Jordan

Road Improvement Project

Report date: March 2001
Field survey: September 2000

1. Project Profile and Japan's ODA Loan

Site map: Northern Jordan


Jarash-Irbid Road

1.1. Background

Road transport is the most advanced means of transportation in Jordan. At the end of 1985, Jordan had a total road length of 8,003 km, of which 2,436 km, accounting for 30.4%, were class A trunk roads and 1,035 km, accounting for 12.9%, were class B trunk roads. The remaining 56.7% of the road network comprised provincial and agricultural roads, with a combined total length of 4,532 km. Of the total length of these four road types, 5,405 km, representing 67.5%, were paved roads with the remaining 2,598 km, representing 32.5%, being unpaved. Most of the unpaved roads were agricultural, and a high proportion of class A and class B roads as well as provincial roads were paved.

When the loan request was made in 1988, although Jordan already had a basic skeletal road network, the roads did not fully meet standards in terms of width, alignment, pavement, etc. Various problems had also become apparent in terms of driving costs, traveling time and traffic safety. In particular, road traffic was concentrated in the densely populated areas of the north centered on the capital city of Amman, with road capacity being insufficient to handle the volume of traffic.

1.2. Objectives

The objective of the project was to improve and repair major trunk roads in Jordan in response to rapid growth in demand for travel and to address the problems of low road standards, driving costs, traveling time and traffic safety.

1.3. Project Scope

The project comprised (1) repairing the two-lane Azraq-Iraq Road, (2) building a new four-lane road between Jarash and Irbid, (3) building a new four-lane road

between Irbid and North Shunah, (4) improving and widening the four-lane Salt-Ardah Road, and (5) providing consulting services for the supervision of the construction work described above. The Japanese ODA loan covered all the foreign currency portion of the project costs and part of the local currency portion.

1.4. Borrower/Executing Agency

Hashemite Kingdom of Jordan/Ministry of Public Works and Housing

1.5. Outline of Loan Agreement

Loan amount/Loan disbursed amount	¥13,424 million/¥11,278 million
Exchange of notes/Loan agreement	September 1988/January 1989
Terms and conditions	
Interest rate	2.9% p.a.
Repayment period (grace period)	30 years (10 years)
Procurement	Partially Untied
Final disbursement date	April 1997

2. Results and Evaluation

2.1. Relevance

The road network is the most advanced means of transportation in Jordan. While basic skeletal road network was already developed at the time of project appraisal, the road standards were low with various inconvenience to use in terms of driving costs, traveling time and traffic safety. For this reason, the Jordanian government emphasised improvement and rehabilitation of existing roads, and widening and bypass roads construction with the aim of reducing traffic congestion.

Against this backdrop, all sections covered by the project were important trunk roads as described below which required improvement and repair in order to resolve various problems in terms of road standards. The plan for the project is deemed relevant in light of the importance of roads in Jordan and the consistency with the government's development policy as mentioned above.

Positioning of Project Road Sections and the Necessity of Repair

Azraq-Iraq Road	The only road connecting Iraq and Jordan with a single lane in each direction. As the traffic of trucks, trailers and other large vehicles increased, the surface was heavily damaged, causing problems such as rising transport costs and traffic insafety.
Jarash-Irbid Road	A trunk road connecting the capital city of Amman and Irbid, the center of administration and industry in northern Jordan. It is part of the north-south trunk road, which meets the largest traffic demand in Jordan, and had almost reached its capacity limit.
Irbid-North Shunah Road	Links Irbid with agricultural areas in the northern part of the Jordan Valley. At the time of appraisal, it had a single lane in each direction and was not well aligned in terms of plane and profile, making it difficult to ensure safe and reasonable driving.
Salt-Ardah Road	Important, the shortest route between the capital Amman and the central Ghor region, a center of agricultural production. At the time of appraisal, it had a single lane in each direction and was poorly aligned in terms of both plane and profile creating a bottleneck.

2.2 Efficiency

(2.2.1.) Implementation Schedule

The Jarash-Irbid Road sustained damage from large-scale landslides in the winter of 1991 due to record torrential rain. Damage included parts of the road being swept away and subsidence, accumulation of earth and sand, and cracks in the road surface. In response, the executing agency implemented preventive measures, but heavy rainfall in the winter of 1994, caused further landslides to occur. Accordingly, another field survey was conducted and further preventive measures adopted, forcing the executing agency to change the routing of the Jarash-Irbid Road, while this did not affect the total length of the road. In 1988, the Jord an dinar (JD), the local currency, appreciated against the yen and the dollar, causing the value of the yen-based ODA funds to depreciate and forcing the Jordanian government to make up the discrepancy with its own funds. Since it took time for the government to raise additional project funds, the construction period was extended by four years and three months from the originally estimated 27 months to the actual result of 78 months.

