Kyrgyz Republic

Bishkek-Osh Road Rehabilitation Projects (I) (II)

External Evaluator: KRI International Corp.
Nobuko Shimomura

Field Survey: September 2008

1. Project Profile and Japan's ODA Loan

Map of project area

Bishkek-Osh road

1.1 Background

The Kyrgyz Republic is a landlocked country in the northeast portion of Central Asia. Located at the western edge of the Tian Shan, her southern border extends to the Pamir Mountains in the heart of the Eurasian Continent. Nearly half the size of Japan, 94% of the republic's land is mountainous terrain. Bishkek, the capital of the Kyrgyz Republic, is the country's political and economic hub with a dense population of 840,000. The largest city after Bishkek is Osh (population 250,000), located in the Fergana valley in the south, the country's major agricultural area. These two cities' GDP accounts for nearly half of the total for the nation, home to 80% of the country's industry. However, transportation between the two principal cities is severely constrained by the country's alpine topography, as steep mountains of 3,000 meters in altitude lie between them.

An artery road called the Bishkek-Osh Road passes through four out of seven provinces, linking the country's two major population centers. Although the road benefits a large proportion of the public—about half of Kyrgyz's population—it was barely maintained due to social disruption in the country after it attained independence from the Soviet Union in 1991. Given this situation, machinery for maintaining the road had been critically degraded by the late 1990s and some damaged pavement had been left unattended. Furthermore, some mountain pass sections remained unpaved. During winter, the temperature can drop to -40 degrees at some points. Lack of proper machinery and equipment to maintain the road also undermined efficiency and safety, as there were delays in rehabilitation from the damage caused by frequent snow disasters and avalanches.

The Bishkek-Osh Road is also a part of the Great Asian Highway, which extends from Bishkek to Kazakhstan and Russia in the north and from Osh to Uzbekistan and Tajikistan in the south. The highway is the most critical road for Kyrgyzstan, a country that depends mostly on road transportation for its domestic and international transportation, and therefore needed to be rehabilitated at soon as possible. Given the circumstances, the Asia Development Bank (ADB) decided to implement this project as a co-financed program with Japan's ODA loan, after conducting a final feasibility study on the entire road, including a part covered by this project in 1994.

1.2 Objective

The purpose of the project is to enhance the efficiency and safety of road transportation by partially rehabilitating an artery road connecting Bishkek and Osh. This was to be accomplished by procuring the machinery and equipment required for road maintenance,

thereby contributing to economic development in Kyrgyz Republic. The targeted zone of the road is 166 kilometers out of approximately 620 kilometers that requires an immediate response.

1.3 Borrower/Executing Agency

Government of Kyrgyz Republic / Ministry of Transport and Communications (MOTC)

1.4 Outline of Loan Agreement

	Phase I	Phase II
Loan Amount/ Loan Disbursed Amount	3,016 million yen/ 2,533 million yen	5,250 million yen/ 5,050 million yen
Exchange of Notes/ Loan Agreement	March 1997/ March 1997	October1998/ October 1998
Terms and Conditions	Main: Interest rate: 2.3%, repayment period (Grace Period): 30 years (10 years) General untied Consulting service: ADB fund	Main: Interest rate: 1.8%, repayment period (Grace Period): 30 years (10 years) General untied Consulting service: Interest rate: 0.75%, repayment period (Grace Period): 40 years (10 years) Bilateral tied
Final Disbursement Date	June 2002	December 2006
Main Contractors (with 10 hundred million yen or above)	Suusamyr-Inter JV, Keyson Construction Co. (Iran)	Entes Indust'l Plants Const.& Erection Contracting Co., Inc. (Turkey)
Consultant Services (1 hundred million yen or above)	Carl Bro International a/s (Denmark), funded by ADB	Japan Overseas Consultants Co., Ltd. (Japan), Kyrgyzdortransproject (Kyrgyzstan), Kyrgyz TREC International (Kyrgyzstan)
Feasibility Study (F/S), etc.	ADB F/S (1995) SAPI (1998)	ADB F/S (1995)

2. Evaluation Result (Rating: B)

2.1 Relevance (Rating: a)

2.1.1 Relevance at the time of appraisal

The “Public Investment Plan 1997-1999” explains that the Bishkek–Osh Road was first on the list to make use of the donor’s financial resources for road rehabilitation project, due to its being the longest among Kyrgyzstan’s eight international routes (total length: 2,242 kilometers) and having several mountain passes. These inevitably require technological guidance and funds from international society. However, because of the difficulty in procuring new machinery and equipment, road maintenance was literally left abandoned. Therefore, about 60 % of the entire road needed urgent rehabilitation, and securing the needed machinery was a pressing issue.

In Kyrgyzstan, generating hydroelectric power for export is considered extremely vital. Hydropower resources are concentrated in area along the Bishkek–Osh Road where an offshoot of the Naryn River branches off and stretches east to west across the country. Therefore, three hydroelectric power plants had already been constructed in the vicinity of the 400 kilometer point from Bishkek. Nonetheless, transporting the necessary machinery and equipment to the site required rail transportation from Russia or Uzbekistan and then road transportation on the Bishkek–Osh Road. This resulted in serious difficulties in refurbishing power plants after Kyrgyzstan’s independence, as it strictly constrained the carrying capacity of motor trucks (10 tons) under poor road conditions. Further, due to prolonged driving times, refurbishment costs for the power plant had been adding up.

Even worse, border disputes between Kyrgyzstan and Uzbekistan arose after the collapse of the Soviet Union, making border crossing complicated in terms of time and cost. Before the disputes, there was an effective bypass for the Bishkek–Osh Road, which entered the neighboring country of Uzbekistan and passed through its capital city of Tashkent. Although a 1995 feasibility study indicated that the detour added about 80% in terms of distance, the additional costs incurred were only around 50% thanks to the fairly flat terrain and good road conditions. Since border issues compromised the advantages of the international bypass, the domestic Bishkek–Osh Road linking the country's north and south became a focal point for political reasons and for its reduced distance.

