Federal Democratic Republic of Nepal

FY2015 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Construction of Sindhuli Road (Section 2 (Phase3/3) and Section 3)"

External Evaluators: Yuko Kishino and Ryuji Kasahara, IC Net Limited

0. Summary

The objective of this project is to reduce travel time and improve transport safety by opening the entire length of Sindhuli Road that connects Kathmandu, the capital, with Terai Plain in Southern Regions and with the Indian border through construction of Section 2 and Section 3, thereby contributing to realizing stable transportation of goods, promoting industries, vitalizing local economies, and improving living conditions of the citizens who live along the route.

It was found that this project had been highly relevant to Nepal's development plan and development needs both at the time of planning as well as at the time of the ex-post evaluation, and Japan's ODA policy at the time of planning. Therefore, its relevance is high. Although there were no changes in the length of the road itself, and the project cost was lower than the plan, as the project period exceeded the plan, the efficiency of the project is fair. The distance and time of travel between Kathmandu and Terai Plain were both reduced, attaining the target value. Sindhuli Road has seen increase in traffic volume and has not experienced any road closure due to bad weather: indicating Sindhuli Road is being used as a route to move people and goods, and thus supports Nepal's economy. Therefore, this project has been highly effective and has had high impact. Concerning the sustainability of the effects of this project, although generally there are no major issues, because of a few challenges in institutional aspects, technical aspects and financial aspects, the sustainability of the project effects is fair.

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

1. Project Description

Project Location[1]

Road Improved by this Project[2]

[1] Marked on a blank map (https://commons.wikimedia.org/w/index.php?curid=9506560) (as of 15 March, 2016)

[2] Provided by JICA (April 13, 2010 after work completion; the switchback section, Phase 3/3, Section 2)

1.1 Background

Nepal is a landlocked country situated south of the Himalaya Mountains, along whose border lie China in the North and India in the South. Nepal has an elongated territory that stretches about 885 km from east to west, and about 193 km from north to south. Its topography changes from the north to south: from the steep mountainous topography (in Northern Regions), then lower hills (in Central Regions), and to the plains (in Southern Regions).

Because of those topographical characteristics, the majority of Nepal's transport system relies on road transportation. During the monsoon period from June to September, precipitation causes landslide or river erosion in the mountainous region, often blocking transport. For that reason, improvement of existing road networks and construction of new road networks are significant developmental challenges that the Nepalese Government faces. About fifty percent of Nepal's GDP comes from agriculture, and Terai Plain is Nepal's main agricultural region. Meanwhile, majority of international goods are traded with India (about 45% is imported and 70% is exported).[3] Thus, improving the flow of goods between Kathmandu, the national capital, and the Southern Regions (the Terai Plain) was one of the priority challenges in building stable road networks in Nepal.

The Japanese Government carried out a feasibility study in 1986-88, which confirmed the relevance of Sindhuli Road construction. Although the plan had been frozen for some time because of political and financial reasons, the second study "Aftercare Study for the Sindhuli Road Construction Project" was conducted in 1992-1993. In response to the study results the Japanese Government launched the support for the construction of Sindhuli Road through Grant Aid projects, the first of which started in 1995.

The total length of Sindhuli Road is approximately 160 km. From the starting point at Bardibas in Terai Plain to the terminus at Dhulikhel, the entire route was divided into four project sections from Section 1 to Section 4,[4] each of which was constructed with aid from the Japanese Government and the Japan International Cooperation Agency (JICA). The scope of this evaluation (Section 2 (Phase 3/3)[5] and Section 3 (all Phases)) was the final sections of the construction of Sindhuli Road which had started in 1995.

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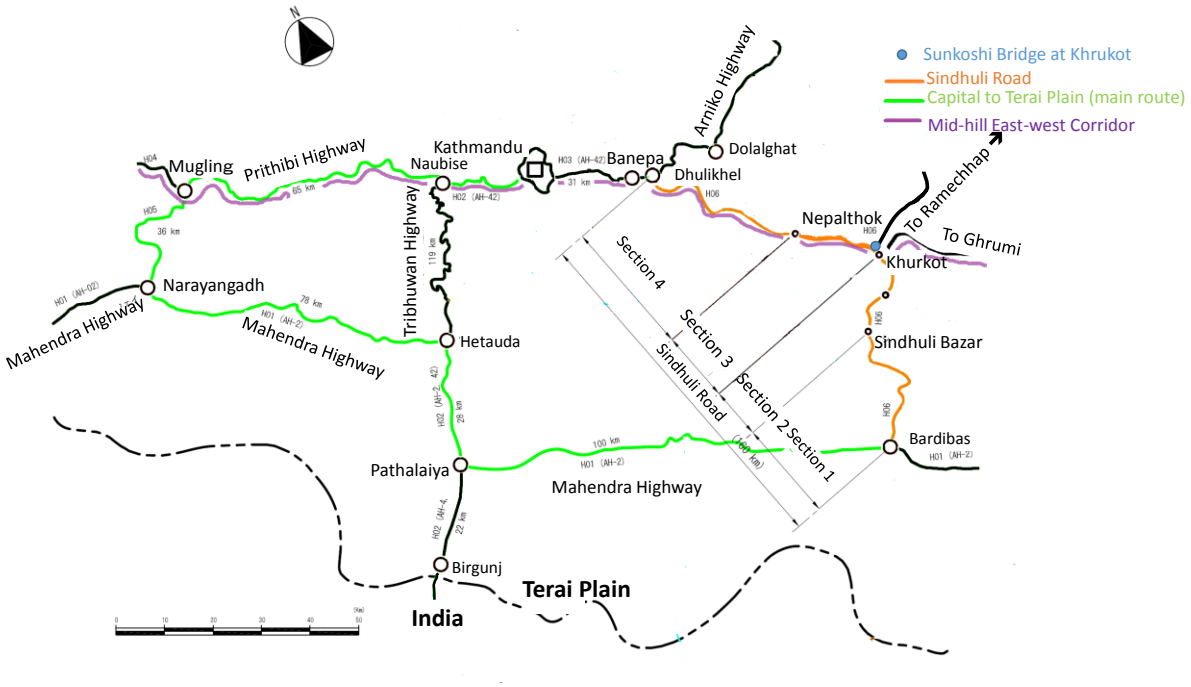
[3] Base on the information from the Government of Nepal, Seventh Fiver Year Plan (1985-1990)

[4] Section 1 (Bardibas — Sindhuli Bazaar), Section 2 (Sindhuli Bazaar — Khurkot), Section 3 (Khurkot — Nepalthok) and Section 4 (Nepalthok — Dhulikhel)

[5] The work for Section 2 (35.8 km) was done over three construction phases. Phase 1/3 covered the 12.5 km stretch from Sindhuli Bazaar; Phase 2/3 covered the 13.5 km stretch between the 12.5 km point and the 26 km point; and Phase 3/3 covered the remaining 9.8 km stretch between the 26 km point and the 35.8 km point.