(2.2.2.) Project Cost

The amount of loan disbursement was ¥11,278 million, 14.0% lower than the approved loan amount of ¥13,424 million. The costs financed by the Jordanian government are estimated to have substantially exceeded initial projections due to the prolonged construction period and the measures taken to prevent landslides, while the actual amount is unclear since the relevant data have not been systematically recorded.

2.3. Effectiveness

(2.3.1.) Traffic Volume

Table 1 compares traffic demand forecast for each road section at the time of appraisal and actual traffic volumes.

Table 1 Comparison of Forecasts and Actual Results for Mean Traffic Volumes

(Unit: No. of vehicles per day)

Figures in parentheses indicate the ratio of actual traffic volume to forecast traffic demand.

		1994	1995	1996	1997	1998	1999	2000
Azraq-Iraq	Forecasts	2,041	2,081	2,123	2,166	2,209	2,253	2,298
	Actual results	2,640 (129%)	1,843 (89%)	1,630 (77%)	1,670 (77%)	1,690 (77%)	—	2,049 (89%)
Jarash-Irbid	Forecasts	7,012	7,293	7,585	7,888	8,204	8,532	8,873
	Actual results	15,790 (225%)	17,214 (236%)	16,573 (218%)	15,574 (197%)	17,751 (216%)	16,650 (195%)	22,939 (259%)
Irbid-North Shunah	Forecasts	4,800	4,992	5,191	5,399	5,615	5,840	6,073
	Actual results	4,756 (99%)	3,288 (66%)	4,446 (86%)	2,296 (43%)	2,923 (52%)	1,435 (25%)	2,255 (37%)
Salt-Ardah	Forecasts*	3,822	3,975	4,134	4,300	4,472	4,650	4,836
	Actual results	—	3,278 (82%)	2,660 (64%)	—	2,782 (62%)	—	2,455 (51%)

* In order to obtain forecasts for each year, those made at the time of appraisal have been carried forward by four years in consideration of the delay in the completion of the project.

The Jarash-Irbid Road constitutes part of the north-south trunk road and meets the largest demand for travel in Jordan. Its actual traffic volume was well in excess of the initial forecasts and during the five-year period to 2000, grew at an average annual rate of 7.16%, far higher than the annual rate of 4% forecast.

The traffic volume for the Azraq-Iraq Road continued to decline after 1994 due to the effects of economic sanctions imposed on Iraq by the UN, though it recovered to 90% of the initial forecast in 2000. For the five-year period to 2000, traffic volume increased at an average annual rate of 2.46%, slightly higher than the initially projected rate of 2%.

The traffic volume for the Irbid-North Shunah Road continued to decrease after peaking in 1996 and stood at only 37% of the initial forecast in 2000. This was probably because a section near North Shunah continues to have only two lanes and construction work to expand the 14-km section west of Kufur Huda had negative effects on the traffic volume. Neither section was included in the project.

At first, the Salt-Ardah Road maintained almost the same level of traffic volume as initially forecast, but traffic volume has been tend to decline with an average annual growth rate at -5.39% for the five-year period from 1996 to 2000. In 2000, the traffic volume for the road remained at approximately 50% of the initial forecast.

(2.3.2.) Impact of Reduced Traveling Time

Table 2 compares the traveling time required at the time of appraisal with that required after completion of the project to ascertain the scale of reductions. The reductions achieved in the traveling time for the Jarash~Irbid Road were much greater than initially forecast.

The Jarash-Irbid Road is an important road that constitutes part of the north-south trunk road, which meets the largest traffic demand in Jordan. The north-south trunk road starts from Aqabah Port, the only external port of the country in the southernmost part. It runs through the northern industrial city of Irbid via the capital. The effects of reduced traveling time for the Jarash-Irbid Road were substantial, at approximately JD8.1 million (approximately ¥1.3 billion) in 1999.

Table 2 Post-project Reductions in Traveling Time
(Comparison of estimation at the time of appraisal and actual result)

		Azraq-Iraq	Jarash-Irbid	Irbid-North Shunah	Salt-Ardah
Passenger car	Plan	0.54 hrs	0.17 hrs	0.05 hrs	0.07 hrs
	Actual results*	0.43 hrs	0.27 hrs	0.02 hrs	0.05 hrs
Small truck	Plan	0.83 hrs	0.17 hrs	0.05 hrs	0.08 hrs
	Actual results*	0.83 hrs	0.27 hrs	0.03 hrs	0.06 hrs
Large truck	Plan	0.96 hrs	0.28 hrs	0.06 hrs	0.20 hrs
	Actual results*	0.89 hrs	0.37 hrs	0.06 hrs	0.18 hrs
Bus	Plan	0.83 hrs	0.28 hrs	0.05 hrs	0.11 hrs
	Actual results*	0.63 hrs	0.37 hrs	0.03 hrs	0.07 hrs
Achievement ratio**		88.0%	142.2%	66.7%	76.6%
Time reduction benefits*** (in JD1,000)		193.8	8,137.5	19.5	86.0

* Calculated with the estimated traveling time after the project completion and the actual traveling time before the project implementation known at the time of appraisal.