At the time of appraisal, the urgency of this project had already been recognized. Further, this project was designed as a co-financed program with the ADB, and the Kyrgyz government had consistently looked to rehabilitate the entire road. Consequently, the project's effectiveness was significantly enhanced by rehabilitating sections not covered by this project. As a result, the relevance of the project was considerably high.

2.1.2 Relevance at the time of evaluation

According to the "Public Investment Program 1998-2000", the project originally included an expenditure of approximately 214 million US dollars for the transportation sector, which accounts about 30% for the entire investment amount (695 million US dollars). Also, it was expected that the project would invest in the road sector for an amount equivalent to 70% of the transportation sector amount. A total of 121 million US dollars (approximately 80% of the road development budget) was allocated for the rehabilitation of the Bishkek-Osh Road.

According to the "National Development Strategy 2007–2010", the transportation, construction, and the agricultural sectors were specified as targets for growth, following the power sector. The report further specifies various strategies: execution of the Bishkek-Osh Road Project III and other projects for artery roads, relegation of road maintenance works to the private sector, technological cooperation for improving maintenance, and continuous procurement of machinery and equipment for maintenance.

In addition, Kyrgyzstan had had a derailed project to newly construct hydroelectric power plants in Kambarata, upstream of the Naryn river. Kambarata is located at the halfway point between Toktogul and Karakol, where this project took place. Two power plants were planned during the Soviet era [I (1,900MW) and II (240MW)]; however, the project was rescheduled due to difficulties in funding. The mega-project was a national project intended to sell electric power to Russia, Kazakhstan, China and Pakistan. The Kambarata project was finally launched in 2008 owing to the benefit of a reduction in drive costs, which further cut construction costs for the power plants. Following Phase I and II construction, the Phase III construction was completed with help of the Islamic Development Bank, which provided financial aid. This resulted great contribution for enhancing effectiveness of the Bishkek-Osh road rehabilitation project.

For all of these reasons, the execution of this project was considered to fully conform to development needs and policies both at appraisal and ex-post evaluation. The relevance of this project is therefore considered outstanding.

2.2 Efficiency (Rating: b)

2.2.1 Output

The target section funded by the ODA loan extends from the 248 kilometer point to the 412 kilometer point from Bishkek. Although the design needed to be modified from the perspective of safe operation, the entire project for road rehabilitation was executed as planned. A total 184 of units of machinery for road maintenance (such as bulldozers and trucks) were procured during Phase I and additional machinery and equipment for safety management was procured during Phase II, as they were not planned at the time of appraisal. Consulting services were provided along with financial aid by the ODA loan project exclusively during Phase II, providing relevant services as planned: bid tender, execution maintenance, safety operation guidance, effectiveness monitoring for the project, and project

evaluation.

The feasibility study of the executing agency (Ministry of Transport and Communications, MOTC) was carried out with the technical assistance and cooperation of the ADB. The review revealed the necessity of design modifications to fully reflect the result of investigations of bedrock and geologic conditions at the time detailed designs were created. An additional investigation to ensure safe operations was executed accordingly. This required road replacement construction instead of rehabilitation around the 360 kilometer point from Bishkek, where there is a steep slope with sharp turns. Furthermore, other points where land slides and falling rocks occur frequently also required additional construction installing gabion baskets and severing slopes to make them more solid. On top of this, as more flood prevention facilities were needed, the original design was drastically reformed; for example, earth excavation for just the 37 kilometer section in Phase I increased by 72 % of the original contracted figure.

Fig 1 Map of project area

Project machinery and equipment were procured when construction rehabilitation started. However, due to the drastic changes in the project design, the number of pieces of machinery and equipment actually procured increased over the original contracted amount. Due to desperate shortfalls in the necessary machinery for construction, increasing the number of pieces of machinery as much as possible was justified, using the surplus from currency gain and the public tender bid. During Phase II, some additional safety control machinery was procured. This was a part of an accident response for a massive avalanche involving eighteen vehicles, resulting in 150 meters of snow-buried road. The accident occurred in February 2004 when the project was reaching its final stage. On the advice of a consultant, the MOTC requested a satellite communication system, safety control machinery, snow blowers and other equipment to enhance the ability to cope with unexpected situations such as snow avalanches and falling rocks. Equipped with these devices, the predictability of snow and rainfall improved in accuracy. In line with this additional procurement, a satellite communication system was installed in Bishkek and four other road maintenance offices on the project road in 2006, after construction was finished. As a result, changes in project outputs—particularly design modification—contributed to improvements in safety operation.

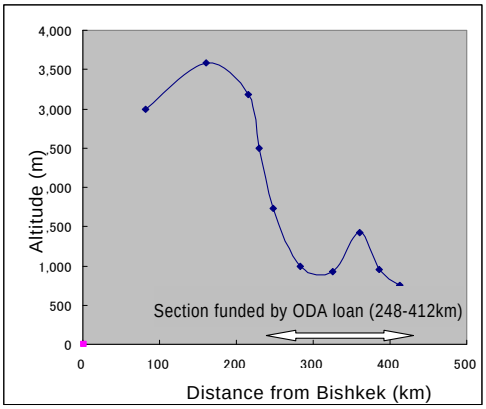


Fig 2 Altitude of project area

Figs 1 and 2 were created by an evaluator using relevant data

The road before construction rehabilitation
(Photo by project consultant)

The road after construction rehabilitation

2.2.2 Project period

Originally, the expected period of the civil engineering work for this project was: Phase I: 30 months from July 1996 to December 1998, and Phase II: 33 months from April 1999 to December 2001. However, completion of both phases was seriously delayed: Phase I: July 2001 (61 months, 203% of the original plan), and Phase II: December 2005 (77 months, 233% of the original plan). The primary reason for the massive delay in the two phases was modification in output (see preceding paragraph for details). Additionally, the approval procedure for design changes on the Japan side consumed a significant amount of time.