Source: Map from Section 3 Basic Design Study Report (modified)

Figure 1: Sindhuli Road and Other Main Roads of Nepal

E/N Grant Limit or G/A Grant Amount / Actual Grant Amount	Section 2 (Phase 3/3): 2,588 million yen (E/N) / 2,584 million yen Section 3 (Detailed design): 50 million yen (G/A) / 49 million yen Section 3 (Phase 1/2): 4,333 million yen (G/A) / 4,053 million yen Section 3 (Phase 2/2-1st half): 577 million yen (G/A) / 576 million yen Section 3 (Phase 2/2-2nd half): 4,096 million yen (G/A) / 4,092 million yen
Exchange of Notes Date (/Grant Agreement Date)	Section 2 (Phase 3/3): June 2005 (/ G/A not exchanged) Section 3 (Detailed design): February 2009 (/ February 2009) Section 3 (Phase 1/2): June 2009 (/ June 2009) Section 3 (Phase 2/2-1st half): February 2012 (/ February 2012) Section 3 (Phase 2/2-2nd half): July 2012 (/ July 2012)
Implementing Agencies	● Department of Road (DoR), Ministry of Physical Infrastructure & Transport (Changed in July 2013) ● Former DoR, Ministry of Physical Planning, Works & Transport Management (Charged in June 2012) ● Former DoR, Ministry of Physical Planning & Works (Original)
Project Completion Dates	Section 2 (Phase 3/3): March 2009 Section 3 (Phase 1/2): June 2012 Section 3 (Phase 2/2-1st half): July 2013 Section 3 (Phase 2/2-2nd half): March 2015
Main Contractor	Section 2 (Phase 3/3): Nippon Koei Co., Ltd. Section 3 (Phases 1/2, 2/2-1st half & 2/2-2nd half): Nippon Koei Co., Ltd.
Main Consultants	Section 2 (Phase 3/3): Joint Enterprise of Hazama Corporation and Taisei Corporation Section 3 (Phases 1/2, 2/2-1st half & 2/2-2nd half): Hazama Ando Corporation (Joint enterprise of former Hazama Corporation and former Ando Corporation, name changed as of April 2013)

Basic Design	Section 2 (Phase 3/3): February 1999–January 2000 Section 3 (Phase 1/2): March 2008–December 2008 Section 3: August 2011–January 2012 (preliminary study)
Detailed Design	Section 2 (Phase 3/3): May 2000–October 2000 Section 3: March 2009–October 2009
Related Projects	【Expert】 ● Road policy maintenance management advisor (2003) 【Technical Cooperation Projects】 ● The Project for the Operation and Maintenance of Sindhuli Road (2011–2016) ● The Project for the Master Plan Study on High Value Agriculture Extension and Promotion in Sindhuli Road Corridor (2011–2014) ● Sindhuli Road Corridor Commercial Agriculture Promotion Project (2015–2020) 【Grant Aid Projects】 ● Project for the Construction of Sindhuli Road, including Section 1, Section 4, Section 4 Emergency Recovery Project, and Section 2 Slope Countermeasures (1995–2014) ● The Project for the Improvement of Kathmandu - Bhaktapur Road (2008) ● Community Access Improvement Project (2010) 【Others by International Agencies, Aid Agencies, etc.】 ● Aid for building anew or repair of main trunk routes such as the Mid-Hill Corridor (approximately 17,500 km) (The World Bank and Asia Development Bank) ● District Road Support Program (Swiss Agency for Development and Cooperation)

1.2 Project Outline

The objective of this project is to reduce travel time and improve transport safety by opening the entire length of Sindhuli Road that connects Kathmandu, the capital, with Terai Plain through construction of Section 2 (35.8 km between Sindhuli Bazar and Khurkot) and Section 3 (36.8 km between Khurkot and Nepalthok), thereby contributing to realizing stable transportation of goods, promoting industries, vitalizing local economies, and improving living conditions of the citizens who live along the route.

2. Outline of the Evaluation Study

2.1 External Evaluators

Yuko Kishino, IC Net Limited

Ryuji Kasahara, IC Net Limited

2.2 Duration of Evaluation Study

This ex-post evaluation study and related field studies were carried out as follows:

Duration of the Study: July 2015–September 2016

Duration of the Field Study: November 24-30, 2015 and February 6-14, 2016

2.3 Constraints during the Evaluation Study

Although the works whose costs were borne by the Japanese side were completed in March 2015, the project works for the Nepalese side related to development of Sindhuli Road (hereinafter referred to as the "Sindhuli Road Project"[6]) is still ongoing. As the budget of the Sindhuli Road Project is covering some of the maintenance activities, such state differs from the normal institutional setup for maintenance, in which the maintenance costs would be paid only by the Nepal Road Board. The institutional setup after the completion of the said project in July 2018 has yet to become concrete. The evaluation was carried out against this limited institutional setup after the completion in which many uncertainties were present. With regard to the financial sustainability of operation and maintenance after July 2018,[7] the evaluators referred to the data of normal institutional setup for maintenance, which the maintenance costs are paid by the Nepal Road Board.

3. Results of the Evaluation (Overall Rating: B[8])

3.1 Relevance (Rating: ③[9])

3.1.1 Relevance to the Development Plan of Nepal

At the time of both planning and the ex-post evaluation, the Nepalese government's development policy documents[10] identified road development as one of the priority policies, therefore, this project had been highly relevant to Nepalese policy.

Priorities in road development are as follows: (1) development of a north-to-south road to connect the mountainous areas (Northern Regions) with the plains (Southern Regions); (2) road development in the regions without road access; and (3) development of an east-to-west road in the hill country (hereinafter referred to as "Mid-Hill Corridor")[11]. This project will: (1) join the Kathmandu Basin (Northern Region) and Terai Plain (Southern Region); and (2) connect the Sindhuli District, which has not been served by any main road, to the road network. Also, the section between Dhulikhel and Khurkot in this project becomes (3) a part of the

6 In this report, the term "Sindhuli Road Project" is used to refer to the Nepalese project. The Nepalese share of costs for the "Project for Construction of Sindhuli Road" is paid from the budget of the "Sindhuli Road Project." At the time of the ex-post evaluation, the main work of the "Sindhuli Road Project" concerned maintenance and safety measures.

7 The Nepalese fiscal year starts on July 16 in a given year and ends on July 15 in the following calendar year.

8 A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

9 ③: High; ②: Fair; ①: Low

10 The Ninth Five-Year Plan (1997/98-2002/03) at the time of the study for Section 2 Basic Design, the interim Three-Year Plan (2007/08-2010/11) at time of the study for Section 3 Basic Design, and the interim Three-Year Plan (2014/15-2016/17) at the time of the ex-post evaluation.

11 At the time of the ex-post evaluation, Nepal, a country elongated from east to west, had only one road that connected Eastern Nepal with Western Nepal. The road named Mahendra Highway also called the "East-West Corridor" runs in the southern side of the country from east to west. If there is hindrance in one section of Mahendra Highway, it would impact the entire country. Therefore, development of another east-west road network (Mid-Hill Corridor) in addition to Mahendra Highway is required to solve this problem. Mid-Hill Corridor is to be built not by construction of new roads but by joining existing roads in the hill area (Mid-Hill).

Mid-Hill Corridor. This project meets the priorities described above and therefore is highly relevant.

3.1.2 Relevance to the Development Needs of Nepal

At the time of planning, there was practically only one route: a main trunk road that connects Kathmandu, the capital, and Terai Plain, and then reaches the town of Birgunj at the Indian border which is a primary gate for international cargo distribution. As marked on Figure 1, the route is a long detour using the Prithibi Highway and Mahendra Highway (approximately 230 km long) on the following route: Kathmandu— Naubise — Mugling — Narayangadh — Hetauda — Pathalaiya — Birgunj.[12] This route was closed by natural disasters in 1993 and in 2000, both of which resulted in the capital being isolated from the distribution networks for approximately three weeks and two weeks, respectively. This experience proved the development need for this road at the time of planning, which was to construct a road that would not suffer from natural disasters and would offer an alternative route to connect Kathmandu, with Terai Plain, Nepal's main agricultural region.

The importance of Terai Plain at the time of planning was unchanged at the time of the ex-post evaluation. Terai Plain produces about 70% of the total rice production of Nepal. The central and eastern Terai Plain, near Sindhuli Road, accounts for over 50% of Terai Plain's rice production.[13] At the time of the ex-post evaluation, the main trade route that connected Kathmandu with Terai Plain was still the Prithibi Highway route discussed above. Moreover, the need for Sindhuli Road as its alternative is also unchanged.

Therefore, the project's relevance to the development need is high both at the planning stage and at the time of the ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

The 2009 ODA Data Book states Japan's basic ODA policy for Nepal at the time of the planning for Section 2 was "to accelerate the country's democratization and peace building, thereby to reduce poverty through economic growth." One of the focus areas for that goal was "to improve socio-economic infrastructure," including road development. Therefore, this project is relevant to Japan's ODA policy at the time of planning.