** Achievement ratio = (total reductions in traveling time obtained from actual results) / (total reductions in traveling time estimated at the time of planning)

*** Benefits arising from reductions in traveling time achieved in 1999.

(2.3.3.) Economic Internal Rate of Return (EIRR)

The EIRR for the entire project calculated using the same assumptions as those used at the time of appraisal was 18.2%, slightly higher than the 17.8% estimated at the time of appraisal. The reason is that, while the actual traffic volumes for some sections are lower than the planned, the Jarash~Irbid Road produces much larger effects (i.e., increased traffic volumes and reductions in traveling time) than initially planned. A portion of actual costs funded by the Jordanian government substantially exceeded the initially estimated costs; the EIRR will be 16.6% if the portion has increased by 50%, and the EIRR will be 15.3% if it has been increased by 100%.

Benefits: Reductions in driving costs, reduced traveling time, decreases in the number of traffic accidents and reductions in operation and maintenance costs
Costs: Project costs (converted into economic prices) and maintenance costs
Project life: 10 years for the Azraq~Iraq Road and 20 years for the others

2.4. Impact

(2.4.1.) Technology Transfer for Road Repairs

Basalt, a type of volcanic rock, which is abundant along the Jarash-Irbid Road, is broken into laminar pieces when crushed and could not be used for the basic layer of the paved road surface because of problems with its strength. When the project was actually implemented, crushers were improved in cooperation with consultants, and as a result, it became possible to use basalt for the basic layer of the paved road surface. This technology was transferred to local maintenance firms and engineers, and the costs for purchasing and transporting materials were substantially reduced, contributing to reduced costs in similar construction works.

(2.4.2.) Environmental Impact

Among the four project roads, the new bypass road on the Jarash-Irbid Road passes through one of Jordan's few forest areas, and there was a concern of negative impact on the environment. When the road was constructed, the forest was partially cut down as planned. After the implementation of the project, however, efforts were made to recover the ecosystem by, for example, planting trees in the areas where deforestation had taken place, thereby minimizing the negative impact.

(2.4.3.) Impact on Society

The project sites consisted of mountain and desert areas, and no particular social problems has reportedly arisen from land acquisition, involuntary resettlement.

2.5. Sustainability

(2.5.1.) Operation and Maintenance

The Road Maintenance Department of the Ministry of Public Works and Housing (MPWH) is responsible for road operation and maintenance.

Regular maintenance and road improvement work is mainly outsourced from external contractors. The Maintenance Department is divided into three sections that are responsible for operating and maintaining roads in central, southern and northern Jordan, respectively. In addition to proposing road repair projects, the major task of each maintenance section is to supervise contracted construction work. The three areas of the country are subdivided into 12 districts which are covered by

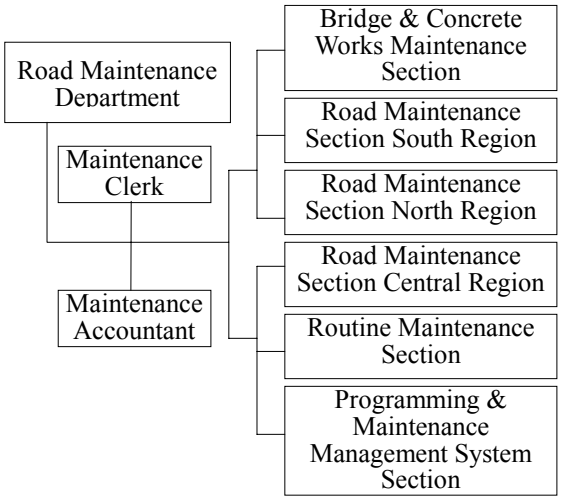

Figure 1 Organizational Chart of MPWH Maintenance Department

regional offices. The project roads were covered by the regional offices in Irbid, Jarash, Balqa, Mafraq and Amman.

Daily maintenance is carried out by the Routine Maintenance Section under the supervision and programming of the Programming & Maintenance Management System Section (PMMS). The operation and maintenance of bridges and drainage is conducted by the Bridge & Concrete Works Maintenance Section under the supervision of PMMS.