Secondly, the person in charge of the executing agency was completely unfamiliar with the system of international project operation, having only knowledge of the obsolete Soviet-style construction control system. He introduced the international competitive tender bit system to the project for the first time, and it was also his first experience supervising contractors by hired consultant. Furthermore, because he was short on experience in negotiating with local consultant firms, a barrage of superfluous adjustments were required. With regard to machinery procurement as well, a Kyrgyz company, the winner of the tender bid with keen price competition, he lacked sufficient experience in handling large-scale machinery procurement. The company was over-dependent on Russia for supplying machinery, resulting in a devastating delay in procurement. This was caused by paralyzed material production in Russia following a major economic crisis. To make things worse, the Kyrgyz border with Uzbekistan was closed during construction because of a political dispute that arose in the neighboring country. This created substantial inconvenience in material transportation by detouring traffic.

Thirdly, frequent snow avalanches and landslides caused further delays in construction. Even worse, the 2003 winter was extraordinarily severe, causing another one-month delay in construction, which resumed in spring after three-month winter break.

Even though project completion was painfully delayed due to numerous unforeseeable factors, it is inappropriate to underestimate this project by simply focusing on the difference with the expected period at the time of planning. Most of the delay was attributable to the design modifications brought about by an insufficient preliminary feasibility study, which failed to fully consider safety control issues.

Kok-Bel pass in winter
(Photo by project consultant)

Rock fall during construction
(Photo by project consultant)

2.2.3 Project costs

Project costs for Phases I and II respectively were 84% and 96% of the planned costs respectively, and the project can be considered well-managed in terms of cost efficiency. Even though some factors contributed to boosting project costs (such as a surge in oil prices, construction delays, and inflated construction volume), they were offset due to lower contract prices than expected and vulnerable currency status. After the completion of Phase II construction in 2006, the executing agency requested additional machinery procurement for safety control, hoping to make good use of the surplus. The request was approved on an ex-post basis and a satellite communication system was immediately procured.

The project achieved most of its expected output and planned project costs. Since the project period was significantly prolonged due to numerous factors, the efficiency rating of this project was judged to be moderate.

2.3 Effectiveness (Rating: a)

2.3.1 Traffic volume and characteristics

Traffic volume is a fundamental indicator measuring the operational effectiveness of the road. At the time of appraisal, the Asian Development Bank (ADB) prepared a survey of the actual traffic volume in 1995 and assessed future volume for the roads, including a section funded by the ODA loan. The ADB also validated actual traffic volume to issue a report after the completion of the project. According to the survey and report, the actual traffic volume had almost reached the values projected at the planning stage. However, critical difficulties were found in accurately grasping traffic volume since there were several data sources: 1) a database compiled by MOTC with help of the World Bank, 2) a database issued by the Administrative office of the Bishkek-Osh Road, which is currently in charge of maintenance of the project, and 3) a traffic survey recorded at two tunnels. Although data from the three sources demonstrated similar trends, they conflict each other in the details. In the light of this, our traffic volume analysis was conducted based on a database compiled with help of ADB and the World Bank.

The ADB issued revised projections for traffic volume at each project completion: 2002 for Phase I and 2005 for Phase II. The revisions were made based on actual values from the past. Table 1 shows the revision results. In 1995, the average daily traffic volume for each section was less than 700 vehicles per day. In 2005, after the construction completion, actual traffic volume jumped nearly 2.5 times from 1995, marking a 9% annual growth rate in average daily traffic volume (vehicles per day) over the past 10 years. This means actual traffic volume has been growing 4% to 15% faster than traffic volume projected by the ADB at the planning stage in 1995.

Table 1: Trend in Actual Values and Comparison of Average Annual Daily Traffic (vehicle/day) with Projected Values

Project Section	1995 Actual traffic volume	1997 Actual traffic volume	2000 Actual traffic volume	2005 Actual traffic volume	2005 Traffic volume projected at the time of planning	2008 Revised projected traffic volume	2008 Traffic volume projected at the time of planning
Phase II A: 248－327km	691	1,350	1,376	1,676	1,608	1,926	2,071
Phase I: 327 - 361km	691	752	959	1,640	1,489	1,849	1918
Phase II B: 361－412km	640	1,196	1,455	1,710	1,480	1,916	1,906

Source: ADB's project appraisal reports and project completion reports for Phases I and II. Data partially made by evaluator

Table 2 Average Annual Daily Traffic (vehicle/day) by Vehicle Type on the 280–450 km point from Bishkek

Year	Passenger cars	Micro-buses	Motor-coaches	Mini-trucks	Medium trucks	Heavy trucks	Trailer trucks	Total
2000	763	17	25	20	55	327	72	1,279
(%)	59.7	1.3	2.0	1.6	4.3	25.6	5.6	100
2005	986	37	18	56	79	358	106	1,640
(%)	60.1	2.3	1.1	3.4	4.8	21.8	6.5	100
2006	1,154	29	0	46	68	354	103	1,754
(%)	65.8	1.7	0.0	2.6	3.9	20.2	5.9	100
2007	1,204	31	0	48	72	363	106	1,824
(%)	66.0	1.7	0.0	2.6	3.9	19.9	5.8	100

Source: MOTC

In order to grasp the fluctuation in traffic volume by vehicle type, this report is based on Kyrgyz's national road database compiled by the MOTC with help of the World Bank. The database is based on actual traffic volume values. According to the database, the proportion of motor coaches, trucks and trailer trucks was confirmed to have fallen at the 280-450 km point from Bishkek, including the project section funded by the ODA loan. This reflects the rapid increase in passenger cars, which account for over 60% of all traffic. At the time of appraisal in 1995, although the proportions slightly differed depending on section, the overall proportion of passenger cars was less than half and pickup trucks accounted for a large proportion. After construction started, the number of passenger cars surged. Today, passenger cars rose more than expected in traffic volume due to reduced driving risks for small cars at night and during winter thanks to road rehabilitation. This trend can be seen in the flood of privately-run taxies and press management of a state-run bus company.