3.1.4 Appropriateness of Project Planning and Approach

According to the demand projection of traffic volume made at the time of Basic Design, road design standard was set to be a 1.5-lane vehicle road of 4.75 m wide,[14] designed for travel

[12] Tribhuwan Highway (Naubise-Hetauda section) is too steep for heavy vehicles, and therefore cannot become a main transport route.
[13] Statistical Yearbook of Nepal (2013)
[14] Small vehicles can pass each other, while larger vehicles need to have vehicles in one lane stop and wait while vehicles in the other lane pass.

at 30 km/h. From the beginning, some debated that the road should be developed as a double-lane road (single lane for either direction). However, taking into consideration the traffic demand projection made at the time and the budget constraint, it was decided that the road width would be 1.5-lane.

The actual traffic volume at the time of the ex-post evaluation exceeded the demand projection. Here are the events that likely caused it: the Sunkoshi River near Khurkot located between Section 2 and Section 3 was bridged in recent years, connecting Sindhuli Road to the road linking to the Ramechhap District, and the Sindhuli Road was linked to the road heading to Ghrumi also near Khurkot, making that section a part of the Mid-Hill Corridor. However, at the time when the study for Basic Design of Section 3 was taking place, the information concerning those two linkages was insufficient. Therefore, it was unavoidable that the information could not be taken into consideration when projecting the demands at the time of Basic Design.

Sindhuli Road development did not forcibly cut through mountains to construct a straight road. It constructed a road on the route traditionally used by the locals, who avoided the land prone to natural disasters. As a result, Sindhuli Road is resilient against natural disasters. With regard to the road design against earthquake-resilience, as Sindhuli Road was not damaged as much to be closed during the catastrophic quake that hit in April 2015, it is fair to say that the project plan and its approach are relevant.

As described above, this project has been highly relevant to Nepal's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Tables 1 and 2 show the project outputs of the Japanese side and the comparison between planned and actual data. Although some changes in the outputs were made, for which a part of road construction works initially planned for Section 2 was moved to Section 3, most project outputs were completed as planned.

Table 1: Section 2 (Sindhuli Bazar – Khurkot)

Facility Category	Plan	Actual	Changes
Road construction			
Road extension (entire Section 2)	39.7 km	35.8 km	Reduced by 3.9 km
Road extension (Section 2 Phase 3/3)	13.7 km	9.8 km	3.9 km reduction done in Section 3 Phase 1/2
Causeway construction			
Structure	Continuous box culvert	Continuous box culvert	As planned
No. 3 (Phase 3/3) extension	130 m	Moved to Section 3	Some changes
No. 4 (Phase 3/3) extension	30 m	Moved to Section 3	Some changes
No. 5 (Phase 3/3) extension	50 m	Moved to Section 3	Some changes

Source: Planned and actual data both from documents provided by JICA, or obtained by interviews at the Implementing Agency.

Table 2: Section 3 (Khurkot–Nepalthok)

Facility Category	Plan	Actual	Changes
Road construction			
Road extension (entire length)	36.8 km	36.8 km	As planned
Road extension (Phase 1/2) [(1)]	14.3 km	14.3 km	As planned
Road extension (Phase 2/2-1st half)	3.6 km	3.6 km	As planned
Road extension (Phase 2/2-2nd half)	18.9 km	18.9km	As planned
Causeway construction			
Structure	Continuous box culvert	Continuous box culvert	As planned
No. 3 (Phase 1/2) extension [(2)]	130 m	130.0 m	As planned
No. 4 (Phase 1/2) extension [(2)]	30 m	30.0 m	As planned
No. 5 (Phase 1/2) extension [(2)]	50 m	50.0 m	As planned
No. 1 (Phase 1/2) extension	30 m	30.8 m	0.8 m
No. 2 (Phase 2/2-2nd half) extension	190 m	190.0 m	As planned
No. 3 (Phase 2/2-2nd half) extension	20 m	20.0 m	As planned
No. 4 (Phase 2/2-2nd half) extension	50 m	50.0 m	As planned
No. 5 (Phase 2/2-2nd half) extension	90 m	90.0 m	As planned
No. 6 (Phase 1/2)	40 m	40.8 m	0.8 m
No. 7 (Phase 1/2)	60 m	60.8 m	0.8 m
No. 8 (Phased 1/2)	70 m	70.8 m	0.8 m
No. 9 (Phase 2/2-1st half)	90 m	90.0 m	0.8 m

Source: Planned and actual data are both from documents provided by JICA, or obtained by interviews at the Implementing Agency.
Note 1: The 14.3 km included the 3.9 km moved from Section 2 (Phase 3/3)
Note 2: Moved from Section 2 (Phase 3/3)

The change mentioned above concerned the 3.9 km stretch of road extension planned for Section 2 (Phase 3/3) and construction of the flood relief culverts (under causeway) planned in that 3.9 km stretch: both works were shifted to Section 3 (Phase 1/2).[15] This change was caused by the construction cost being found to exceed the Exchange of Notes (E/N) Grant Limit, and was approved before the Section 3 Basic Design Study (2008). The factors that caused the construction cost to exceed E/N Grant Limit were as follows: (1) changes in the construction market such as rise in consumer price as well as the minimum wage paid to the workers; (2) additional security expenditures in view of the worsened public order; and (3) changes in construction methods in consideration of the matters identified in stretches already completed such as pouring additional concrete for the foundation of the valley-side retaining wall, and changing the pavement structures at the sharp part of the hairpin curve. These factors occurred during the nearly five-year period between the Basic Design Study (February 1999) and the Detailed Design Study (May 2000), and the start of the main works for Section 2 (Phase 3/3) in December 2005. (1) and (2) were matters which were beyond the control of the project agencies such as the Department of Road, and (3) were appropriate changes which were led by the necessity of fine-tuning the road construction method to meet the status of the sites. The road extension whose portion was reduced in Section 2 was incorporated in Section 3 design and construction. Thus, it is fair to say that appropriate measures were taken.

As discussed above, with regard to outputs, the planned works were almost all carried out, while the reduction of road extension and accompanying changes are considered reasonable.

Photographs 1 and 2 below compare the same site before and after the Section 3 works.

Photograph 1: Before the Construction[16]

Photograph 2: After the Construction[17]

[15] The 3.9-km stretch is situated between Section 2 and Section 3. As this stretch is in an area with only a few houses, and was already served by a 4WD-vehicle-only route commonly called "the truck road" before the start of construction of Section 3, it is likely that delay of its work had limited negative impact on the effect of the project.

[16] Provided by JICA (July 18, 2012; before project work: View from the upstream left side of the Sadhi River over the site for causeway structure No. 9)

[17] Provided by JICA (July 8, 2014; after completion (at the time of fault inspection): View from the upstream left side of the Sadhi River over causeway structure No. 9)

3.2.2 Project Inputs

3.2.2.1 Project Cost

As the data on the Nepalese share were not available, the project cost evaluation was analyzed with only the data on the Japanese share. Table 3 shows a summary of the Japanese share of the project cost: planned and actual data and their comparison. The actual cost of Section 3 was lower than planned, at 88% of the planned figure. However, the actual cost of Section 2 (Phase 3/3) was 120% of the planned cost.[18] The reason for Section 2 exceeding the planned cost was, as described in the section under "3.2.1 Project Output," the need to address the changes in situations that occurred after starting the works. It was unforeseeable as of 1999, and therefore seemed unavoidable. The actual overall project cost for the sections evaluated was lower than planned, at 94% of the planned cost.

Table 3: Project Cost

	Section 2 (Period 3/3)	Section 3	Total
Planned (E/N, GA)	2,158 (1)	9,942	12,100
Actual	2,584	8,770	11,354
Actual-to-Planned Ratio	120%	88%	94%

Source: Documents provided by JICA, Unit: million yen
Note 1: This figure for "Planned" cost was obtained by subtracting the assumed portion for the reduced section (430 million yen) from the initial planned figure at the time of E/N signing (2,588 million yen).