(2.5.2.) Budgeting for Operation and Maintenance

Post-project maintenance works for the four project roads and the present condition of the roads are as shown below. Appropriate operation and maintenance work is being implemented for each road, and road surfaces are in good condition. The joints for the bridge on the Azraq-Iraq Road near Safawi are damaged and need repair.

Road section	Post-construction operation and maintenance	Present condition*
Jarash-Irbid	During the period from 1997 to 2000, a 0.5km section of the road surface was elevated, resurfacing work was conducted on a 0.4 km section, and net boxes were installed in sections damaged by landslides.	Good (4)
Azraq-Iraq	In 1995, resurfacing work was conducted on a 6.0 km section, and ditches were built along a 6.0 km section.	The condition of the bridge on the road near Safawi is bad (2). Other sections of the road are largely in good condition (3-5).
Irbid-North Shunah	Seal coating using bitumen was performed on a 1.0 km section in 1997.	The road is generally in good condition (3-4)
Salt-Ardah	Resurfacing work was conducted on a 2.0 km section. Waterproofing of the hard shoulder was executed on a 1.6 km section. Guardrails, open conduits and traffic signs were cleaned.	The road is in excellent condition (5).

* Figures in parentheses indicate the results of visual site inspection by MPWH officials in 1999, and 1, 2, 3, 4 and 5 on a five-level scale correspond with “bad”, “poor”, “fair”, “good” and “excellent”, respectively.

As described above, generally good operation and maintenance work is being implemented for the four project roads partly because they are main trunk roads in Jordan. This section considers budgeting for operation and maintenance for the various sections of roads in Jordan. The results of a survey of road surface conditions conducted by MPWH in 1996 indicated that, on a scale of 1 to 5, 15% of class A roads and 18% of class B roads were classified into “2 (poor)” or “1 (very bad).” Estimates made by the Swedish International Development Agency (SIDA)* revealed that a budget of JD14 million was required to improve the condition of the surface of class A and class B roads. A budget of around JD10 million is needed for regular maintenance whereas it is estimated that actually approved maintenance budgets totaled JD7-8 million.

However, since priority is given to main roads when operation and maintenance

budgets are allocated, regular maintenance work is being performed on the four project roads. Spare parts as well as operation and maintenance equipment are under the control of 36 regional offices nationwide, which are under the management of the Maintenance Section.

* *Road Section Development Plan*, SIDA, 1998

(2.5.3.) Environmental Monitoring

Currently, no environmental monitoring is conducted and no environmental standards have been established. At present, however, a new Environmental Unit is in the process of being established and environmental monitoring is scheduled to start in the near future.

(2.5.4.) Data Organization for Maintenance

With the cooperation of SIDA, MPWH is currently promoting the establishment of a Road Information System (RIS), a database system that provides basic information for understanding road conditions, supervising projects and budgeting. At present, officials can access the database system via the MPWH network. Plans call for MPWH to enable data transmission to regional offices through modems in the near future.

Information on the width and total length of all roads as well as on types of pavement and surface conditions has been stored in RIS. Information on average traffic volumes for class A and class B roads, as surveyed by MPWH's Traffic Studies Section, is also stored in the system. Such information can be output as cartographic data as required. In addition, the management of information on traffic accidents (accident locations/number of casualties) in cooperation with the police is also under consideration. It is believed that an improved RIS will contribute to achieving greater efficiency in the execution of future projects, supervision of construction work and maintenance planning.

Comparison of Original and Actual Results

Item	Plan	Results
1. Project scope	Azraq-Iraq Road (Repairing the two-lane road) · Section A: Azraq to Safawi (51 km) · Section B: Safawi to a point 59.5 km away from Safawi (59.5 km) · Section C: The terminal of Section B to Ruweishid Bridge (59.5 km)	Same as left
	Jarash-Irbid Road (Construction of a new four-lane road, etc.) · Section II: Thagrad Asfour to Zarqa Bridge (18 km) · Section III: Zarqa Bridge to Jarash old road intersection (15 km)	The total length of the new road remained unchanged though the route was altered slightly to bypass sections affected by landslides.
	Irbid-North Shunah Road (Construction of a new four-lane road) · Section I: Irbid to Kufur Huda (6 km)	Same as left
	Salt-Ardah Road (Improvement and widening of the four-lane road) · Section I: Salt to Kufur Huda (8 km) Consulting services: 512 M/M	Same as left 324 M/M
2. Implementation schedule	December 1988 to February 1991 (27 months)	December 1988 to May 1995 (78 months)
3. Project cost Foreign currency Local currency Total ODA loan portion Exchange rate	 ¥10.593 billion ¥6.917 billion ¥17.51 billion ¥13.424 billion JD1.00 = ¥373 (1988)	 N/A N/A N/A ¥11.278 billion N/A