2.3.2 Traffic speed and road surface conditions

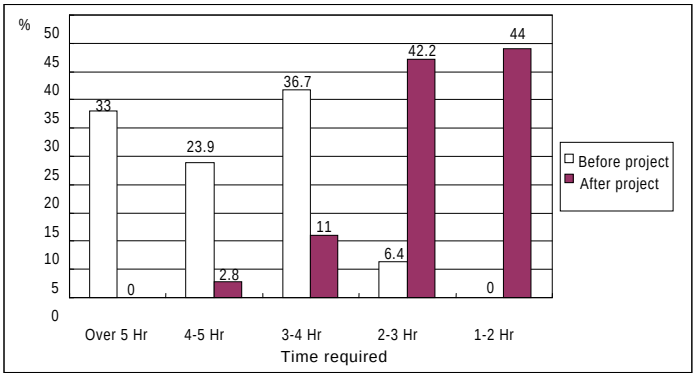
The amount of reduction in driving time varies according to section and vehicle type; however, the required driving time for passenger cars is thought to have been reduced by nearly half compared by the period before road rehabilitation.

Previously, ten hours were required to travel from Bishkek to Karakol by car. It now takes only five hours, which can be interpreted to mean that average vehicle speed has doubled. This project took place in the town of Bihkek, and Karakol, known for its hydroelectric power plant, located 386 kilometers from Bishkek. The average traffic speed became twice as fast as it had been. This figure was verified through in-person interview investigations with drivers[1].

[1] Interviews with road users (drivers) were conducted at three points: target section of Phase I (Uchterek),

In these investigations, 50% of drivers responded that they previously needed at least four hours to drive to Karakol from Toktogul (approximately 96km, see figure 3); however, after rehabilitation, nearly half of drivers responded that they need just one or two hours and nearly 90% of drivers responded they can arrive in Korakol within four hours.

Fig 3 Driving Times from Toktogul to Karakol (approx. 96 kilometers) (Number of respondents: 109, Unit: %)



Source: Beneficiary survey

With regard to the International Roughness Index (IRI)[2], a worldwide standard for measuring pavement smoothness, a section funded by the ODA achieved an average of 1.91[3] (at the time of the completion in 2005), which was lower than the average of 2.11 for the other sections of the Bishkek–Osh Road. A lower IRI is better in terms of passenger comfort as it represents pavement smoothness.

According to the drivers that participated in the interview, road conditions were too poor prior to rehabilitation for normal passenger cars—particularly in some of the mountain passes. At the time, Russian-made heavy vehicles dominated Kyrgyz roads. However, in 2008, when driving a car on the road for this evaluation, the car shook for some time due to deteriorated pavement. In the drivers' interview, some road surface subsidence and cracks were reported.

A change driver attitudes was also reported: now, more people drive at night or in wintertime. Previously, most drivers were afraid to do so for safety reasons. In the interviews, drivers indicated some points for improvement: widening of the narrow road, eliminating sharp turns, and installing more guardrails and parapets. They also mentioned that even after the project is completed, some sharp corners need mirrors or lights installed, not enough sidewalks are installed (even in residential areas), and sufficient road width is not ensured. Even today, the road leaves much to be improved, for example, when driving at night or during winter. One key fact demonstrates this problem: Kyrgyz's Interior Ministry still hesitates to allow an MOTC bus company to provide bus service in wintertime on a section with mountain passes for safety reasons.

2.3.3 Impact on traffic accidents and disasters

The main concern in interviews with roadside residents and drivers was increasing traffic accidents. According to the MOTC, the number of traffic deaths per 10,000 vehicles in all of Kyrgyzstan has nearly doubled: 23.2 deaths in 2000 versus 42.8 in 2007. These figures suggest that urgent and fundamental measures are needed for traffic accidents, not only for

---

Section A of Phase II (Toktogul) and Section B (Karakol). The number of respondents was 109 classified into five groups by vehicle type: heavy truck, mini truck, buses, microbus, and passenger car, and were sampled according to the proportions of traffic volume by vehicle type.

[2] The IRI is the ratio of a vehicle's accumulated suspension motion against the distance traveled by the vehicle while constantly running at a certain speed. This indicates comfortable ride quality, with a value of 2 serving as the benchmark. The average value for Japanese expressways is around 2.

[3] Data provided by an execution unit of the World Bank.

the Bishkek-Osh Road but also on roads throughout the country. Although traffic accident data before road rehabilitation is not available, an increasing number of accidents is obvious (see table 3). In the 9-month period since the beginning of 2008, 82 traffic accidents have been already reported. As transportation fatalities and classified data by vehicle type for traffic accidents were only available after 2005, it is enough to suggest the annual traffic death has increased from 30 to 50 level. In traffic accidents classified according to accident type, car-to-car accidents accounted for the biggest share at 36.2 %, followed by pedestrian-car accidents (33.4 %), single-car accidents (20.1 %) and damage-only accidents (10.2 %). The most common causes for traffic accidents in the country were speeding and violation of driving regulations. Interviews with local policemen and residents clearly showed that poor driving manners were the main cause of accidents. As a countermeasure, damaged vehicles are demonstrated on the side of the road to call attention to safety; however, no immediate effect has been seen so far.

According to driver interviews, “Constant fear of traffic accidents” decreased by over 50% after project completion (see table 4); at the same time, the response of “No fear at all” has increased. Further, data analysis indicated that more accidents occurred at specific locations. Interviews with drivers apparently suggested that measures must be taken for blind corners, caving roads, and other dangerous spots in addition to driver carelessness. Therefore, the establishment of an effective system to promptly respond to road safety issues (e.g. installing mirrors on corners and proper maintenance of road surfaces), is required.

