries where the primary industry is agriculture. Therefore, other data (population and urban area) that also correlate with economic revitalization were collected to verify the impact of this project (economic revitalization of roadside areas) from multiple information sources.

The method of analysis was to spatially examine the extent to which the above three complementary indicators changed within a certain distance from the Southern Corridor. Specifically, we analyzed the relationship between the change in each indicator and its distance from the Southern Corridor within an area up to 50 km from the Southern Corridor from 2008 (2012 for nighttime light due to data limitations), when the first project started, to the latest year for which data were available (see Figure 2).

According to Figure 2, all indicators generally increase within 20 km from the Southern Corridor on the Mali side. In particular, the peak of the increase is around 10 km along the Southern Corridor (Figure 2 left). Nighttime light and population also increased near the Falémé bridge at the border (Figure 2 right). On the other hand, there is no increase in these indicators on the Senegalese side, with only a slight increase in nighttime light within 10 km from the Southern Corridor.[19]

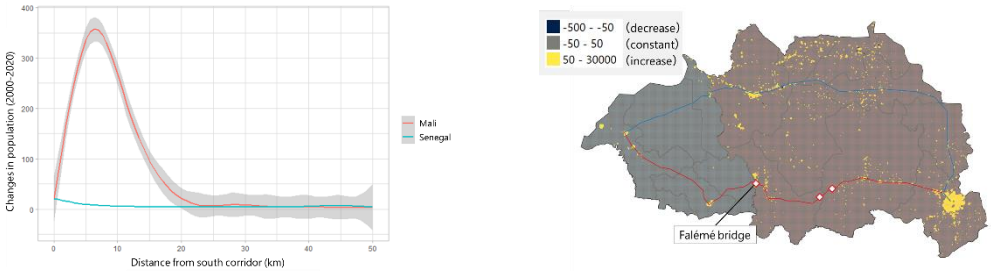
Based on the above results, we can say that on the Mali side, "economic revitalization of roadside areas" was confirmed. However, no similar impact was observed on the Senegalese side, suggesting that the cross-border spillover effect of the project to the west of the Falémé bridge was minor.

Nighttime light analysis results[20]



[15] Annual VNL V2 (annual data of VIIRS) median masked data (2012-2021) (resolution: about 500 m).
[16] WorldPop: Unconstrained individual countries UN adjusted (2000-2020) (resolution: 1 km).
[17] MODIS Land Cover Type Yearly Global 500 m (2001-2019) (resolution: 500 m).
[18] See, for example, the following paper.
Henderson, J. V., Storeygard, A., & Weil, D. N. (2012). Measuring economic growth from outer space. *The American Economic Review*, 102(2), 994-1028.
[19] In addition to the above analysis, we conducted a focused analysis within 20 km of the three bridges rather than the entire corridor. We found that the change was particularly significant around the Falémé Bridge, while we observed little change around the Bafing and Balé bridges.
[20] The vertical axis of the graph shows the brightness of the light source (radiance), taking a minimum value of -1.5 and a maximum value of 340,573 (units are "nanoWatts/cm2/sr").

Population analysis results[21]



Urbanization analysis results[22]

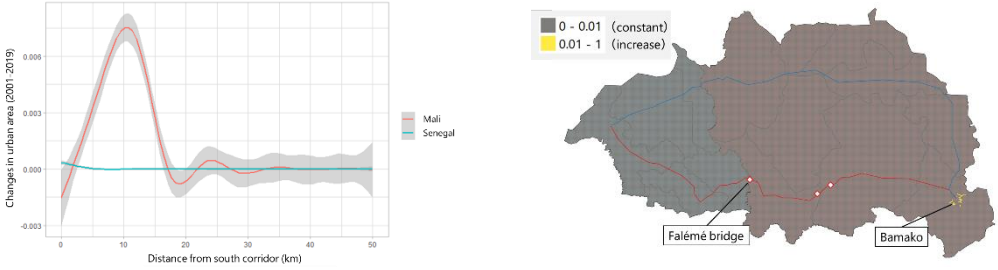


Figure 2 Change in each indicator and distance from the Southern Corridor (left), the spatial distribution of indicator change (right)

3.4 Sustainability (Rating: ②)

3.4.1 Policy and System

As noted in the section on Relevance, the road and transport sector is important in the development policies of Mali and Senegal, and the need for the Southern Corridor would not change even under Mali's transitional government. Therefore, the sustainability in the aspects of policy and system is high.

3.4.2 Institutional/Organizational Aspect

The executing agencies of Mali and Senegal both changed after the completion of the project. The original executing agency of Mali was the National Department of Roads, Ministry of Equipment and Transport (*Direction Nationale des Routes, Ministère de l'Equipement et des Transports*). It was replaced by the National Department of Roads, Ministry of Transport and Infrastructure (*Direction Nationale des Routes (DNR), Ministère des Transports et des Infrastructures*) when the transitional government was established after the coup in May 2021. The three bridges constructed by this project were managed by its Kayes Regional Department of Roads. After Kita Region was separated from Kayes Region in December 2020, Bafing and Balé Bridges have been managed by the Construction Monitoring and Control Division of Kita

[21] The vertical axis of the graph shows the number of people.
[22] The vertical axis of the graph shows the value of urbanization (the percentage of the area of each 1 km mesh classified as urban). The minimum value is 0, and the maximum value is 1.