3.2.2.2 Project Period

The actual duration for each section of this project exceeded its planned duration. For Section 2 (Phase 3/3), the actual duration was 45.5 months, 147% of the planned duration (31 months); for Section 3 (all Phases), the actual duration was 72.6 months, 117% of the planned duration (62 months). Overall, the actual duration was 116.9 months, 125% of the planned duration (93 months). Table 4 shows a summary of project periods showing the planned and actual durations and their respective comparison rates.

The work for Section 2 (Phase 3/3) took longer than the planned duration, by 14.5 months. The project monthly reports for this Section reported some work stoppages caused by the following: delays with tree felling work (31 days); political protest actions (124.5 days); natural disasters within the section area (16 days); other disasters (approximately 110 days); and accidents at work sites (51 days). Except for the accidents, many of those causes for delays were beyond the control of the project contractors and project management consultants. To catch up with the work days that had been lost due to those delays, various measures were put in place, including (1) laying of construction service roads, (2) extending work hours, and (3)

[18] The figure of planned project cost of Section 2 (Phase 3/3) (2,158 million yen) was obtained by subtracting the assumed portion for the reduced section (430 million yen) from the initial planned figure at time of E/N signing (2,588 million yen). The figure120% is the ratio of the actual amount of spent money against the figure of planned project cost of Section 2 (Phase 3/3) (2,158 million yen).

securing transport routes during the monsoon period.[19]

Table 4: Project Period

	Date started Year/Month/Day	Date completed Year/Month/Day	Duration (Months)	Comparison Actual/Planned (%)
Section 2 (Phase 3/3)				
Planned	-	-	31.0	-
Actual	2005/06/09	2009/03/24	45.5	147
Section 3 (all Phases)				
Planned	-	-	62.0	-
Actual	2009/02/12	2015/03/01	72.6	117
Total				
Planned	-	-	93.0	
Actual	2005/06/09	2015/03/01	116.9	125

Source: Documents provided by JICA

As described above, although the project cost was within the plan, the project period exceeded the plan. Therefore, the efficiency of the project is fair.

3.3 Effectiveness[20] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

Although this evaluation is for Section 2 (Phase 3/3) and Section 3 (Phases 1/2 and 2/2), the project's effectiveness evaluation used the three effect indicators stated in the Ex-Ante Evaluation of Section 3 (Phases 2/2). The three Effect Indicators are as follows: travel distance (Indicator 1); required travel time (Indicator 2); and annual number of days closed by natural disasters (Indicator 3).[21] Access improvement was evaluated by comparing those indicators for two travel routes between Kathmandu and Terai Plain between those for the route via Prithibi Highway (Kathmandu—Naubise —Muglin— Narayangadh—Hetauda—Pathaliya—Bardibas), and those for the route via Sindhuli Road (Kathmandu—Dhulikhel—Bardibas). In addition, average daily traffic volume in a year, a typical indicator of operation, was used to identify how the road is used, as referential information for the evaluation.

[19] To put the matter in context, when one subtracts the number of work stoppage days (worth about nine months) that are beyond the control of project contractors and/or project management consultants from the actual duration of construction period (from the day when the work was started to the day the work was completed), one finds the delay is only about two months long.

[20] Sub-rating for Effectiveness is to be put with consideration of Impact.

[21] At the time of the ex-ante evaluation, the measurement points for the sections of Indicator 1 and Indicator 2 were not clearly indicated. Although the section was indicated as "Bardibas Intersection—Kathmandu" in the Ex-Ante Evaluation, it was unclear which intersection in Kathmandu should be used as the reference point. Therefore, the measurement points which were defined in a JICA Technical Cooperation Project, "Project for the Operation and Maintenance of Sindhuli Road," were applied in the ex-post evaluation. Accordingly, measurement was taken between the Koteshwor Intersection in Kathmandu and the Bardibas Intersection in the Terai Plain.

(1) Improvement of Transport Access between Kathmandu and Terai Plain

Targets for respective outcome indicators have been set as the figures to be attained in three years after the originally planned project completion (2018). However, this ex-post evaluation was conducted in 2015, the year of project completion. For that reason, the targets (2018) and the actual data at the time of the ex-post evaluation (2015) were compared for evaluation. Table 5 shows baseline, target, and actual figures for the respective indicators.

Table 5: Output Indicators

	Baseline 2011 Basic Design	**Target 2018 3 Years After Completion**	**Actual 2015 Year of Completion**
Indicator 1: Distance traveled (km)			
A. via Prithibi Highway	333	—	368
B. via Sindhuli Road	—	189	195
Indicator 2: Time required to travel (hours)			
A. via Prithibi Highway	8	—	Approx. 8
B. via Sindhuli Road	—	5	Approx. 5
Indicator 3: Number of days closed by natural disasters in a year			
A. via Prithibi Highway	20 (1993)	—	Unknown
B. via Sindhuli Road	—	2	0

Source: JICA Technical Cooperation Project, "The Project for the Operation and Maintenance of Sindhuli Road" Progress Report, and interviews at the Department of Road

Indicator 1: According to the data from a study conducted by the JICA Technical Cooperation Project, the distance traveled (km) has been reduced as anticipated.

Indicator 2: According to the data from a study conducted by the JICA Technical Cooperation Project, the time required to travel (hours) has also been reduced as anticipated. In addition, similar information about travel time reduction was received from share taxi drivers, who were interviewed as a part of the ex-post evaluation study. The transport service from Kathmandu, the capital, to southern Terai Plain started using Sindhuli Road about nine years ago. Around that time, before the start of Section 3 construction works, the route commonly known as "Truck Road"[22] opened and had allowed 4WD access. Until then, according to the drivers, it had taken 12 hours to travel from the capital to the south via Prithibi Highway.[23] Using the Truck Road, it took 8–9 hours to complete the trip. Later, after completion of the

[22] The Truck Road and Sindhuli Road do not follow the same route. They may be parallel or cross each other in some sections.

[23] The travel time for Kathmandu—Terai Plain via Prithibi Highway route took 12 hours in 2007, which was the information offered during the interviews. However, the travel time given for Indicator 2 in 2011 was 8 hours. Therefore, there is a difference between the travel time in 2007 and 2011.

Section 3 construction, at the time of the ex-post evaluation, it had become possible to travel from the capital to the south in about 5 hours.

Indicator 3: As the data on the number of days closed by natural disasters in a year for the Prithibi Highway route were not available, it is not possible to compare the Prithibi Highway route with the Sindhuli Road route. However, according to the Department of Road, the number of days closed by natural disasters in a year for Sindhuli Road is zero.[24] Therefore, even if the Kathmandu-Terai Plain route via Prithibi Highway becomes impassable, travel through the route via Sindhuli Road would be possible. From the above, it is fair to say the transport situation has improved, compared to the time when travel from the Kathmandu to Terai Plain became impossible after the natural disaster of 1993.

(2) Average Daily Traffic Volume in a Year

No target was set for the average daily traffic volume in a year in the Ex-Ante Evaluation (Section 3 Phase 2/2). Consequently, as a practical alternative, the evaluators used the value of projected demands found in the Report of the Study for Basic Design for Section 3 to compare with the actual traffic volume study data attained from JICA's "Project for the Operation and Maintenance of Sindhuli Road." Chronological changes for average daily traffic volume in a year on Sindhuli Road were confirmed at the southern starting point (Bardibas Intersection) and northern starting point (Dhulikhel Intersection) (Figure 2)[25].