Table 3 Number of Traffic Accidents on sections funded by ODA Loan (242-412 km point)

Year	2002	2003	2004	2005	2006	2007
Number of traffic accident	49	86	64	72	71	98

Source: Made by Evaluator based on the MOTC data

Table 4 Drivers’ Fear of Traffic Accidents, Landslide or Rock Falls

(Number of respondents: 109, Unit: %)

	Fear of a traffic accident		Fear of a landslide/rock fall	
Situation	Before project	After project	Before project	After project
Always fear	69.7	14.7	67.9	48.6
Fear in winter only	14.7	22.9	14.7	19.3
Fear during heavy snowfall only	3.7	19.3	0.9	7.3
Fear during rain only	2.8	15.6	2.8	3.7
No fear at all	9.2	27.5	13.8	21.1
Total	100.0	100.0	100.0	100.0

Source: Beneficiary survey

Further, avalanches with a snow volume between several hundred cubic meters and some thousands of cubic meters occur in the vicinity of the Bishkek-Osh Road as frequently as ten times per year. To cope with these natural disasters, it is critical to predict avalanches in advance, blockade roads as needed, and remove snow immediately after the disaster. To ensure safe road operation, a satellite communication system has been procured for five points to aid in weather monitoring and emergency communication: namely, the capital of Bishkek, the Thuash tunnel, Arabel, Toktogul, and Karakol. Thanks to improvements in road blockade procedures and preparation of snowplows, disaster prevention activities can now take place for snow, debris flow, and fallen rocks. At the time of appraisal, roads were blockaded an estimated thirty out of 150 days during winter. However, according to interview investigations with drivers after the execution of this project, more than half of drivers answered they no longer experience blockades at all. A quarter of drivers answered that they experience one a month, and slightly above 20% said they experience them several times a month. Overall, it has been confirmed that the frequent blockades no longer take place in

+

Kyrgyzstan.

2.3.4 Economic analysis

At the time of completion of this project, the recalculated Economic Internal Rate of Return (EIRR) for each zone for Phase I yielded a slightly low result and a high result for Phase II. Calculation of EIRR for each zone includes zones funded by the ODA loan at the time of ADB's appraisal and project completion.[4] Table 5 shows these references. Prior conditions for EIRR calculation are as follows: cost factor as project costs and administrative/maintenance costs, benefit factor as cost savings for driving and reduction in drive time, and project life factor as twenty years after completion of construction.

Satellite communication system installed at Thuash tunnel

Phase I demonstrated relatively low recalculated figures at the time of project completion. This is because rehabilitation of the Phase II zone was still incomplete even after construction was completed, and traffic volume stayed stagnant for some time due to prolonged closure times during construction. Further, delays in construction and spikes in materials costs also resulted in adverse consequences. However, at the time of construction completion for Phase II, recalculated figures were high, as more people tried to curtail driving costs after rehabilitation due to escalating fuel costs versus the time of appraisal. Other factors that contributed to boosting the recalculated figures are the ripple effect of economical growth in the Kyrgyz Republic overall and reduced drive times.[5]

Table 5 EIRR at the time of appraisal and project completion

Target zone	At appraisal	At project completion
Phase I (including zone funded by ADB: 138km)	10.35%	9.7 %
Phase II: entire road	16.0%	17.5%
Zone funded by ODA loan 128km	17.1%	20.1%
Zone funded by ADB 128km	14.3%	15.0 %

Source: Executive report (Phase I, II), Appraisal document for Phase I, II of ADB's project, and project completion report

As stated above, traffic volume has increased in recent years after completion of rehabilitation in the entire zones. Furthermore, improvement in driving speed, shortened required time, and shorter road closure times during winter were also confirmed. Consequently, the effectiveness of this project can be considered high as it achieved the expected effects.

2.4 Impact

2.4.1 Impact on Local Economy

The Bishkek-Osh Road is an arterial road with an entire length of approximately 620km, connecting four states located in the north and south of Kyrgyzstan. This project certainly had an extensive impact on Kyrgyz's socioeconomy by cutting the time required for traveling and commodity distribution as well as reducing costs. Therefore, the beneficiaries are considered

[4] Construction zones funded by the ODA loan and ADB project are situated next to each other. Both zones include rough spots such as the same level of mountain paths and tunnels. It is said that there are no significant differences between these zones in terms of construction per assumed unit, maintenance cost, and potential benefits.

[5] At the time of appraisal of this project in 2008, the ADB prepared a project completion report for Phase III (including 120km for reaching Osh and 125km of secondary roads). At the same time, the ADB implemented an economic analysis for the entire project road once again, issuing a revised figure of 12.2%. Target time span for calculation: 1996 (since the commencement of Phase I construction) to 2027.

to be the more than 2.5 million people which is about half population of Kyrgyzstan. In order to understand the socioeconomic effects of this project, interview investigations were conducted at various places, including cities and towns in Jalal-Abad State other than where the 166km-road was constructed using the ODA loan. Further, to ensure investment accuracy, the evaluation visited the state capital Jalal-Abad (an exception to this project) to confirm the impact on the local economy.[6] Located between Bishkek and Osh, Jalal-Abad State is a rich farming area producing 15% of Kyrgyz's farming GDP. It is also an area with abundant hydropower resources, producing 90% of the power in Kyrgyz. Among Jalal-Abad's population of 98,000, some 120,000 are living along the Karakol project area, in Toktogul prefecture, and in nearby cities. To know the impact of road rehabilitation and the socioeconomic situation, interview investigations were conducted with approximately 100 residents living the project area.

Income per capita for farmers, who account for about 70% of all workers in Kyrgyzstan, was slightly above the national average for all farmers. However, approximately 80% of recipients admitted that their income had increased recently and trade volume of farm products had increased through improved access to market due to road rehabilitation and easier access to farming land far from their residences. This suggests that land transactions, including agricultural land and long-term leasing, have also activated, resulting in revitalized commercial activities (e.g. coffeehouses and shops selling honey and other agricultural products, and hotels).

