

Mongolia

FY2015 Ex-Post Evaluation of Japanese Grant Aid Project

“The Project for Construction of Railway Fly-over in Ulaanbaatar City”

External Evaluator: Yuko Kishino and Makiko Oleynikov, IC Net Limited

0. Summary

The purpose of this project is to build a new flyover (hereinafter referred to as the Narny Bridge) across the railway in Ulaanbaatar city, thereby making it convenient for road users of the Middle Ring Road going in the north-south direction, stimulating economic activities, and improving the access to social services. This project has been consistent with Mongolia’s development policies both at planning and the ex-post evaluation phase, while it was also consistent with Japan's Official Development Assistance policy at the planning phase and corresponded to the development needs of constructing an efficient road network in the city. Therefore its relevance is high.

After the project completion, the Narny Bridge has been fully utilized, and the weight limit for vehicles in the north-south direction has been eased. This led to an increase in the transportation capacity. The existing Gurvaljin Bridge and the Peace Bridge has seen an easing of traffic. Traffic has become smoother. Thus the effectiveness and the impact are high. Both the project cost and project period were within the plan, so efficiency is high. Regarding the maintenance of the Narny Bridge, the Ulaanbaatar City Road Department conducts periodic inspection and repairs, while the Ulaanbaatar City Public Service Company¹ conducts cleaning, daily inspections, and general maintenance work, such as pavement repairs. There is only one flyover besides the Narny Bridge in the city, requiring advanced maintenance technology. However, the Road Department has had little experience on planned operation and maintenance. The city’s tax revenue and funds for road and bridge construction and operation and maintenance (O&M) have increased dramatically, and are expected to be secured at a high and stable level. As such, there were no issues in the institutional and financial aspects, though there is room for improvement in the technical aspects. Therefore, sustainability of the project is fair.

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

¹ The former Ulaanbaatar city operation and maintenance management company. It was restructured in September of 2013.

1. Project Description



Ulaanbaatar's flyover (Naryn Bridge)

1.1 Background

Mongolia, nestled between two great powers of China and Russia, is a landlocked country located in an important geopolitical position. Ulaanbaatar city serves as the center of the country's politics and economy, where its gross regional domestic product (GRDP) accounts for 54.5% of Mongolia's gross domestic product (GDP). In recent years, the city has experienced rapid urbanization, where the population doubled from 660,000 (1995)² to 1,330,000 (2014)³. The progression of urbanization caused the society to transform into motorization, where the number of vehicle registrations increased from 42,500⁴ (2000) to 106,848⁵ (2008), surpassing 100,000 cars. With the rapidly increasing population and vehicles, road maintenance and traffic conditions continued to worsen. In particular, the railway, which has been the most important mode of international transportation, had been dividing the industrial zone of the south and the commercial zone of the north of the Ulaanbaatar city. This had been a big interference to building an efficient road network. Under these conditions, to enhance the north-south direction transportation capacity of Ulaanbaatar, it was necessary to build a new flyover as part of the Middle Ring Road.

1.2 Project Outline

The objective of this project in Ulaanbaatar is to facilitate the increase of transportation capacity in the north-south direction by constructing a railway flyover that connects the Ikh Toyruu Street and the Engels Street, thereby contributing to improved convenience by the users of the main road in the north-south directions, to improved access to social services and to a revitalized economy.

² World Bank statistics.

³ World Bank statistics.

⁴ Basic Design Study.

⁵ Basic Design Study.



Note: Red circle indicates project location
 Source: Basic Design Study Report

Figure 1: Ulaanbaatar City and Project Location

E/N Grant Limit or G/A Grant Amount / Actual Grant Amount	3,658 million yen / 3,658 million yen
Exchange of Notes Date (/Grant Agreement Date)	May 2009 / May 2009
Implementing Agency	Ministry of Road Transport
Project Completion Date	October 2012
Main Contractor	JFE Engineering Corporation
Main Consultant	CTI Engineering International Co., Ltd
Basic Design	January 2009
Detailed Design	July 2009
Related Projects	<p>Technical Cooperation</p> <ul style="list-style-type: none"> ● The Project for Capacity Development on Bridge Maintenance and Management (2013-2015) <p>Grant Aid</p> <ul style="list-style-type: none"> ● The Project for Improvement of Water Supply Facilities in Ulaanbaatar (1994) ● Rock Asphalt Road Pavement Construction Plan (1994) ● The Project for Improvement of Roads in Ulaanbaatar (2000) ● The Project for Rehabilitation of Railway Facilities (2000) ● The Project for Construction of the Eastern Arterial Road and Improvement of the Related Equipment (2005) <p>Other International Organizations and Aid Agencies</p> <ul style="list-style-type: none"> ● World Bank: Silk Road A (1995), Silk Road B (2001), Silk Road C (2004) ● Asian Development Bank (ADB): Asian Highway 3-first phase (1996), Asian Highway 3-second

	<p>phase (2000)</p> <ul style="list-style-type: none"> ● ADB / Korea International Cooperation Agency: Asian Highway 3-third phase (2006) ● Kuwait Fund for Arab Economic Development: Asian Highway 83 Route Phase 1 (1996), Asian Highway 83 Route Phase 2 (2004), Local roads (2005) ● Turkey Bank for International Cooperation: Silk Road (2005)
--	--

2. Outline of the Evaluation Study

2.1 External Evaluator

Yuko Kishino, IC Net Limited

Makiko Oleynikov, IC Net Limited

2.2 Duration of Evaluation Study

Duration of the Study: July 2015 – September 2016

Duration of the Field Study: October 18 - October 30, 2015, January 31 - February 5, 2016

2.3 Constraints during the Evaluation Study

None.

3. Results of the Evaluation (Overall Rating: A⁶)

3.1 Relevance (Rating: ③⁷)

3.1.1 Relevance to the Development Plan of Mongolia

During the planning phase, the Government of Mongolia promoted regional and rural development as well as infrastructure development based on the “Good Governance for Human Security” (2001). This flyover project was a part of a middle beltway of the “Capital City Ulaanbaatar Master Plan with 2020 as the Target Year” (2002), and thus had high policy significance. At the time of the ex-post evaluation, the former plan had been modified to match the rapid population growth and “Ulaanbaatar 2020 Master Plan and Development Approach for 2030” (2013) was being implemented. This plan focuses on expansion and repair of the road networks including bridges, with the goal of building 30 flyovers by 2030. The Government of Mongolia has focused on the development of a road network including bridges consistently since the planning phase, so there is a high relevance between the project and the policy.

⁶ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁷ ③: High, ②: Fair, ①: Low

3.1.2 Relevance to the Development Needs of Mongolia

As urbanization continued at a rapid pace, Ulaanbaatar's population of the year the project was planned was 1.07 million (2008)⁸ while the number of vehicle registration surpassed 100,000. The city's road network was insufficient and was not able to respond to the car society. Furthermore, the Ulaanbaatar Railway divided the southern industrial area and the northern commercial area in the heart of the city. Passage between the two areas was possible only through the two existing flyovers, the Gurvaljin Bridge and the Peace Bridge built by reinforced concrete, and two railroad crossings. The Peace Bridge built in 1961 had been aging for quite some time. Large vehicles weighing 15 tons or more were restricted there, and it was unable to secure sufficient traffic function. Against this backdrop, a need to build a new, safe and reliable flyover had been confirmed by the Ulaanbaatar city.