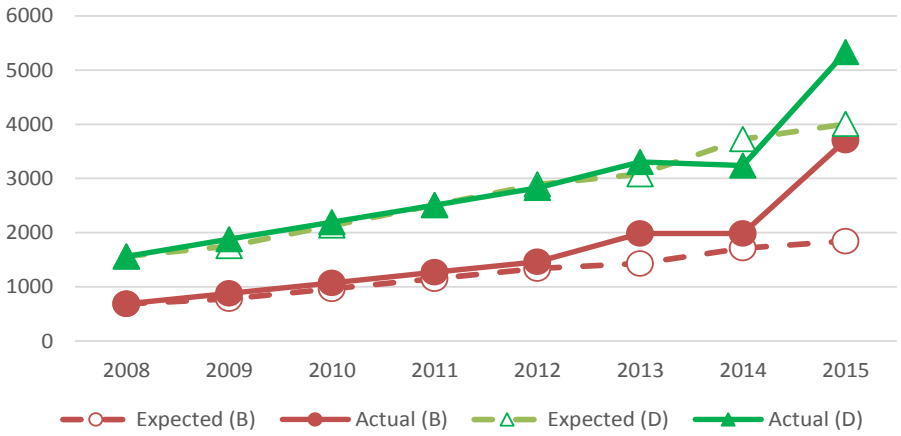
By 2012, whose data on traffic volume study by the mentioned project are available, the actual traffic volume data at both Bardibas and Dhulikhel exceeded the projected volume. A further increase in traffic volume was observed between 2014 and 2015 in both locations. However, the increase in recent years may be influenced by bridging of the Sunkoshi River near Khurkot located between Section 2 and Section 3, which connected Sindhuli Road to the road linking to the Ramechhap District, and by linking of the same section near Khurkot to the road heading to Ghrumi, which has made that section a part of the Mid-Hill Corridor (see the map in Figure 1).[26]

As described above, Sindhuli Road has made sizable contribution to the movement of people and goods, offering more value than anticipated.

[24] Following the April 2015 earthquake, the route was reportedly closed for 72 hours for inspection. As that was a road closure for inspection, those days are not included in "Number of days closed by natural disasters in a year."

[25] As the actual figures between 2009 and 2011 are missing, the average figures of the years prior to and following those three years are used instead.

[26] Those two links have been outside the scope of this project, but were carried out by other projects.



Note: the horizontal axis indicates year of observation, while the vertical axis indicates number of vehicles traveled at each point. Solid lines indicate actual data, while dotted lines indicate projections. Triangles represent the data observed at Dhulikhel Intersection, while the circles represent the data observed at Bardibas Intersection.

Figure 2: Average Daily Traffic Volume in a Year

3.3.2 Qualitative Effects

See the sections under the heading "Impacts"

3.4 Impacts

3.4.1 Intended impacts

The impacts intended by this project were as follows: 1) to stabilize transportation of goods between the capital and Terai Plain; and 2) to vitalize local economies. The evaluators conducted a questionnaire study on the beneficiaries and an interview study on related parties to confirm those impacts.

(1) To vitalize local economies

A questionnaire study was conducted on the beneficiaries (local citizens) in Section 3. The main categories of the questions were as follows: 1) matters related to changes in local citizens' behaviors (e.g., use of road and time of travel), and 2) matters related to changes with goods. Sampling for the study assumed the valid response number of 100.[27] [28] The target areas for this study were three local governments (the Village Development Committees). Sample size was decided based on the number of households in each of the electoral wards (nine

[27] If the level of significance i.e. confidence level is 95%, the upper and lower standard error is 10%, and the proportion is 50%; the required sample size for interval estimation of the proportion (infinite population) is 97.

[28] The actual sample size was 133. The genders of those who took part in the study were 68 men and 66 women. The age ranges were as follows: 11 people were 20–29 years old; 22 were 30–39 years old; 37 were 40–49 years old; 35 were 50–59 years old; 24 were 60 years old or older; and three people of unknown age. The three VDCs where the study was conducted were: 1) Jhangajholi Ratamata, 2) Purano Jhangajholi, and 3) Sitalpati. The number of people who took part in respective VDCs was 51, 41 and 41, respectively. Although the data on household number at the Ward level in those VDCs were obtained, the resident register data could not be obtained. For each VDC as well as each Ward, the number of households was divided by the sample size, so that house-to-house visits were conducted with method of equal interval sampling. As no baseline study was conducted, the pre-project information was collected by asking the participants to recall their past memories.

Wards) that constitute each local government. Sampling was conducted within the boundaries of the respective Wards. However, because of a limitation with the range of data obtained by this study, it is difficult to discuss the contributions on vitalizing local economies by distinguishing the attribution of this project from other factors. Accordingly, the discussions on the project's contributions shall take that into consideration. The results of the study are as stated below.

(i) Changes in local citizens' behaviors

The study collected data on whether the road is used or not, and changes in time needed to travel for five main behaviors: 1) travel to workplace (commuting to work); 2) travel for delivery of goods and/or services; 3) travel to local government offices including the district offices; 4) travel to the district hospitals and/or a regional hospital; and 5) travel to schools (commuting to school).

(a) Changes in road use status (used or not)

When compared to ten years ago, there has been a slight increase in users of Sindhuli Road after the opening of Sindhuli Road except for those who use it for commuting to work and school. The reason for the decrease in numbers of people who use it for commuting to work and school may be a change in occupation or the effect of a new school built near their local community, but precise factors are unclear.

(b) Changes in time needed for travel

Approximately 90% of the people who used the road said, after the project, that the travel time to the district office or hospital became shorter than it had taken before the project. No major changes were observed in commuting or student transport time; reason for that may be the lack of necessity to use Sindhuli Road for those purposes, therefore, those respondents did not benefit from Sindhuli Road opening in form of reduced travel time. However, whether the Road is used or not and changes in time travel stated above seem to indicate the possibility that the development of Sindhuli Road by this project may have influenced people's behaviors.

(ii) Changes in quantity and diversity of daily commodities

Those who participated in the study were asked about the changes in quantity and diversity of daily commodities between before and after the project. Approximately 90% answered that they increased and became more diverse. These results seem to indicate a possibility that transportation of goods became more active and sales transaction for daily commodities was increased.

It is necessary to keep in mind that this study alone can hardly distinguish the contributing factors by this project with other factors. However, an overall trend in the local citizens' voices heard through this beneficiary study can be interpreted to suggest a possible contribution to "vitalizing local economies" made by the opening of the entire Sindhuli Road by this project.

(2) To stabilize transportation of goods

The events behind planning of Sindhuli Road Construction, i.e., closures of Prithibi Highway and Tribhuwan Highway due to natural disasters as well as subsequent interruptions in transportation of goods to the capital, have not occurred since 2001. Therefore, no record exists for Sindhuli Road having been used as an alternative route in case of an interruption to transportation of goods to the capital. However, Sindhuli Road's contribution to stabilizing transportation of goods was heard during interviews as described in the following paragraph.

In the interviews at Kalimati Market (the Central Market), the Imported Fruits Market, and an agricultural company in Kathmandu,[29] it was heard that the majority of crops produced in Terai Plain was transported on large vehicles via Mahendra Highway and Prithibi Highway, and that Sindhuli Road is not used for mass transport of produce from Terai Plain to the capital, as it cannot be used by large vehicles. According to the information provided by or interviews at the Trade and Export Promotion Centre, two-thirds of international traded goods are imported from India. Those imported goods go through the customs station in the southern town of Birgunj, and then are transported by large vehicles via Mahendra Highway and Prithibi Highway to the capital, while Sindhuli Road is not used as it cannot be used by large vehicles. However, Sindhuli Road is used for transportation of produce from the Sindhuli District. According to the information gained in interviews at an agricultural company in the Sindhuli District[30], large vehicles were used to transport fruits to the capital via Mahendra Highway and Prithibi Highway, which took a long time before the Sindhuli Road opened. However, at the time of the ex-post evaluation, it had become possible to use medium size vehicles on Sindhuli Road for delivery in a shorter time. In addition, it has been heard that, when Mahendra Highway was blockaded near Birgunj in September 2015 for about five months due to a political protest action, the route for transportation of goods from a part of the Southern Region to the capital was switched to Sindhuli Road.

It is not just the transport from the South to the metropolitan zone that uses Sindhuli Road. According to the information heard during the interview at Central Fruit Market, the imported fruits delivered to the capital are then delivered to the consumers in the Sindhuli District via Sindhuli Road. In addition, the non-governmental organization (NGO) that responded to the April 2015 Earthquake also used Sindhuli Road to transport post-quake aid goods from the capital to the Sindhuli District.