Regional Department of Roads. The original executing agency of Senegal was the Autonomous Agency for Road Works (*Agence Autonome des Travaux Routiers: AATR*), and it was replaced by Senegal Agency for Road Works and Management (*Agence des Travaux et de Gestion des Routes Sénégal: AGEROUTE Sénégal*) in April 2010. The plan at the time of project completion was that Falémé Bridge at the border would be managed by the management committee consisted of Keniéba Subdivision of Roads, Kayes Regional Department of Roads of Mali and Tambacounda Regional Office of AGEROUTE Senegal. However, the management committee is not functioning at the time of ex-post evaluation, and the responsible sections of the two countries manage their respective parts of Falémé Bridge. Both parties communicate when needs arise. From the above, the sustainability in the institutional and organizational aspects is high.

3.4.3 Technical Aspect

Construction Monitoring and Control Division of Kita Regional Department of Roads has one engineer and two technicians. For Falémé Bridge, the Mali side has two engineers including the chief of Keniéba Subdivision and one administrative staff. The Senegalese side has four staff including the director of the regional office and three engineers, who are all in this office more than nine years. Daily operation and maintenance works, such as inspection, repair and cleaning, are sufficiently implemented for the three bridges. While there are no specific training or manuals for the operation and maintenance of the three bridges, no problems have been observed in staffing and the technical levels. Therefore, the sustainability in the technical aspect is high.

3.4.4 Financial Aspect

As shown in Table 7, the budget of the agencies responsible for operation and maintenance of the bridges was increasing in the two countries at the time of the feasibility study of the project (2007-2008), corresponding to the increase in road-related projects including the construction of the Southern Corridor. However, as shown in Table 8, the budget of DNR Mali has decreased significantly since 2019, with actual expenditures being less than 20% of the budgeted amount needed for the maintenance of roads and bridges. According to DNR, its proper revenue is only from road user fees, which are insufficient for maintenance, and therefore DNR obtains its budget from the central government which includes support from development partners. However, the recent political situation in Mali has halted support from major development partners, and budget from the central government has been significantly reduced due to ECOWAS sanctions as well as by the impact of COVID-19. The actual maintenance status of the three bridges shows that the impact of the budget decrease is not particularly significant at the time of the ex-post evaluation. However, due to the political situation in Mali, the current maintenance budget is unlikely to be restored to the previous level. Therefore, financial sustainability is moderately low considering the large-scale repairs of roads and bridges in the future. As for AGEROUTE Sénégal, the budget

appears to be adequate at the time of the ex-post evaluation.

Table 7. Budget status of executing agencies at the time of feasibility study of the project

(Unit: Million CFA francs)

Year	2003	2004	2005	2006	2007
DNR: Budget for business implementation	6,112	8,334	8,414	55,171	86,461
DNR: Budget for operation and maintenance	5,880	8,000	8,000	11,044	12,243
AATR: Budget for business implementation	49,263	60,223	60,000	129,340	137,978
AATR: Budget for operation and maintenance	20,000	49,000	49,960	27,846	33,242

Source: documents provided by JICA

Table 8. Financial status of DNR Mali at the time of ex-post evaluation

(Unit: Million CFA francs)

Year	2018	2019	2020	2021
Budget of DNR	1,405,000	503,000	475,000	499,000
Requested amount of budget for the operation and maintenance of infrastructure including roads and bridges	90,000	81,432	92,263	120,436
Actual expenditure for the operation and maintenance of infrastructure including roads and bridges	32,265	14,813	18,400	22,000

Source: Information from DNR

Table 9. Financial status of AGEROUTE Sénégal at the time of ex-post evaluation

(Unit: Million CFA francs)

Year	2018	2019	2020
Budget of AGEROUTE	495,805	495,805	354,844
(Of which) Budget for the operation and maintenance of infrastructure including roads and bridges	64,361	53,381	20,374
Actual expenditure for the operation and maintenance of infrastructure including roads and bridges	41,556	26,061	28,679

Source: Information from AGEROUTE

3.4.5 Environmental and Social Aspect

Please refer to the section on Impact.

3.4.6 Preventative Measures to Risks

According to interviews in the communities around the bridges, human flow and traffic,

especially of large vehicles, had increased after the construction of roads and bridges, and it has led to an increase in traffic accidents and deterioration of security, including robberies, theft, violence, and sexual crimes. Mali experienced two coups by the military government in 2020 and 2021, and terrorism by Islamic extremist groups has been frequent, resulting in a deterioration of security throughout the country.

3.4.7 Status of Operation and Maintenance

The local assistant confirmed during the site visit that the condition of the bridges and their operation and maintenance were good without particular problems. DNR Mali wants to repair a crack due to erosion at the bottom of the pier of the Bafing Bridge, but the local assistant, an engineer, observed the crack and confirmed that it was s minor and would not require immediate attention.

Some minor issues have been observed in the financial aspects in the current status of operation and maintenance, and they are not expected to be resolved. Therefore, sustainability of the project effects is moderately low.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project was to facilitate smooth traffic along the Southern Corridor connecting the capitals of Senegal and Mali by constructing three bridges on the corridor in Mali, thereby contributing to the economic development of roadside areas and the promotion of transport and trade between the two countries and with the neighbouring countries.

The relevance and consistency of this project are high as it was in line with the development plans and development needs of the two countries as well as with the Japan’s assistance policy, and the bridges were integral parts of the Southern Corridor together with other road construction projects. The efficiency of the project is high as the project cost was within the plan while the project period was slightly longer than planned. The effectiveness and impact of the project are high because the objectives of the project, "to facilitate smooth traffic along the Southern Corridor" and “to contribute to the economic development of roadside areas and the promotion of transport and trade between the two countries and with the neighbouring countries," were generally achieved as planned. The sustainability of the project effects is moderately low as there are some financial problems in the operation and maintenance of the project due to the political instability in Mali.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

None.

5. Non-Score Criteria

5.1. Performance

5.1.1 Objective Perspective

None.

5.1.2 Subjective Perspectives (retrospective)

None.