At the time of the ex-post evaluation, the number of vehicles registered in Ulaanbaatar had increased three-fold to 331,564 (2015)⁹ compared to figure from the time of planning. The influx of people to urban areas has been increasing by 3%¹⁰ per annum. As shown in Table 1, Ulaanbaatar City's volume of cargo transport by road occupies 12~34% of that of the whole country, though it depends highly on the surge of construction in the capital and on the transportation of mining resources.

Table 1: Cargo Transport Volume by Road (total) (unit: thousands of tons)

Year	National	Ulaanbaatar City	Ulaanbaatar City's Growth Rate	Ratio of Ulaanbaatar's cargo volume against the national
2009	10,564	3,289	N/A	31%
2010	12,610	2,597	-21%	21%
2011	25,635	3,087	19%	12%
2012	32,899	5,206	69%	16%
2013	28,748	9,878	90%	34%

Source: Ulaanbaatar City Statistics Department

As shown in table 2, the city's passenger transport volume accounted for around 80% of the national figure, and during the year 2009 to 2014, the annual average growth rate was high at 7%. At the time of the ex-post evaluation, the roads and bridges in Ulaanbaatar city were found to be an important transport route. In the east side of the Ulaanbaatar city, in consideration of watershed conservation, etc. there is a need to suppress development compared to the west side. It is expected that the development of the city in the west and southwest, including the access to the new international airport¹¹, will become even more active. The Narny Bridge that connects the south and north is still important because the access to the new international airport

⁸ Ulaanbaatar City Statistics Department

⁹ Ulaanbaatar City Statistics Department.

¹⁰ Ulaanbaatar City Statistics Department.

¹¹ Under construction during the ex-post evaluation.

construction in the western side of the city and development of the south-western areas are expected to surge.

In light of the above, the project was evaluated to have a high consistency between the project and development needs.

Table 2: Passenger Vehicle Transport (unit: million people)

Year	National	Ulaanbaatar	Growth Rate	Ratio of Ulaanbaatar's passengers to that of national
2009	229	199	N / A	87%
2010	247	221	11%	89%
2011	292	235	6%	80%
2012	314	237	1%	75%
2013	304	263	11%	86%
2014	342	285	8%	83%

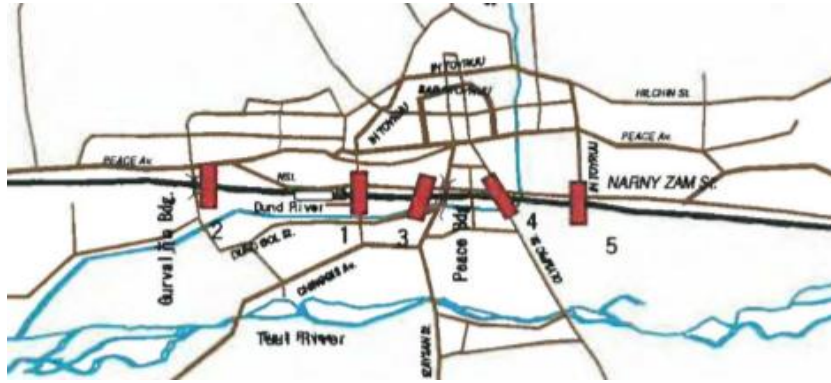
Source: Ulaanbaatar City Statistics Department

3.1.3 Relevance to Japan's ODA Policy

At the time of planning, Japan's aid policy towards Mongolia outlined in "Mongolia Country Assistance Plan" (formulated in 2004), stipulated that Japan's overall goal to support Mongolia's self-help efforts to reduce poverty through sustainable economic growth would be achieved through these four priority areas: (1) support institutional development and human resource development who are the actors responsible for the market economy, (2) support local development, (3) support environmental conservation, as well as (4) support infrastructure development to promote economic activity. This project is consistent with (4).

3.1.4 Relevance to Appropriateness of Project Planning and Approach

Figure 2 depicts the possible locations of the flyover at the planning phase. The five flyover construction alternatives include the Gurvaljin Bridge (No. 2 in Fig. 2) on the west and the Naran Tuul market (No. 5 in Fig. 2) to the east. Priorities were placed according to the flyover's position within the city's network of roads, increase in the north-south road capacity with regards to the railway cross section, connection to the Narny Zam Street, traffic demand, and traffic volume predictions (Table 3). The conclusion was that the railway flyover connecting the Engels Street and Ikh Toyruu Street (No. 1 in Fig. 2) would be the best suited in terms of the connectivity of the networks of city roads, and was predicted that there would be an increase in the north-south traffic capacity of the railway cross section. Both governments decided to construct a four lane flyover that can withstand the increase in north-south traffic and connects the Narny Zam Street. As one can see, the selection was made after due consideration. The project planning and approach could have been appropriate.



Source: Preliminary Study Report

Figure 2: Project Alternatives

As such, this project has been highly relevant to the country’s development plan and development needs, as well as Japan’s ODA policy. The project planning and approach was also appropriate. Therefore its relevance is high.

Table 3: Flyover Alternatives

Map	Position	Contents of the Study
1	Engels Street and Ikh Toyruu Street	Two ideas including what Mongolia requested (large vehicles had no access to the industrial roads) and the loop method that connected large vehicles to industrial road.
2	Gurvaljin Bridge	Replace the bridge due to the significant deterioration of the bridge and terrain around the bridge.
3	Peace Bridge	Because the current bridge seemed to be sufficient for the time being, construction of a parallel bridge was assumed. Since the west has large buildings, the bridge would be built on the east.
4	Olympic Street	Using the current road, consider the development of the railway flyover.
5	Next to Naran Tuul Market	Although there is no road connecting to the south, construct a railway flyover using the Ikh Toyruu Street, which is the loop road in the north.

Source: Preliminary Study Report

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

Table 4 shows the planned and actual output undertaken by the Japanese. Except for a few areas where there were small changes in the detailed design, the project was implemented as planned.