As described above, at the time of the ex-post evaluation, Sindhuli Road had established itself as an essential part of the road network east of Kathmandu, and Sindhuli Road's design

[29] The Central Market (Kalimati Market) is a vegetable and fruit market in the Capital, Kathmandu, said to meet 60-70% of vegetable and fruit demands of the Capital. The Imported Fruit Market is the depot for the fruits imported mainly from India. An agricultural company visited was Balkhu Agriculture & Vegetables Market.

[30] An interview was conducted at Junar Central Co-operative Union Ltd. in the Sindhuli Bazaar. This organization presides over the Sindhuli District junar producers' cooperatives whose main produce are citrus fruits called junar.

withstands natural disasters, contributing "to stabilize transportation of goods." The primary significance of Sindhuli Road is that it functions even at the time of natural disaster. The fact that Sindhuli Road was usable in the catastrophe caused by the April 2015 Earthquake suggests that Sindhuli Road has fulfilled its significant role.

3.4.2 Other Impacts

(1) Impacts on Natural Environment

Section 2 (Phase 3/3): Environmental Impact Assessment (hereafter referred to as the "EIA") for Section 2 (entire length) was carried out in 1999 prior to the start of the work for Section 2. According to the report of that EIA, it was planned to establish a Monitoring Cell in the Sindhuli Road Project office. However, it was actually the construction contractor who carried out environmental monitoring, and submitted monthly reports to the Sindhuli Road Project office. Field study for this ex-post evaluation was unable to obtain those reports; therefore, the evaluators have not confirmed the content of that environmental monitoring. According to the monthly report by the construction management consultant, no particular negative environmental impact was reported when the Ministry of Environment site inspection team visited in December 2006.

Section 3: For Section 3, EIA was carried out at the time of the project appraisal. As a result, an Environmental Certificate was obtained, and due procedure was completed. Initially it was planned to establish a specific team (Environment Monitoring Unit) within the Sindhuli Road Project office to carry out the task of environmental monitoring. However, this did not materialize during the Section 3 project period. Nonetheless, the Environment Compliance Monitoring Report stated that the monitoring task was carried out by the Sindhuli Road Project office in Section 3 (Phase 1/2) and by the construction contractor in Section 3 (Phase 2/2). Incidentally, the environmental monitoring was supported by the Geo-Environmental and Social Unit (hereafter referred to as the "GESU") of the Department of Road HQ. An interview at GESU revealed that a GESU environment expert carried out on-site inspections to confirm compliance of the Sindhuli Road Project approximately November 2012 According to the Environment Compliance Monitoring Report for Section 3 and the abovementioned GESU expert, no case of major negative environmental impact occurred in Section 3.

(2) Land Acquisition and Resettlement

Section 2 (Phase 3/3): According to the first monthly report submitted by the construction management consultant to the Department of Road, land acquisition was completed before December 2005, when the work for Section 2 (Phase 3/3) started. The said reports do not state what process was taken concerning this land acquisition; therefore, its details cannot be confirmed.

Section 3: Land acquisition also took place for Section 3. About 80% of the lands for Phase

1/2, all of the land for Phase 2/2-1st half, and about 60% of the land for Phase 2/2-2nd half were acquired prior to the start of the construction work. A JICA-supported preliminary study was included in the process to inform the local citizens. The acquisition price adjustment was done by a committee which consists of members including the Head of District Administration. The process of the land acquisition followed the provisions of the Land Acquisition Act of 1977, and therefore is deemed appropriate.[31]

(3) Unintended Positive or Negative Impact

During Section 2 (Phase 3/3), two accidental falls occurred that killed workers who were employed by the construction contractor.[32] Reports of those accidents inform that the contractors revised the measures to prevent accidents, implemented the revised measures, and worked harder for prevention.

3.4.3 Positive or Negative Impact on Women and the Maternal and Child Health

(1) Impact on Women

The data obtained through the abovementioned beneficiary study were analyzed with a focus on gender differences. With regard to changes in road use status under each purpose and the travel time needed for each of those, no positive or negative impact on either gender was confirmed. Also concerning changes in access to, and variety and quantities of daily commodities, no positive or negative impact on either gender was confirmed. Additionally, when asked whether the project helped improve road safety, most beneficiaries answered that the roads as a whole become safer after the project. However, the answers showed no gender-related difference.

(2) Impact on the Maternal and Child Health

Among those participated in the beneficiary study, this survey targeted the families with women who had given birth to check if there were any changes between before and after this project regarding healthcare service use. However, because of the factors that limited analysis of this aspect of the study, such as sample size, sampling practice,[33] and impacts from other projects, it should be noted that the results of this survey do not indicate a direct impact of this

[31] The beneficiary study participants (in Section 3) were asked about experience with resettlement and land acquisition, as well as the details and results of their resettlement and land acquisition experience. Among the 133 study participants, the category of re-settlers applied to eight of them. According to those eight re-settlers, their resettlement and land acquisition process followed the rules. Five of them said their lives had improved as a result of resettlement. These answers suggest that the due process was followed adequately.

[32] September 2006 accident: the victim fell from the scaffolding for slope protection work. August 2008 accident: the victim, who was walking up a section of the road on a steep slope, fell off from the road.

[33] Although the completion of this project was in March 2015, each stretch of road in Section 3 was opened as soon as the work for the stretch was completed. Also, at the time of the Study for Basic Design in 2008, the Truck Road was already open. For those reasons, the subject for this analysis was households of families with child (ren) younger than six years old. Among those who took part in the beneficiary study, 18 families fit the said criteria for this analysis.

project on maternal and child health.

To the question on whether they received antenatal and/or postnatal health checks, 30% of the survey respondents answered that they did. However, no behavior difference was observed between before and after this project.[34] Of those who answered the previous question about whether they had received antenatal and/or postnatal health checks, 80% used the road, while less than 50% of those answered that they had not received health checks had not used the road. With regard to the use of Sindhuli Road when traveling to a primary health clinic, more than 60% of the survey respondents answered they used it. However, no behavior difference was observed between before and after this project. Incidentally, when asked about the time needed for travel to their respective primary care clinics, those who used the Road said the average time needed travel to their respective primary care clinics after the project became shorter than it had taken them before the project.

Interviews with doctors were also conducted at a university hospital at Dhulikhel.[35] In Nepal, although difficult birth cases are handled at major facilities such as a district hospital (where Caesarian Section would be performed), many women gave (natural) birth at such places as a clinic near their house. The evaluators found that district hospitals have seen an increase in the number of patients who underwent Caesarian section after the opening of Sindhuli Road.[36]

As described above, this beneficiary study found that there has been no major change between before and after this project for the antenatal and postnatal health checks, which are conducted in areas near where mothers live, and therefore it is less likely they need to use Sindhuli Road directly. However, when Sindhuli Road was used, a shorter travel time was observed. An increase in number of patients at major facilities that accept emergency cases were also observed, which suggests an improvement in the state of the maternal and child health.

In light of the above, implementation of this project has largely achieved its objectives. Therefore, the effectiveness and impacts of the project are high.

[34] In this analysis, the criterion for "before" or "after" project is whether it was before or after the time of the Truck Road opening.
[35] Two doctors were interviewed.
[36] The evaluators could not obtain the data on the increase in number of patients.

Column: Japanese Civil Engineering Technology Contributing to the Development of Road Construction Technology in Nepalese Mountains

The Project for Construction of Sindhuli Road is a landmark project building a 160-km road with an altitude difference of 1,300 m crossing the Nepalese mountains that exceed 2,000 m in height. The project was completed 30 years after the planning stage. Under difficult geological and natural conditions such as fragile soil and steep and unstable slopes, the project overcame various natural calamities such as the road being washed away by heavy flood and large-scale collapse of a slope in a trans mountain area.

In 2016, the project earned the Technical Award from the Japan Society for Civil Engineers[37], a long-standing and prestigious award in Japanese civil engineering. The project was evaluated highly in two aspects: technology and socio-economic development. Specifically, the project contributed significantly to the development of road construction technology in Nepal while adopting locally available technologies as much as possible, such as making full use of the locally procurable construction materials and equipment. It introduced new Japanese technologies to make possible the construction of the road while overcoming steep escarpment and slopes that are prone to collapse. In addition, it contributed to the socio-economic development of the roadside regions and ensuring a stable transportation route to the capital of Nepal.