Furthermore, more people are now able to commute to larger cities for work thanks to road rehabilitation. This has brought significant benefits to residents by increasing work opportunities. Previously, people working at the hydropower plant had to prepare another house to stay in, since the plant is located 40-50 km away from the town of Karakol. The hydropower plant is the largest industry in the area. Now that road rehabilitation has been implemented through this project, people can now commute to the plant by car or bus from their houses. Consequently, the transportation sector including taxi has improved its services, which is also highly valued. As just described, this project largely benefits the agricultural and service sector; however, the manufacturing sector has remained stagnant due to market loss in the former Soviet bloc and a flood of cheap commodities from outside countries.

Although data regarding trends in international cargo for the Bishkek-Osh Road was not available, it has been confirmed that cargo volume for all of Kyrgyzstan with neighboring countries increased after the project. An origin-destination survey (OD survey) shows a significant number of foreign drivers from Russia, Kazakhstan, and other countries use the Bishkek-Osh Road to deliver agricultural products from the south to Bishkek or even further to Kazakhstan and Russia, or to deliver building materials from north to south. Nonetheless, as Kyrgyzstan has territorial issues with neighboring Uzbekistan for exclaves as well as issues with water utilization rights, international trade with Uzbekistan is still stagnant.

To cite a successful case for revitalization in domestic transportation, a Northern-based chain supermarket opened stores in Jalal-Abad and Osh after completion of construction in 2006. According to the store manager, frequent distribution and stock management of groceries and perishable foods would never have been possible without completion of this project. In addition, the supermarket is now able to sell high-value-added products from the south, such as a famous mineral water produced in Jalal-Abad, in the northern Kyrgyz market.

Also, as verified in an interview with a coffee shop owner, more tourists have been driving on the Bishkek-Osh Road (see table 6) since completion of the road rehabilitation. Kyrgyzstan's famed tourist spots are lined up along the secondary and tertiary roads. Besides

[6] Sampling tests were conducted to verify the impact of this project on residents living along the project road, attaching importance to diversity of residents' background: namely, farmer, self-employed, or educated (teacher, doctor, and bureaucrat). Further, extra consideration was given to include women in resident interviews, since interviews with drivers only included men. At the same time, interview investigations were conducted at a bus company, taxi drivers' association, hospital, junior high school, college, hydropower plant, and road maintenance office at the execution agent. Furthermore, in order to understand the project's impact on Kyrgyz's socioeconomy, additional interviews were conducted with the state governor, private company employees and others while visiting the state capital of Jalal-Abad.

roadside natural scenic resources (including a dam lake), there are a number of mountain resorts: Fergana valley in the south, lakes in springs, and a horseback-riding resort in Jalal-Abad. The town of Jalal-Abad is a resort with a mineral spring, popular among holidaymakers from Kyrgyzstan. The town of Osh, with its historical bazaars, will attract more tourists as security is restored in near future.

Table 6 Number of tourists in Jalal-Abad and Kyrgyzstan

	Foreign tourists		All tourists	
Year	2003	2007	2003	2007
Jalal-Abad state	900	1,200	30,000	57,400
Nationwide	116,900	129,600	703,500	826,100

Source: National Commission for Statistics

Toktogul tank

Airplanes and railroads are the most popular means of travel linking Bishkek and Osh. Since airfare between the two cities costs about 90 USD and taxi or bus costs only half that, ordinary people prefer to travel overland. Moreover, because scheduled flights for domestic cities are only available for Osh in Southern Krygzstan—not even for the relatively large-sized town of Jalal-Abad, most people living in Jalal-Abad depend on land transportation for domestic travel. Traveling time for various destinations has been shortened by road rehabilitation, and people now have more transportation options, such as buses and taxis. This has led to price competition among transportation companies. A vast number of residents have welcomed the increase in the number of privately-owned transportation companies following road rehabilitation.

2.4.2 Impact on Local Society

According to the beneficiary survey, improved access to hospitals, markets, and educational institutions is highly appreciated. Additional interviews with various hospitals indicated that they now have more patients from remote places and eventually were able to mitigate overcrowded patients for a certain period of time. For medical consultations during the night or off-hours as well, the burden on medical staff has been significantly reduced, as public transportation (including buses and taxis) is now available for a greater number of patients. In terms of transferring patients with severe symptoms to larger cities like Bishkek, before rehabilitation hospitals had to use an airplane an average of twice a month. This costly transportation placed a heavy burden on hospitals. However, after completion of this project, hospitals were able to transfer patients by land. Although no official statistics were available for the mortality of pregnant or parturient women, according to medical staff interviewed, the rate has been improved by 10 to 15% due to shortened transfer time. At the same time, however, new problems have now emerged among local small hospitals due to the climbing number of traffic accidents; more patients from distant places avoid their responsibility to make payments, and some hospitals suffer a chronic shortage in stocked medicines.

In addition, students studying at junior high schools, higher educational institutions (extension campuses), and medical staff can now participate in training programs held in Bishkek. Consequently, more people can enjoy a wider variety of educational or career options.

Although the satisfaction level remained at 70-80% for direct employment opportunities and income growth, satisfaction for this project in general resulted in almost 100%.

2.4.3 Impact on Environment

Since nature of this project was rehabilitation, there was no need to obtain new land. Further, since the vicinity of the project area was scarcely populated, no relocation for residents was required for the rehabilitation project. According to drivers and coffee shop owners who participated in the interviews, construction noise and airborne pollution were almost completely resolved after completion of construction. However, mud flow during rain

and waste problems would be the next issue to be solved in the coming days.

2.5 Sustainability (Rating: b)

2.5.1 Executing agency

2.5.1.1 System

As a MOTC's subsidiary, the Administrative office of the Bishkek-Osh Road is in charge of maintaining the Bishkek-Osh road together with its secondary and tertiary roads. At their Bishkek HQ, 24 specialists and 664 technicians are allocated to eight road maintainence offices, in addition to another 150 skilled engineers who are working at two tunnels and an axle weight design station. Besides the HQ, a considerably large office is established in Jalal-Abad. The section funded by the ODA loan project is under the supervision of Road Maintenance Office No. 23 in Toktogul and Office No. 30 in Karakol.