Table 4: Comparison of Planned and Actual Output

Planned Output (basic design study phase) (2008)	Actual Output (2012)
1. Railway Flyover (1) Bridge length: 262 m (2) Type of superstructure: 6-span continuous steel I-girder (3) Erection methods: crane with bent and let-off technical method (4) bridge substructure: - Abutment: reinforced concrete Inverted-T type - Pier: steel multi-pillar type 4 pillars ($\varphi=1.5$ m) - Foundation: cast-in-place concrete pile ($\varphi=2.5$ m), rotary penetration steel pile ($\varphi=1.5$ m) (5) Other facilities: street lighting, drainage	As planned
2. North Approach Road (1) Road length: 280m [interval with retaining wall:110m, interval without retaining wall: 170m] (2) Channelization length: 428 m (east side extension: 223 m; west side extension: 205 m) (3) Other facilities: drainage, guardrail, road marking, street lighting, skid-resistant pavement, delineator, etc.	As planned
3. South Approach Road (1) Road extension:353m [interval with retaining wall: 208m, interval without retaining wall : 145m] (2) U-turn road: 560m (3) Other facilities: drainage, guardrail, road marking, street lighting, delineator etc.	As planned
4. Intersection (1) Number of intersections: 2 locations at the crossing point with the approach road and the Narny Zam Street (2) Other facilities: drainage, guard-pipe, road marking, street lighting, traffic signal, road signboard, etc.	As planned

Source: documents provided by JICA, Ulaanbaatar Road Department responses to the questionnaire



Narny Zam Street under the Narny Bridge western intersection (ex-post evaluation phase)



Ikh Toyruu Street, north of Narny Bridge (ex-post evaluation phase)

The main changes from the detailed design are as follows. They were carried out without any problems. All of the changes intended to respond to the situation appropriately, and all were necessary and reasonable changes.

1. Change in the traffic signal specification and areas of installation: As there was a change in the signal systems, a new signal system was introduced as part of the Intelligent

Transport System¹² (ITS) by the South Korea's technical cooperation. The signals were matched to the newly installed system.

2. Change in the gutter: Since there was a possibility of an increase in the number of vehicles driving over the U-shaped gutter by excessive overtaking, which would add damage to the drainage structure, the U-shaped gutter was changed to an L-shaped gutter in the northern side of the bridge at the east-west junction.
3. Replacement to good quality subgrade material: Since the excavation revealed that there were weak layers in some areas of the west side road in the north of the bridge, soil reinforcement was carried out using good quality subgrade material.
4. Correction of the sliding on the south approach road: A lane was added to the south approach road, and the central divider was constructed. This was planned to be carried out from October 2011 to June 2012 and was carried out without delay.
5. Change in the road marking: Changed the lane marks, partition lines, line type and line width according to the Mongolian standards.

The output borne by the Government of Mongolia is as shown in Table 5. It was carried out without any change or delay.

Table 5: Outputs Obligated by the Government of Mongolia

Planned (at the time of the Basic Design Study) (2008)	Actual
1. To acquire the additional land and establish the margins of the road.	As planned
2. To remove existing utilities.	As planned
3. To make the necessary arrangements for vehicles' detour or diversion at necessary sections during construction.	As planned
4. To level the ground and secure temporary yard.	As planned
5. To secure the site for disposal of wastes.	As planned
6. To make necessary arrangements to control railway operation at sites neighboring the construction work for at least four hours.	As planned
7. To secure electric power for lighting, signals and temporary power.	As planned

Source: Consultant Progress Report

3.2.2 Project Inputs

3.2.2.1 Project Cost

Regarding the total project cost, the evaluation was conducted only with the planned Japanese project cost as the Mongolian obligation amount was unknown. The total project cost was 3,752 million yen, where the Japanese planned project cost was 3,658 million yen, the Mongolian planned project cost was 634 million yen. The actual Japanese project cost was 3,210 million yen, which was within the plan (88% of the plan). The reason that approximately 448 million yen had decreased was because the large crane that was not locally available at the

¹² Refers to a set of information technology systems and that contributes to the improved efficiency of the transportation volume and comfort. It requires an enhancement to the equipment.

time of cost estimation, became available within the country for procurement during the bid phase at a price lower than the planning phase.

3.2.2.2 Project Period

Although the project period at the time of plan, including from the detailed design to the main construction works, was 46 months the performance from January 22, 2009 (G/A signed) to October 16, 2012 (date of completion) was 44.8 months. The actual performance was 97% of the plan including Mongolia's scope of construction works. Though the field work had been limited in the winter from December to March, the construction was completed as expected.

Given the above, this project falls within the plan of both the project cost and the project period, and thus efficiency is high.

3.3 Effectiveness¹³ (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

The project was intended to achieve an increase in the north-south direction transport capacity and a smooth flow of traffic at the newly constructed Naryn Bridge and existing Gurvaljin Bridges and Peace Bridge, located in the central loop of the Ulaanbaatar city. More specifically, it aimed to shorten the travel distance between the Peace Avenue and Chinggis Avenue and achieve a "safe and smooth traffic" that can respond even to an increase in traffic volume for large and heavy vehicles in the north-south direction.

At the time of planning, the weight limit of the north-south direction was expected to be relaxed from 15 tons to 40 tons. With this, it was expected that the risk of road closures would be reduced on the Peace Bridge and Gurvaljin Bridge which were in poor shape¹⁴. Therefore, in evaluating the effectiveness, the evaluators used the annual average daily traffic of the road that connects to the Naryn Bridge as an indicator to verify whether the bridge has been utilized in addition to using the three performance indicators written in the project ex-ante planning table as reference. The evaluators assessed the changes in the annual average daily traffic volume of the Gurvaljin Bridge and Peace Bridge at the time of the ex-post evaluation from the time of planning. By doing so, the evaluators verified the transport capacity of the loop road and the impact of the implementation of the project. In order to verify whether the traffic had become smoother, the evaluators examined the average speed on each bridge and interviewed transportation companies located in Ulaanbaatar city¹⁵ to hear the user's opinion.

¹³ Sub-rating for Effectiveness is to be put with consideration of Impact.

¹⁴ The Gurvaljin Bridge was repaired in 2010 by the city and 40 ton trucks are now permitted to cross at any time of the day.

¹⁵ Interviews were conducted with transportation companies based in Ulaanbaatar city. Five companies were selected randomly from a list of Ulaanbaatar City transportation companies. The evaluators made phone calls to five truck drivers (all male, one person in his 30s, two people in their 40s, two people in their 50s).

(1) Enhancement of the transport capacity of Ulaanbaatar city Middle Ring Road

Performance indicators indicated in the project ex-ante planning table are shown in Table 6. After the construction was completed, all of the targets were met.

Table 6: Performance Indicators of the Direct Effect

Performance Indicators	Baseline (2008)	Target (Completion Year)
Quantity of a safe and reliable flyover*	0	1
The distance between the Peace Avenue - Chinggis Avenue (km)	4.7	1.8
Alleviation of control to heavy vehicles in the north-south traffic (t)	15	40

*The Peace Bridge is limiting the passage of heavy vehicles, while the Gurvaljin Bridge has deteriorated significantly due to problems in the design and construction. By completing the implementation of this project, the risk of cutting off the safe and smooth north-south traffic is reduced.

Source: Project ex-ante planning table

The plan estimated that the annual average daily traffic volume will be 25,600 cars at the Narny Bridge one year after completion if the Narny Zam Street and Ikh Toyruu Street on the north are connected to the Engels Street in the south. The actual annual average daily traffic volume (2013) was almost as planned at 27,000 units, as shown in Table 7 (105% of the plan). Annual average daily traffic volume of the Gurvaljin Bridge continued to increase until 2014, but in 2015, three years after the completion of the project, an alleviation in traffic was observed. At the Peace Bridge near the Narny Bridge, traffic has been easing from 2012, the project completion year. From 2013 onwards, the annual average daily traffic volume stabilized at around 38,000.