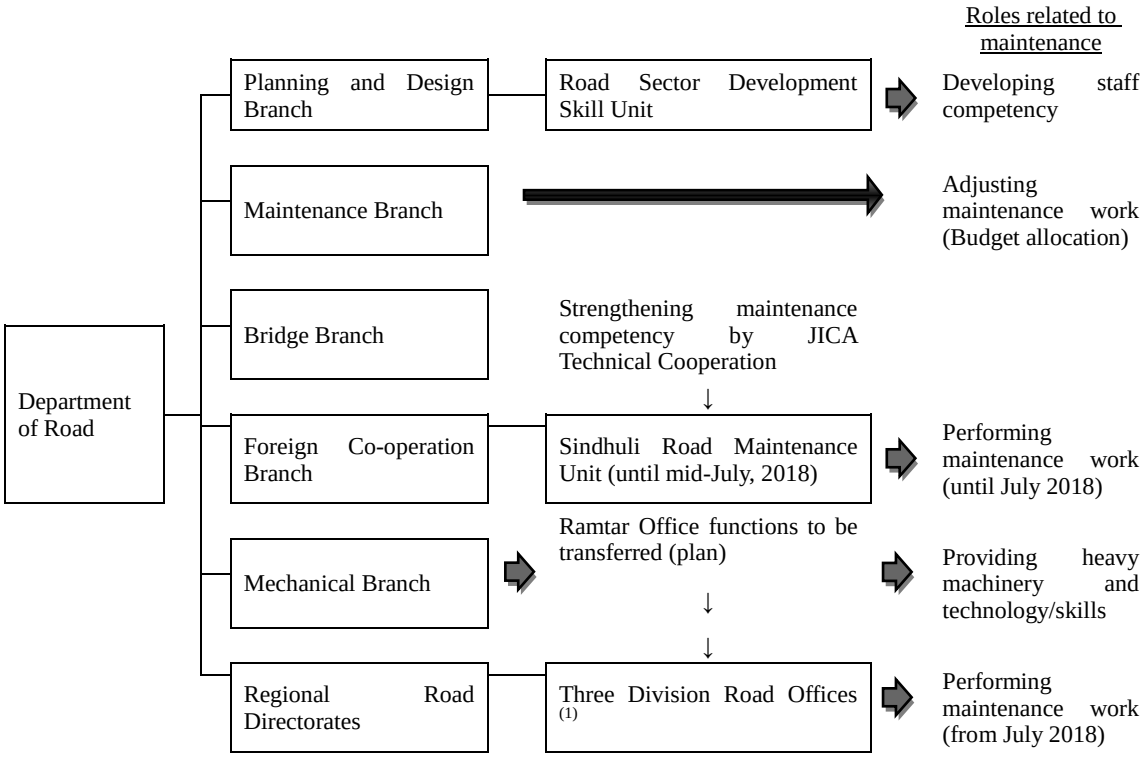
3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

With normal road construction projects by the Department of Road, the 34 Division Road Offices of Department of Road, located across the nation, are instituted to perform maintenance of roads after project completion. However, the Sindhuli Road Project (the Nepalese side of the project) is yet to be completed at the time of the ex-post evaluation, and the evaluators found an institutional arrangement in which the Sindhuli Road Maintenance Unit under the abovementioned project was covering maintenance for the Sindhuli Road. According to the people involved in the abovementioned project, the said institutional arrangement is set to continue until July 2018, when funding of the maintenance cost from the Project Budget of the abovementioned project ends. After that, the Division Road Offices at Khurkot, Janakpur, and Bhaktapur plan to perform maintenance for Sindhuli Road.[38] In addition, it is assumed that the functions at the Ramtar Office, which has been established at a halfway point on Sindhuli Road with support by JICA's "Project for the Operation and Maintenance of Sindhuli Road (2011-2016)," will be transferred to the Khurkot Division Road Office. However, when asked about staff, heavy machinery, and equipment that belong to the Ramtar Office at the time of the ex-post evaluation, varying responses were received from the concerned people at the Department of Road. Therefore the evaluators were unable to know their clear policy on the matter. Figure 3 shows the institutional arrangement of Sindhuli Road maintenance at the time of the ex-post evaluation.

[37] The award is given to milestone projects that are deemed to have contributed significantly to the development of civil engineering technology and society. http://www.jsce.or.jp/prize/prize_list/p2015.shtml#s02 (June 5, 2016)

[38] It is assumed that maintenance of the sections that were subjects of this project will become the responsibility of the Khurkot Office.



Sources: Documents provided by the Implementing Agency
Note: Branches that are not involved in maintenance of Sindhuli Road are omitted.
Note 1: the three Division Road Offices refers to those at Khurkot, Janakpur, and Bhaktapur. Among those three, the Division Road Office at Khurkot will receive the functions of the Ramtar Office, whose maintenance competency was strengthened by a JICA technical cooperation project.

Figure 3: Department of Road: Chart of the Department Organizations that Were Involved in Maintenance of Sindhuli Road and Roles of Each Branch, Unit, or Office

In light of the above, it is fair to say that there are some issues because of the presence of uncertainties concerning the institutional aspects of maintenance of Sindhuli Road in two years, although the current institutional aspects of road maintenance at the Department of Road itself are firmly established.

3.5.2 Technical Aspects of Operation and Maintenance

(1) Level of technical expertise of the Department of Road employees

The staffing structure at the Department of Road consists of engineers/technologists (university graduate level), assistant engineers (vocational college graduate level) and other employees (such as accounting clerks and drivers). The institutional arrangement is that those engineers/technologists become administrators at Central Branches/Units Regional Road Directorates, or Division Road Offices, and administers the Department of Road as a whole.

As all engineer/technologist posts are filled at the Division Road Offices that will become responsible for maintenance of Sindhuli Road from July 2018 (at Khurkot, Janakpur, and

Bhaktapur), the institutional setup with engineer/technologist posts is ensured, although each has a few vacancies at assistant engineer posts. As described above, the functions of the Project Office at Ramtar, whose maintenance competency was strengthened by a JICA technical cooperation project, are scheduled to be transferred to the Khurkot Division Road Office, which presumably will enforce the office's technical competencies.

At the time of the ex-post evaluation, the works for repairs of the roads under the Department of Road were supposed to be carried out by outsourcing on a contractual basis. Mainly the engineers/technologists at Division Road Offices supervise the works done by those contractors. At the time of the ex-post evaluation, neither interviews at the Department of Road nor on-site field work confirmed delays or other issues with maintenance due to limited technical level of Department of Road employees.

(2) Strengthening Department of Road employees' competencies

The Road Sector Development Skill Unit under the Planning and Design Branch of the Department of Road carries out training to strengthen competencies of the employees, following the Department of Road's own employee training plan. According to the employees at the said unit, the unit carries out management of the content and quality, and mainly contracts outside lecturers to deliver lectures in accordance with manual(s) and/or guideline(s). However, at the time of the ex-post evaluation, recruiting and contracting outside lecturers were not going smoothly, because the remuneration conditions for outside lectures specified by the Ministry of Finance in 2014 were different from those on the Department of Road's training plan, reducing the unit price of the wage the department could pay the lecturers. The abovementioned unit now uses its own employees as lecturers to carry out a part of the training.

(3) Competencies of Sindhuli Road Maintenance Unit

The terminal evaluation of JICA's "Project for the Operation and Maintenance of Sindhuli Road" suggested that, because of the support by the said project, the Sindhuli Road Maintenance Unit developed the competency to formulate an appropriate Annual Road Maintenance Plan for Sindhuli Road. According to the Department of Road, it takes time to procure the contractors for the range of tasks after the identification of sites needing repairs; meantime the sites needing repairs would further deteriorate. For that reason, the said project supported the development of an institutional aspect in which the Department of Road itself could carry out small repairs. The Department of Road said it intended to maintain that institutional aspect even after completion of the Sindhuli Road Project.