Interview with farmers

Interview at local stores

At the time the project, a project execution unit took control of construction progress and data management. The execution unit had a high-end technician with an excellent command of English and computer literacy, being employed at a higher salary in comparison with the standard MOTC compensation system. However, at the completion of the project, the entire management unit was transferred to the Bishkek-Osh Road Maintenance Office. Regretfully, at the road maintenance office, a significant portion of data was filed in non-digital form, although the offices possessed some computers supplied by various donors. The data that need to be digitalized are: a traffic volume survey as a basis for a road maintenance budget plan, an equipment maintenance book, and others. With regard to the academic background of some 2,000 MOTC employees working for the road maintenance office, almost 40% of them are college graduates and have completed vocational school courses. This ensures their technical skill at some extent; however, 70% of them are 40 years old or older. In general, elder people often hesitate to adapt innovative technologies such as the computer. Unsurprisingly, with the majority of elder workers, data was not systematically managed in digital form. Handling the flood of paper data creates a mess; faxed documents from local offices printed on photosensitive paper are filed but has been already discolored, a significant portion of paper data are kept in stock for only three years and not readily accessed for even important surveys. Furthermore, key data from local offices (e.g. traffic volume, road surface conditions, machinery and equipment management) has not been collected in an efficient manner. This inappropriate data management makes database building difficult; however, the database is still needed at MOTC HQ to form the road maintenance plan and budget control. So far, the World Bank and the ADB have attempted to introduce software for road plans and management; however, the software has not been fully utilized. Today, data is scattered by projects aided by respective donor. The traffic volume survey conducted under this plan is representative of MOTC's problem, and it is obvious that no effective survey on traffic volume has been conducted after completion of this project.[7] Moreover, there is an increasing trend for MOTC technicians to out-migrate to Kazakhstan or Russia seeking higher wages. In comparison with 1991 levels, at the time of Kyrgyz Republic's independence, only 60% of the needed personnel were secured. MOTC's top management is concerned about the shortage in technicians, because it could be their most serious problem followed by the budgetary deficit.

[7] Field investigations proved that the periodic traffic volume surveys are fatally flawed in terms of reliability; e.g., investigation period and observation place are inconsistent, traffic volume survey for two sides includes the only the count for a single side.

2.5.1.2 Technological capacity

Since the Soviet era, Kyrgyzstan has consistently used the same old road pavement design standard. However, after the disintegration of the Soviet Union, the Kyrgyz government adopted a new efficiency-oriented design standard for road pavement to receive aid from voluntary international organizations. Today, the new standard is uniformly applied to the country's newly-rehabilitated roads. This project primarily focuses on roads where rehabilitation is needed due to serious damage caused by severe weather conditions: rock falls due to torrential snowfall or rainfall, distorted ground due to corrosion, and stretching road cracks due to severe temperature fluctuation. Given this situation, disaster preventive measures were extremely vital in that they established a maintenance system through periodical monitoring of mounds, slope, drainage channels, etc. According to the executing agencies, the best human resource development program for their technicians was the OJT program provided by foreign consultants and contractors, followed by an HR training seminar provided by voluntary international organizations during the post-Soviet era. A significant number of technicians who participated in these programs have become primary contributors to other road rehabilitation projects with the aid of their improved techniques in road rehabilitation. Furthermore, through the experience gained through this program, MOTC top officials played a key role in Kyrgyzstan's effective use of the construction and tender bit management system through legal reform.

2.5.1.3 Financial status

Given the strategic position granted by the Kyrgyz government, the Bishkek-Osh Road was allocated a preferential budget for maintenance, which increased by seven to eight times over a 10-year period (based on local currency "Com", described as KGS). However, with increasing demand in its secondary and tertiary road maintenance, the Bishkek-Osh Road project has suffered from a funding gap for a prolonged period. A road fund established when the project was inaugurated was financed by tolling from transit companies and corporate road users. It is currently on general revenue as per Finance Ministry policy, despite the fund's repeated requests for a shift to road-specific revenue sources.

Tunnel constructed at 415km point from Bishkek

Meanwhile, starting November 1996, the road fund has collected a transit fee at two tunnels. This allows the fund to raise the tunnel maintenance costs that are expected to become a greater burden in the near future. The transit fee is collected at two toll booths installed at two tunnels: Thuash (144km point from Bishkek) funded by the ADB, and Karakol (386km point from Bishkek) funded by the ODA loan.

Reflecting gradually increasing traffic volume, tolled revenue for 2007 reached 38 million KGS (equivalent to approximately 100 million USD).[8] However, the total amount of tunnel transit fees is considered too low in comparison with actual traffic volume, even after excluding full or partial exemptions such as hospital, pensioners, MOTC employees, and other entitled persons or bodies.[9] To solve this, transparency must be improved in terms of

[8] Vehicles paying the tunnel transit fee only accounts for 40 to 60% of the actual traffic volume. MOTC explains that this is because vehicles in various categories are exempted from tolling. Establishing a transparent fee system is a main concern for the future in order to build a sound financial foundation for the maintenance budget.

[9] Annual traffic volume for Karakol tunnel for 2007 is reported as 521 vehicles/day (including 9 foreign vehicles/day). This suggests that a significant portion of vehicles is exempt from the transit fee, which widely conflicts with the data shown in table 2: Average Annual Daily Traffic of 1824 vehicles/day. In the meantime, transit fees fall into five categories, e.g. domestic passenger vehicle: 45KGS (equivalent to approximately 1.1USD), foreign passenger vehicle: 5USD.

tolled amounts and traffic volume and this information must be digitally filed and disclose to the public. Although it is legally specified that tolled tunnel transit fees can be used exclusively for tunnel maintenance, the excess fees are still actually spent on other purposes, such as transportation fees for the required machines and equipment purchased.