Table 7: Annual Average Daily Traffic Volume (unit: vehicles/day)

	Baseline	Target	Actual	Actual	Actual	Actual
	2008	2013	2012	2013	2014	2015
	Plan	1 year after completion	Completion Year	1 year after completion	2 years after completion	3 years after completion
1.Narny Bridge	0	25,600	23,000	27,000	33,000	25,000
2. Gurvaljin Bridge	21,500	20,400	22,100	25,000	31,000	18,200
3. Peace Bridge	48,200	37,900	31,000	38,600	37,200	38,100
4. Ikh Toyruu Street	31,100	39,000	27,000	34,700	31,600	40,000
5.Narny Zam Street (east)	56,300	55,100	28,700	33,500	30,000	41,000
6. Narny Zam Street (west)	29,100	29,600	31,000	34,800	21,700	25,000

Source: Ulaanbaatar City Transportation Center

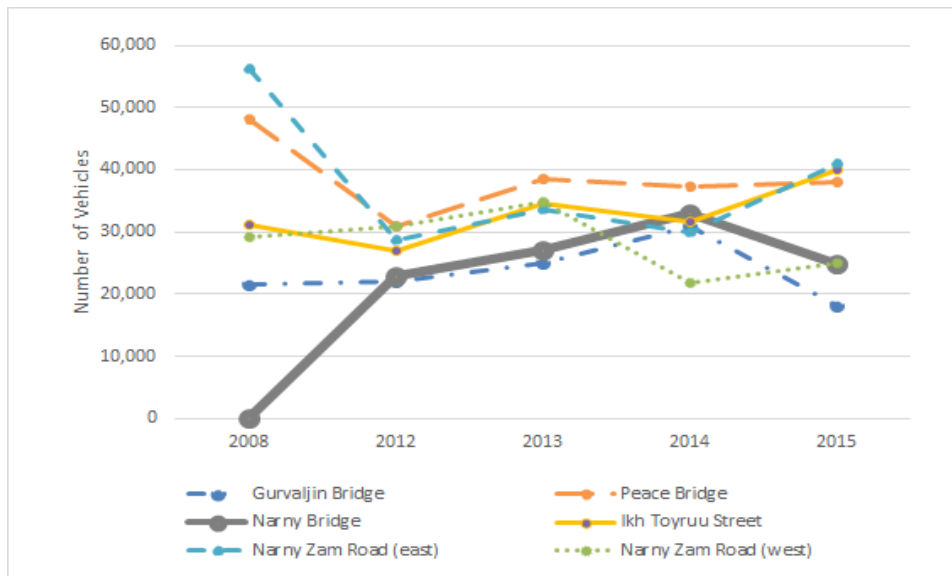


Figure 3: Annual Average Daily Traffic Volume

The annual average daily traffic volume of the road that make up the Middle Ring Road, was 34,700 (2013) on the Ikh Toyruu Street (actual/plan ratio of 102%), 34,800 on the Narny Zam Street (west) (actual/plan ratio of 118%) in the vicinity of the Narny Bridge (2013). Both actual figures were almost what were originally planned. On the other hand, the volume was 33,500 on the Narny Zam Street (east) with an actual/plan ratio of 61%. The traffic has been greatly alleviated from 56,300 in 2008.

The reason for this could be that the Dund Gol Street located on the east of the Narny Bridge (Fig. 4 red line) which used to be two lanes, widened to four lanes in 2013. Also, the Chinggis Avenue (purple line) was widened to two lanes in 2013, as well as the Bogd Mountain Back Road (blue line) opened in 2013. In addition, the street (green line) which passed the east intersection of the Peace Avenue (red dot) was widened from four to six lanes in 2013. As a route connecting the southeastern part of the Peace Bridge to east side of the Narny Bridge was also opened (black line) in September of 2015, it could be thought that the increase in the routes on the east side are likely to have contributed to the decrease in traffic volume.



Source: Ulaanbaatar City Map

Figure 4: Ulaanbaatar City Road Map

The weight limit of the Peace Bridge at the time of planning was 15 tons, and traffic regulations for large vehicles had been implemented. Deterioration of the Gurvaljin Bridge was not as serious as the Peace Bridge and as the weight limit was 40 tons, the ratio of large vehicles was high at above 10%. However, for many years repairs for the Gurvaljin Bridge had not been performed. Therefore, there were parts that had corroded from the exposed concrete reinforcing steel of the main girder, as there were parts of the pier exposed. Rehabilitation of these parts were carried out in 2010. At the time of the ex-post evaluation, the Naryn Bridge has allowed to passage of large vehicles of up to 15 tons from 8am to 8pm and up to 40 tons after 8pm, while the Gurvaljin Bridge continued the passage of vehicles of up to 40 tons at all times. In this way, this project is contributing to the increase in transportation capacity of Ulaanbaatar city Middle Ring Road.

(1) Smoothing of traffic

It was not possible to confirm the change in average travel speed on the Gurvaljin and the Peace Bridge, because the data before the project was implemented could not be obtained from the implementing agency. The travel speed survey conducted during the basic design phase, yielded 22.7 to 23.2 km/h at the Gurvaljin Bridge and 20.1 to 23.4 km/h at the Peace Bridge. It can be observed that it was inevitable to drive slowly during peak hours¹⁶. The survey calculated the average speed from the total distance using the total time that it took to make

¹⁶ Basic Design Study Report (2008) pages 2-5.

loops around the Ulaanbaatar city that pass the Gurvaljin and Peace Bridges in two directions during hours of peak traffic. Because the measurement methods are different from each other, a simple comparison could not be done. However, as shown in Table 8, the average traveling speed on each flyover from 2012 onwards increased around 40 km/h to 50 km/h. The traffic is smoother compared to before the project implementation. After the project was completed in October 2012, there seems to have been a positive impact of this project.

Table 8: Average Travel Speed of Flyover (unit: km/h)

	2012*	2014	2015
Narny Bridge	46.5	N/A	47.7
Gurvaljin Bridge	40.0	N/A	39.9
Peace Bridge	49.5	44.0	N/A

Source: Ulaanbaatar City Transportation Center

*data after the completion of the project

After the evaluators reviewed the results of the interviews for the transportation companies, response included “there was a 25% increase in transport volume” and “traffic congestion was reduced, and the travel time was reduced.” It can be seen that the transportation companies experienced traffic congestion easing first hand through the flyover and road constructions.

Regarding traffic safety, because no planned and periodic maintenance was carried out, Gurvaljin and Peace Bridges had deteriorated significantly. This did not ensure the safe passage of the traffic. The newly constructed Narny Bridge permits large vehicles of 40 tons to pass safely. In the beneficiary survey¹⁷, 90 out of 95 local residents responded that the area near the flyover has become safer in response to the question asking “whether safety has been improved in the vicinity of the flyover after the implementation of this project.” This reveals that the residents’ satisfaction towards safety has become higher¹⁸.