In light of the above, although some adjustments are needed in institutional aspects for future training, maintenance of the project effects is considered technically sustainable.

3.5.3 Financial Aspects of Operation and Maintenance

In accordance with the Roads Board Act of 2002, the costs of road maintenance in Nepal are funded by specific sources, i.e., taxes on fuel and vehicle registration and toll charge to use specified roads. Those funding sources are managed by the Nepal Roads Board. To allocate maintenance cost budget to the Department of Road, the Department needs to follow the process below: first, respective Division Road Offices at the Department of Road formulate their own Annual Road Maintenance Plans, and then the Maintenance Branch of Department of Road consolidate those plans into its Integrated Annual Road Maintenance Plan, which is submitted to the Nepal Roads Board.

Although the Annual Road Maintenance Plan is normally prepared by the Division Road Offices, at the time of the ex-post evaluation, the Sindhuli Road Project also prepared one and received maintenance funding directly from the Neal Roads Board. That is because the Sindhuli Road Project was allowed to formulate its own Annual Road Maintenance Plan for the purpose of maintenance cost application for Section 1 and Section 4. As a result, at the time of the ex-post evaluation, maintenance of Sindhuli Road was funded by the Nepal Roads Board budget as well as from the project cost of the Sindhuli Road Project. This arrangement to receive allocation from two sources will end with the 2017/18 budget. After that, the funding will be provided within the scope of the budget of the Khurkot Division Road Office, which will inherit the responsibilities for the part of Sindhuli Road (the Sections built by this project).

At the time of the ex-post evaluation, there were six forms of categories for budgeting purposes regarding road maintenance in Nepal, as shown in Table 6.[39] According to the information obtained by interviews at the Nepal Roads Board, although budget for Routine Maintenance and Recurrent Maintenance was almost 100% allocated to respective Division Road Offices, according to Integrated Annual Road Maintenance Plan, budget allocation was insufficient for Specific Maintenance, Periodic Maintenance, or Emergency Maintenance.

[39] Routine Maintenance, Recurrent Maintenance, Specific Maintenance, Periodic Maintenance, Emergency Maintenance, and Rehabilitation

Table 6: Forms of Maintenance and Budget Allocation Status

	Form	Content	Budget allocation
1	Routine Maintenance	Weeding, roadside channel clearing, removal of the debris coming down from hillside, etc.	Sufficient
2	Recurrent Maintenance	Small repairs such as repair of small pot holes, tire track depressions, road shoulder damages, etc.	Sufficient
3	Specific Maintenance	Major road surface damage repairs, construction of retaining wall, major roadside channel repairs, installation of new safety fences, etc.	Insufficient
4	Periodic Maintenance	Overlaying of asphalt (low cost road surface treatment) and repainting of signage, etc., that are done every 5 to 8 years	Insufficient
5	Emergency Maintenance	Emergency repairs such as disaster recovery work	Insufficient
6	Rehabilitation	Budget to "catch up" with the periodic maintenance work that had not been done due to budgetary shortcomings (in place since 2012)	Unknown

Source: Documents from the Implementing Agency, and documents from the Nepal Roads Board

In light of the above, although there is no financial issue with Routine Maintenance and Recurrent Maintenance, it is uncertain whether Specific Maintenance and/or Periodic Maintenance can be performed when necessary, and therefore there are some problems with Financial Aspects of Operation and Maintenance.

3.5.4 Current Status of Operation and Maintenance

Routine Maintenance and Recurrent Maintenance are carried out according to the Integrated Annual Road Maintenance Plan. For Routine Maintenance, cleaning contractors are assigned for specific stretches of road[40]. Such tasks as removing landslide debris are meant to be handled speedily by respective Division Road Offices. Recurrent Maintenance tasks are outsourced to contractors. At the time of the ex-post evaluation, the evaluator on an on-site inspection field trip (Dhulikhel—Sindhuli Bazar stretch; Sections 2 – 4) observed some roads with surface damages in the Section 4, which was completed in March, 2003. However, no such damages in Section 2 or 3 were observed. Meanwhile, because of traffic volume greater than that of the demand projection and unanticipated use by overloaded vehicles, sealed road surface was being worn out faster than anticipated. Although the permission has not been granted for large vehicles' operation on Sindhuli Road, the reality is the traffic restriction against large vehicles is not fully complied. The restriction on overloaded vehicles needs to be tightened. One may say that this constitutes more challenges in operation and maintenance of the road.

[40] Called "Length Worker"

In light of the above, some minor problems have been observed in the institutional, technical, and financial aspects of operation and maintenance. Therefore, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned, and Recommendations

4.1 Conclusion

The objective of this project is to reduce travel time and improve transport safety by opening the entire length of Sindhuli Road that connects Kathmandu, the capital, with Terai Plain in Southern Regions and with the Indian border through construction of Section 2 and Section 3, thereby contributing to realizing stable transportation of goods, promoting industries, vitalize local economies, and improving living conditions of the citizens who live along the route.

It was found that this project had been highly relevant to Nepal's development plan and development needs both at the time of planning as well as at the time of the ex-post evaluation, and Japan's ODA policy at the time of planning. Therefore, its relevance is high. Although there were no changes in the length of the road itself, and the project cost was lower than the plan, as the project period exceeded the plan, the efficiency of the project is fair. The distance and time of travel between Kathmandu and Terai Plain were both reduced, attaining the target value. Sindhuli Road has seen increasing traffic volume and has not experienced any road closure due to bad weather: indicating Sindhuli Road is being used as a route to move people and goods, and thus supports Nepal's economy. Therefore, this project has been highly effective and has had high impact. Concerning the sustainability of the effects of this project, although generally there are no major issues, because of a few challenges in institutional aspects, technical aspects and financial aspects, the sustainability of the project effects is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

The road surface is being badly damaged, as the volume of traffic that travels on Sindhuli Road has increased more than the demand projection at the time of planning, and due to lack of sufficient enforcement of the restriction on overloaded vehicles. As a short-term measure, it is crucial to strengthen enforcement of restriction on overloaded vehicles. Other medium- to long-term measures such as road repairs, are desirable to address this issue,.

With regard to maintenance cost, although it may generally be managed on a single fiscal year basis by the Integrated Annual Road Maintenance Plan, for Recurrent Maintenance and other forms of multi-year maintenance, it is desirable to have the budget information of Recurrent Maintenance appear on the Annual Road Maintenance Plan so that the budgetary demands for later years can be grasped.

4.2.2 Recommendations to JICA

Until June 2018, maintenance of Sindhuli Road will be continued to be funded from the Nepalese share of the project costs of the Sindhuli Road Project, therefore it is assumed that a certain level of intensive maintenance actions are possible. At the time of the ex-post evaluation, however, what becomes after July 2018 on some of the institutional aspects of the road maintenance, as well as the ownership of or responsibility for the equipment, etc., provided by the Technical Cooperation project, were not fully clear. Consequently, this matter needs to be followed up.

4.3 Lessons Learned

Significance of grasping the public finance administration system of the partner country in the viewpoint of sustainability

At the time of the ex-post evaluation, the maintenance of the road constructed by this project is funded by the Capital Budget of the Nepalese Government (the project cost) and from a specific fund (Nepal Roads Board). However, the funding source will become limited to the specific fund in two years' time. Consequently, budget allocations for such works as periodic maintenance are highly likely to become insufficient. Generally, in a country that receives Grand Aid cooperation, there tends to be a lack of adjustment between an infrastructure development project funded by Capital Budget and ex-post maintenance plan funded from Current Budget, and this often results in lack of maintenance budget. What JICA should consider to improve the sustainability is to gain a systematic understanding from the basic design stage as to how the partner country government would operate and maintain the road, bridge(s), and/or such other assets developed by the Japanese Government. To achieve this objective, it is important for JICA to become able to grasp the systems related to public finance administration and public investment administration in the partner country government.

End