Reform in the road sector was launched in the late 1990's with help of various aid providers and has continued persistently up until now. This was when this project was started. Because of the reform, 30% of the entire budget for the road sector is allocated to maintenance and indirect departments. In a related move, it was strongly encouraged that full use be made of the private sector for the maintenance and administrative works. With an eye on future privatization, MOTC is now implementing preparatory action by establishing a "Road Organization Privatization Strategy" and introducing an independent accounting system for local road administrative offices. In line with this strategy, in 2006 the Kyrgyz government hammered out a fundamental shift to increase the road-related budget. Therefore, no major obstacles are found in budget allocation for road maintenance for this project.

2.5.2 Operation and maintenance status

It is assumed that the bare-bones improvement work required to maintain the road has been implemented on the Phase I section (more than six years after completion) and Phase II section (more than three years after completion). However, according to interviews with drivers, caving roads and surface cracks are found in certain places. Also, while admitting to drastic improvement in comparison with the period before road rehabilitation, some recipients demonstrated their concerns about maintenance and traffic accident measures to address the soaring traffic volume. Therefore, by utilizing firmly managed data, creating a procurement plan for necessary machines and equipment, as well as ensuring a budget must be accelerated to further enhance the monitoring system. Also in 2007, the MOTC started to fine overloaded motor trucks to mitigate road damage, particularly caused by medium-to-large-sized overloaded trucks. To cope with an increasing number of medium-to-large-sized trucks, the MOTC started full-fledged operation of axle weighting stations in 2007. The MOTC eventually collected 9.3 million KGS (equivalent to approximately 225 thousand USD) in fines for the first year. This punitive move was particularly effective. The MOTC estimates the number of overloaded vehicles will steadily decrease in the coming years.

In addition, as a part of a technical guidance program, the JICA started to provide consulting services for maintenance/administrative budget planning and policymaking. The international organization dispatched two road policy advisers to Kyrgyzstan after 2008 to offer related consulting services. In the future, the plan is to monitor the IRI indicator on regular basis in the project section to enhance road policymaking. JICA's road maintenance performance improvement project was also launched in 2008. This will provide technical guidance to local road maintenance offices that suffer from difficulties in digitizing data, equipment, and road condition information.

Although the executing agency won a certain amount of praise in terms of technical aspects, there is much to be improved in terms of data management and digitization of the management system, which is crucial for road maintenance. Even after assistance was provided by the ADB, the World Bank, and other organizations—on top of the technical assistance that has been provided since the 1990's—MOTC's planning performance still has significant room for additional improvements. The unreliable traffic volume survey represents MOTC's inferior performance. It may be that assistance from the voluntary international organization lacked continuity or consistency. Reflecting this situation, the executing agency's road maintenance system based on their way of data management has become deadlocked. It is expected that more budget will be allocated to road maintenance and significant improvements may take place with help of Japan's technical guidance; however, it is still true that the MOTC requires more assistance in terms of data management and planning in the coming days. Therefore, this project is faced with the worrying execution system of maintenance and administrative scheme, thus the project's sustainability is considered moderate.

3. Feedback

3.1 Conclusion

Although there is room for improvement in the sustainability of the executing agency's structure, the project in general can be considered highly appropriate. Also, effectiveness and impact can be considered excellent. Consequently, this project should receive a high evaluation.

3.2 Lessons Learned

N. A.

3.3 Suggestion for the MOTC and transport police

1. For the increasing number of traffic accidents repeatedly pointed out by the beneficiary survey, the MOTC has only granted that specific vehicles require special permission, policing overloaded vehicles, and unlawful possession of public roads within land secured for road construction. This means that the MOTC is not in a position to police careless drivers who violate traffic regulations. It is crucial that traffic accidents be curtailed by promoting traffic regulation education with help of the police department, which is granted the necessary power.

2. Although there is an enormous quantity of paper data, opacity remains in traffic volume analysis, calculation for future maintenance and the administrative budget, and tunnel transit fees. For the primary reason of failing to adopt adequate software, the most telling factor is the staff's considerably poor computer literacy. Leaving inappropriate data management unimproved has exerted a negative influence on accurate maintenance budget planning and scheduling. This requires improvement without delay.

Comparison of Original and Actual Scope

Item	Planned	Actual
1. Output	I: 38km of 318-362km point from Bishkek, II: 128km of 248-325 km point and 361-412km point	I: 37km of 325-362km point from Bishkek, II: 128km of 248-325 km point
	Machine/equipment procurement I: 75 units and 93 units	Machine/equipment procurement I: 84 units and 100 units II: Satellite communication system and machines and equipment needed for road construction/maintenance
	Consulting Services II: Providing assistance for bid tender, execution management, operation and management, guidance for safety management and measure, monitoring for effectiveness of the project, project evaluation	Consulting Services II: Providing assistance for bid tender, execution management, maintenance, operation and management, guidance for safety management and measures, monitoring for effectiveness of the project, project evaluation
2. Period Civil engineering work	I: July 1996-December 1998 (30 months) II: April 1999-December 2001 (33 months)	July 1996-July 2001 (I) (61 months) II: August 1999-December 2005 (77 months)
Equipment procurement	I: July 1996-November 1997 (17 months)	July 1996-December 1998 (I) (30 months)
3. Project Cost (Total) Foreign currency (including ADB loan) ODA Loan portion	10,024 million yen (I) 14,130 million yen (II) 3,016 million yen (I) 5,250 million yen (II)	75.99 million US dollars (I) 110.89 million US dollars (II) 2,533 million yen (I) 5,050 million yen (II)
Exchange rate	1 USD =107.81yen (October 1996) 1 USD=12.15 KGS (as of March 1996) 1 USD=128.69 yen (April 1998) 1 USD=19.34 KGS (as of August 1998)	1 USD=116.73 (1998-2005 average rate) 1 USD=41.27 KGS (1998-2005 average rage)

*Report does not show yen/ KGS exchange rates.