As described above, the transport capacity of the north-south direction seems to have improved. As this facilitation of transportation was achieved, the effectiveness is high.

3.4 Impacts

3.4.1 Intended Impacts

In this evaluation, a beneficiary survey targeting the Ulaanbaatar city residents and data collection were carried out in order to confirm the three impacts that were expected during

¹⁷ The beneficiary survey was carried out on residents who have lived in the vicinity of this project site from the time before the project was implemented. The population was set as approximately 480,000. Twenty-five people each from the northern, southern, eastern and western part of the Narny Bridge of Sühbaatar, Khan Uul, and Bayangol districts, were selected so as to obtain a total number of valid responses of 100. Responses were obtained from two households from each floor of apartment buildings, passers-by near their homes. The interviews were conducted to people older than high school students from Sunday to Saturday during the day. The final number of valid responses was 95, consisting 31 men and 72 women. The breakdown by age groups (percentage) are: five 15-19 years old (4%), 38 20-29 years old (27%), 23 30-39 years old (22%), 11 40-49 years old (11%), 14 50-59 years old (14%), six 60-69 years (6%), 5 70-79 years old (4%), one 80-89 years old (less than 1%).

¹⁸ There were no differences observed in the satisfaction between the men and women.

planning phase. The following are the results.

(1) Improvement of the User's Convenience in the North-South Direction of the Main Road

Population rapidly increased in 2014, and reached 1.4 times more compared to that of 2008 before the project was implemented, in new residential area of the Khan Uul district located in the southern part of the bridge (Fig. 4 light purple)¹⁹. After the project was implemented, in years 2013 and 2014 the districts with the highest population growth rate were in Songino Khaikhan, followed by Khan Uul²⁰.

Table 9: Population Growth Rate of Each District of Ulaanbaatar

	Bayangol District	Bayanzürkh District	Songino Khaikhan District	Sükhbaatar District	Khan Uul District	Chingeltei District
2007	3%	5%	4%	5%	4%	2%
2008	3%	6%	5%	3%	4%	3%
2009	3%	6%	4%	2%	5%	1%
2010	6%	6%	5%	1%	8%	4%
2011	4%	7%	2%	1%	7%	4%
2012	0%	4%	2%	-4%	6%	1%
2013	4%	3%	6%	1%	3%	1%
2014	4%	1%	7%	2%	6%	2%

Source: Ulaanbaatar City Statistics Department

According to the interviews with the implementing agency, the southern side of Ulaanbaatar has an increasing number of construction for new residential area than before the project was implemented. Also, construction of an exclusive residential area has been increasing in the south. In the vicinity of the Naryn Bridge, construction of apartment buildings is swiftly underway. This construction boom is thought to have been the impact of constructing the convenient Naryn Bridge. On the other hand, responding to the question regarding improvement in the convenience of getting to places, 60% of residents living in the new residential area said that access to stores to buy the products improved²¹. It may be possible to think that the project improved the convenience for the users of the north-south main road.

(1) Economic Revitalization and Improved Access to Social Services (decrease in travel time)

Table 10 shows the contents and results of the beneficiary interviews²². The flyover is

¹⁹ Ulaanbaatar City Statistics Department (2015).

²⁰ The central area of Ulaanbaatar city is comprised of six districts (Bayangol, Bayanzürkh, Songino Khaikhan, Sükhbaatar, Khan Uul, Chingeltei). The municipal government office is located in Sükhbaatar district.

²¹ There were no observed differences in the answers between the men and women.

²² There were no observed differences in the answers between the men and women.

utilized well for providing goods and services, access to the workplace. In all cases, the travel time decreased. There were nearly no changes in the transportation methods pre-and post-implementation. Decrease travel time cannot be concluded as either due to the construction of Naryn Bridge. However, compared to situation where the Naryn Bridge did not exist, there was mitigation in the traffic congestion and decrease in distance travelled. It can be inferred that this has improved peoples access.

Table 10: Decrease in Travel Times

Content	Proportion of Naryn Bridge usage	Travel time (before implementation)	Travel time (after implementation)
To the workplace	60%	31 minutes	28 minutes
Transportation of goods and services	70%	32 minutes	26 minutes
To the government offices	30%	23 minutes	20 minutes
To educational facilities	20%	26 minutes	23 minutes
To the hospital	30%	29 minutes	22 minutes
To the market	40%	23 minutes	20 minutes

Source: Beneficiary survey result

(2) Reduction of the environmental burden by reduced emissions

According to the National Meteorological Agency, the average concentration of NO₂²³ until October 2012 emitted mainly by normal car engines in Ulaanbaatar city, was 43µg/m³, while it was 45µg/m³ after November 2012 when the Naryn Bridge opened until September 2015. The decrease of regular vehicle emission could not be confirmed.

Emissions from diesel engines contain a large amount of fine particulate matter (PM10). The average concentration of PM10 in Ulaanbaatar until October 2012 was 221µg/m³, and 182µg/m³ from November 2012, after the Naryn Bridge opened, until September 2015. At the time of the ex-post evaluation, the average concentration of PM10 of the intersections were 187µg/m³ and 175µg/m³ for each of the time periods. Since many of the ger dwellings on the western part of the flyover are burning coal for heating, this is also believed to have led to the mass emissions of air pollutants²⁴. Because the emissions also depend on the direction of the wind, the emissions at the Naryn Bridge is not necessarily due to the vehicles using it.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

During the planning phase, it was thought that the project would have little negative

²³ A fixed-point observation is being carried out every day by the city near the flyover and the intersection of the Peace Avenue. The average NO₂ concentration was 90µg / m³ until October 2012 and 110µg/m³ from November 2012 to September 2015.

²⁴ A ger is a traditional portable dwelling used by nomads in the steppes of Mongolia. In Ulaanbaatar, many people live in these gers owing to a recent population influx. Because there is no central heating, coal is the major heating fuel for the long harsh Mongolian winter. For this reason, the air pollution caused by soot discharged from many gers has been serious.

influence on the environment. In order to reduce the environmental burden during construction, the implementing agency had been submitting the environmental protection plan and environmental monitoring reports of the Naryn Bridge construction to the Ministry of Nature and Environment from October to December of each year. According to these reports, the soil, noise, water quality, air, and sanitary conditions of the workers that were monitored were all within the national standards. Also, safety signage and waste were properly installed and managed. There were no issues against natural environment that were confirmed during and after the project implementation. According to the beneficiary survey, no negative impact on the environment had been indicated. As such, there was no significant impact on the environment.

3.4.2.2 Land Acquisition and Resettlement

During the planning phase, ten land acquisition and one company relocation were planned under the mayoral orders. In October 2008, talks of compensation and costs for dismantling commenced. The company located in the south site had an old building that was encroaching on to the road, and was scheduled to be moved back from the road site. According to the interviews with the Ulaanbaatar City Land Management and Registration Department, following the mayoral order, the city paid the company a compensation, including the dismantling cost based on the market value of the site and buildings an approximate sum of 450 million MNT (about 29million yen²⁵). However, the company only responded to the dismantling half of the building. After a year and a half, because the relocation and removal were as not completed, the police were mobilized on May19, 2011 and a forced displacement was carried out. According to the interviews to the Land Management and Registration Department, there were no problems between the residents and the city in the process of land acquisition in regards to the ten cases of land acquisition.

However, the two ger households that were squatting had not registered the land from 2005 to 2009 after the land ownership law was enacted in 2003, so they were outside the scope of compensation²⁶.

3.4.2.3 Unintended Positive/Negative Impact

In terms of the traffic safety on flyover, the changes in the number of traffic accidents were checked on the Naryn, Gurvaljin and Peace Bridges. This had increased since 2014 on all of the bridges. This is due to the 2013 amendment on the automobile insurance law that requires drivers to report any accidents, even small accidents, to the police. According to interviews with the Traffic Police station, the actual number of accidents did not increase. While traffic volume has been increasing due to the implementation of the project, no serious accidents have

²⁵ 1 MNT = 0.065 yen (as of 2009).

²⁶ However, at the time of the basic design, both the city and the owners of the gers agreed to suspend the permit to use the land and had agreed to hand over the land before construction started.

increased, and thus has not generated negative impact. In addition, the results of the beneficiary survey show that 10 out of the 95 respondents complained about the noise and vibration from the flyover and the surrounding roads during the construction phase, but there were no other positive or negative impacts indicated.

As described above, nearly equal amount of actual traffic volume as expected was achieved on the Naryn Bridge, and an easing of the traffic volume was observed on the existing Gurvaljin and Peace Bridges. Nearly the same amount of traffic volume as planned was achieved on the approach road. Thus, the project's objectives to mitigate traffic and increase transportation capacity in the north-south direction were achieved. As the Naryn Bridge is part of the loop through the city center, it is thought to play a role in improving access to social services. Therefore effectiveness and impact are high, because the effects that were planned were mostly produced through the implementation of this project.

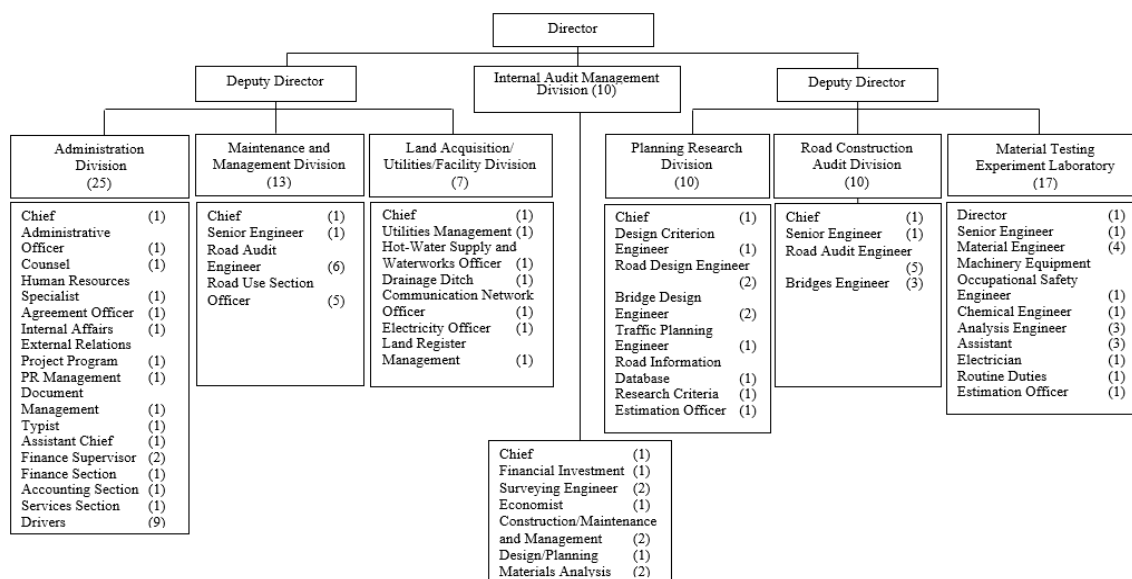
3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

As expected from the planning phase, the project implementation unit, comprised of the Road Construction Section of the Road and Transportation Policy and Coordination Department under the Ministry of Road and Transport was responsible for the managing the construction until the completion of the bridge in October 2012. After the hand off, the Naryn Bridge was transferred to the Ulaanbaatar city Road Department, where the Operation and Maintenance (O&M) Division has been implementing periodic inspections ever since. An organizational chart of the Ulaanbaatar Road Department is shown in Figure 5.

The composition of the Operation and Maintenance Division of the Road Department remained the same as during project planning with one manager, one senior engineer, six road test engineers, four road use section officers, with a total of 13 personnel. The Road Department outsources small-scale repair and urgent rehabilitation of the bridge maintenance work to state-owned or private companies. A planned preventive management through inspection of bridges, planning, repair, and evaluation based on the "Bridge Management Cycle" has not started. To respond to this situation, JICA implemented the "Project for Capacity Development on Bridge Maintenance and Management in Mongolia" from 2013 to 2015. The project established a system that first trained master trainers in areas such as bridge inspection, bridge health evaluation, bridge repair method selection, and bridge maintenance management database. Then the master trainers carried out the technology transfer to others. This way, the technology transfer would spread efficiently throughout the country. From the Road Department, five people participated in the project, of which two passed the master trainer certification exam. At the time of the ex-post evaluation, there were ongoing discussions to secure bridge O&M personnel within the organization. Thus, there appears to be no problem with the institutional

structure.



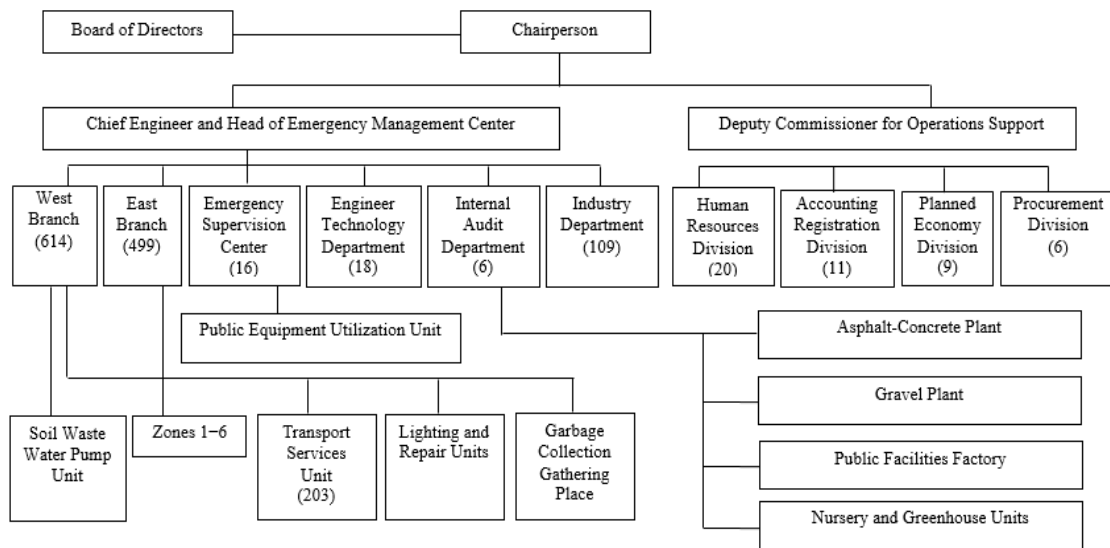
Source: JICA reference

Figure 5: Road Department Organizational Chart (no changes since 2013)

In September 2013, three municipal companies that were responsible for road cleaning and repair of drainage and ditch embankments, greening, and cleaning were merged to create the Ulaanbaatar City Public Service Company. It has an agreement with the Ulaanbaatar City Operation and Maintenance Division to carry out maintenance work such as daily inspections and cleaning, cleaning of approach roads and sidewalks, restoration of damaged road facilities, traffic management facilities, signal, road signs, and cleaning of drains on the 240 km of the 645 km of the total city road²⁷. The organizational structure includes 900 - 1,100 staff. The city divided by zones into six jurisdictions and two branches for the east and west. There are 30 – 70 people placed in each zone. Cleaning of the Narny Bridge is the responsibility of the 5th zone of the West Branch. In regard to bridge repairs, the Ulaanbaatar City Public Service Company lists the areas for repair through their daily inspection in the previous year, which is inspected again to determine the need for repair by the engineer of the city’s Operation and Maintenance Division. This is reflected in the annual contract at the beginning of the year. There are no issues with the institutional aspects of O&M including contract management.

The organizational chart of the Ulaanbaatar City Public Service Company is shown in Figure 6.

²⁷ Annual contract for the cleaning of the road including bridges. The outsourced amounts are 7.894 billion MNT (2014), 6.588 billion MNT (2015). Large-scale bridge rehabilitations are outsourced to 7-8 road and bridge inspection repair companies, while simple repairs are outsourced to the Ulaanbaatar City Public Service Company.



Source: Ulaanbaatar City Public Service Company provided material

Figure 6: Ulaanbaatar City Public Service Company Organizational Chart



Daily inspection and cleaning
Removing a business poster
(At the time of ex-post evaluation)



Pedestrian intrusion ban sign around the
pedestrian stairs of the bridge
(At the time of the ex-post evaluation)

3.5.2 Technical Aspects of Operation and Maintenance

Bridge projects and maintenance in Mongolia, including the Ulaanbaatar city, have low priority compared to that of roads. The city²⁸ has 70 bridges, of which 70% are 50 m or shorter. Compared to the city's roads, there are fewer and smaller bridges. Therefore, bridge experts need a comprehensive and in-depth knowledge on bridges ranging from simple bridges to

²⁸ In Ulaanbaatar city, 93% of the bridges are made of concrete. Two bridges, including the Naryn Bridge that opened in 2012, are made of steel, while one bridge is wooden. The oldest bridge in Ulaanbaatar was built in 1960. In recent years, there has been an increase in the replacement of old bridges and construction of new bridges. 43% of the bridges there were built after 2000. The bridges are relatively short; 71% of the bridges are less than 50 m long. (Source: Project for Capacity Development on Bridge Maintenance and Management in Mongolia Project Completion Report)

flyovers. The Narny Bridge, in particular, is one of the few steel bridges in Mongolia, and to institute proper maintenance, additional training is required. Development of an O&M system in the Road Department that includes medium- and long-term budgeting process has become a pressing issue.

Under such circumstances, the Ministry of Road and Transport and the Road Department are working on the establishment of technical standards, and are expected to standardize them in the medium- and long-term, in order to institute the O&M specialized for bridges proposed by the “Project for Capacity Development on Bridge Maintenance and Management in Mongolia.” In addition, through that project, a database of all of the bridges of Ulaanbaatar was created. At the time of the ex-post evaluation, this database is functioning without any problems²⁹. The Ulaanbaatar City Public Service Company West Branch that is responsible for the day-to-day cleaning has no issues with technical aspects because no special technology is required for cleaning and painting, and etc. As described above, the Operation and Maintenance Division has minimal expertise required for operations, but it is necessary to develop their expertise. Thus, the technical aspects has room for improvement.

3.5.3 Financial Aspects of Operation and Maintenance

The financial trends and the breakdown of Ulaanbaatar City Road Department and Ulaanbaatar City Public Service Company are analysed. The budget of Road Department shown in Table 11 is comprised of general revenue, city road fund, funds from the Mongolia Development Bank, regional development investment fund, and the national budget. The budget has been experiencing volatility in the recent years.

Table 11: Budget of Ulaanbaatar City Road Department (unit: millions of MNT)

	2013	2014	2015	2016 (estimated value)
Ulaanbaatar general revenue	116,117	89,291	53,515	21,126
Ulaanbaatar road fund	15,528	26,833	30,945	33,979
Mongolia Development Bank	221,279	27,200	7,475	9,898
Regional development investment fund	N/A	N/A	4,175	N/A
National budget	16,066	5,346	N/A	250
Total	368,990	148,670	96,110	65,253

Source: Ulaanbaatar City Road Department

According to the interviews with the Road Department, the general revenue of the city has been decreasing because of the slowing of the economy from 2014 causing a decrease in tax revenue. On the other hand, the city road fund has been increasing due to the tax rate hike in

²⁹ Although the Road Department had a road maintenance database that had been developed by ADB in 2005, at the time of the ex-post evaluation, there were not sufficient updates performed. According to the Department staff in charge of the database, the database usability was poor and the data from 2011 to 2012 is insufficient.

2014. As the allocation from the Mongolia Development Bank is determined by the investment projects on a yearly basis, there is a volatility. The Regional Development Investment Fund, which was established by the Mongolian government in 2013 was a measure to encourage foreign direct investment. There is a budget allocation on an irregular basis to the Road Department. The national budget is related to the finances of the country, and majority of revenue depends on mineral resources such as coal and copper, and due to the influence on fluctuations in the international prices of mineral resources, the allocation to Ulaanbaatar also is affected.

The Ulaanbaatar Road Fund was established for the purpose of stabilizing the financial resources of the road sector. The municipal government collects vehicle tax, annual license procedure fees, and road tolls³⁰ to carry out the road maintenance. Table 12 shows the execution of the fund. As one can see, there is a significant increase in 2014 due to the tax rate hike. In particular, the road maintenance cost has increased by six fold compared to that of 2011, and after 2012, it had remained a high level. From this fund, 500 million MNT is distributed annually as a bridge maintenance budget. In addition to this, a part of the national budget has been appropriated for replacing and large-scale rehabilitation work on the major bridges.

Table 12: Expenditure of the Ulaanbaatar Road Fund (unit: Millions of MNT)

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
- Road maintenance	1,303	2,432	2,454	2,704	3,948	1,948	11,774	12,433	13,083	16,221
- Road construction	1,528	388	1,404	1,777	966	5,715	N/A	364	10,651	7,841
- Traffic control	N/A	60	46	694	N/A	279	550	150	212	330
- Traffic safety	248	290	299	350	778	478	650	2,580	2,886	6,553
- Other	200	547	149	338	328	1,040	971	N/A	N/A	N/A
Total	3,279	3,717	4,352	5,863	6,020	9,460	13,945	15,527	26,832	30,945

Source: Ulaanbaatar City Road Department

On the other hand, the Ulaanbaatar road and bridge maintenance budget, in particular the maintenance budget of main roads had increased ten-fold from 2012 to 2013 (Table 13). According to the interviews to the implementing agency, the Road Department has been following the master plan and conducting a targeted rehabilitation and repair work on significantly dilapidated roads and bridges. In 2015, the bridge O&M cost³¹ was 5.508 billion MNT, which was 1.7 times more than the estimated O&M cost of 3.219 billion MNT.

³⁰ Two toll booths located in the east and west part of Ulaanbaatar.

³¹ In the JICA "Project for Capacity Development on Bridge Maintenance and Management in Mongolia" the estimated bridge O&M costs would be 3,219 (2015), 4,500 (2016), 4,740 (2017), 13,684 (2018), 9,340 (2019), 5,388 (2020) (all millions of MNT).

Table 13: Ulaanbaatar Road and Bridge O&M Budget (unit: millions of MNT)

Breakdown / Year	2008	2009	2010	2011	2012	2013	2014	2015
Main roads and bridges	1,040	1,600	1,614	1,877	1,200	12,323	12,833	13,704
Roads in the gers and residential areas	728	500	1,220	3,345	8,315	3,205	3,000	9,400
Total	1,768	2,100	2,834	5,222	9,515	15,528	15,833	22,104

Source: Ulaanbaatar City Road Department

After the Ulaanbaatar City Public Service Company reorganized, the road maintenance budget was allocated according to the road area. According to the Ulaanbaatar City Public Service Company, the actual budget was 22.376 billion MNT³² in 2014, while it is expected to be 24.8 billion MNT in 2016 for the jurisdiction of 4.8 million square meters, and for the future, the budget will remain high. Therefore, it is thought that there are no issues with the financial aspects of the O&M. In summary, judging from the road bridge maintenance costs within the city's finances, and the Ulaanbaatar City Public Service Company's recent budget increases, there are no issues with the financial aspects of the O&M.

3.5.4 Current Status of Operation and Maintenance

The Ulaanbaatar City Public Service Company provided the following answers on issues pointed out in the defect inspection report in 2013. During the site reconnaissance, out of the five points that was indicated in the defect inspection report, the evaluator was able to confirm the re-installation of signage that prohibits pedestrians and repair of damaged portions of the safety fence.

Findings	Response
Clean drainage of the bridge and approach road	Carrying out every June and August
Remove and clean anti-freeze to steel parts	Carrying out cleaning and removal every spring
Repair damaged parts of the safety fence of the bridge, replace lost parts, and conduct continuous maintenance	The safety fence has been repaired. Performing daily inspections and monitoring.
Re-install pedestrian intrusion prohibition sign	Implemented without delay
Replace damaged curb and interlocking	Implemented from areas that require it.

Although there were several cracks found on the approach road, the Ulaanbaatar City Public Service Company repairs the areas they decided required repair in the following year. The cracks are expected to be sequentially addressed. Periodic inspections in principle are to be carried out every three years, but according to the Road Department, because of the deficiencies in inspection equipment, there have been no prospects just yet. Immediate action is required to resolve this issue, because early detection of problems through periodic inspection is imperative in order to extend the life of the bridge.

³² The Ulaanbaatar City road maintenance budget in Table 13 does not include the budget of Ulaanbaatar City Public Service Company.

In light of the above, some minor problems have been observed in terms of technical aspects. Therefore, sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The purpose of this project is to build a new flyover across the railway in Ulaanbaatar city, thereby making it convenient for road users of the Middle Ring Road going in the north-south direction, stimulating economic activities, and improving the access to social services. This project has been consistent with Mongolia's development policies both at planning and the ex-post evaluation phase, while it was also consistent with Japan's Official Development Assistance policy at the planning phase, and corresponded to the development needs of constructing an efficient road network in the city. Therefore its relevance is high.

After the project completion, the Naryn Bridge has been fully utilized, and the weight limit for vehicles in the north-south direction has been mitigated. This led to an increase in the transportation capacity. The existing Gurvaljin Bridge and the Peace Bridge has seen an easing of traffic. Traffic has become smoother. Thus the effectiveness and the impact are high. Both the project cost and project period were within the plan, so efficiency is high. Regarding the maintenance of the Naryn Bridge, the Ulaanbaatar City Road Department conducts periodic inspection and repairs, while the Ulaanbaatar City Public Service Company conducts cleaning, daily inspections, and general maintenance work, such as pavement repairs. There is only one flyover besides the Naryn Bridge in the city, requiring advanced maintenance technology. However, the Road Department has had little experience on planned operation and maintenance. The city's tax revenue and funds for road and bridge construction and operation and maintenance have increased dramatically, and are expected to be secured at a high and stable level. As such, there were no issues in the institutional and financial aspects, though there is room for improvement in the technical aspects. Therefore, sustainability of the project is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

This project was highly rated on four items, but rated as fair on sustainability. The reason behind this is while the Naryn Bridge is made of steel, many of the city bridges are short and made of concrete, making it necessary to allocate specialists with high degree of expertise for the O&M of the Naryn Bridge. In order to improve the technical level of O&M, it is necessary to develop the human resources over a long time. The JICA technical cooperation demonstrated the importance of an institutional strengthening on preventive and systematic plans for O&M,

inspections required for road and bridges O&M, evaluation of the inspection results, improvement of technology regarding the preparation for a repair plan, and developing a relevant database, for bridges including simple bridges and Naryn Bridge comprehensively.

In order to further strengthen the bridge O&M capacity, it is desired that the implementing agency utilize the results of the technical cooperation such as the bridge O&M and inspection training, bridge inspection manual, bridge condition evaluation, bridge repair, and operation of the bridge database.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

Plans to comprehensively support the Road Department until the establishment of an O&M system

There has been a dissemination of the concept of bridge O&M cycle through the technical cooperation “Project for Capacity Development on Bridge Maintenance and Management in Mongolia” and support to improve the bridge O&M capacity. Support for both infrastructure and capacity building led to a synergistic effect, resulting in a high overall rating. But in general, it takes a long time to establish an O&M management system. Therefore, JICA regional department, JICA overseas office, and the implementation agency should develop a comprehensive support strategy to establish systems and technology required in the long term from the planning stages of a grant aid. It is desirable then to be able to implement this support through a scheme that is appropriate at each step. After implementation of the technical cooperation on O&M, to the extent that the budget permits, it is important to implement the next phase of the bridge maintenance technical cooperation project or send bridge experts to Japan for the bridge engineer training or dispatch a bridge expert to give technical guidance for long-term human resource development, or implement an additional policy support.

End