



# Performance Evaluation Report

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Project Number: PPE : PRC 30389  
Loan Numbers: 1641/1642  
December 2006

## People's Republic of China: Changchun–Harbin Expressway Project

Operations Evaluation Department

Asian Development Bank

## CURRENCY EQUIVALENTS

	Currency Unit	–	yuan (CNY)	
	<b>At Appraisal</b>		<b>At Project Completion</b>	<b>At Operations Evaluation</b>
	(July 1998)		(August 2004)	(December 2006)
CNY1.00 =	\$0.1208		\$0.1232	\$0.1277
\$1.00 =	CNY8.28		CNY8.12	CNY7.83

## ABBREVIATIONS

AADT	–	annual average daily traffic
ADB	–	Asian Development Bank
CDB	–	China Development Bank
DMF	–	design and monitoring framework
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
FIRR	–	financial internal rate of return
GDP	–	gross domestic product
ha	–	hectare
HHEC	–	Heilongjiang Hashuang Expressway Corporation
HPCD	–	Heilongjiang Provincial Communications Department
ICB	–	international competitive bidding
JPCD	–	Jilin Provincial Communications Department
JPEC	–	Jilin Provincial Expressway Corporation
MOC	–	Ministry of Communications
NTHS	–	national trunk highway system
O&M	–	operations and maintenance
OEM	–	Operations Evaluation Mission
PCD	–	provincial communication department
PCR	–	project completion report
PPTA	–	project preparatory technical assistance
PRC	–	People's Republic of China
RRP	–	report and recommendation of the President
TA	–	technical assistance
VOC	–	vehicle operating cost

## NOTE

In this report, "\$" refers to US dollars.

### Keywords

asian development bank, development effectiveness, expressways, people's republic of china, performance evaluation, heilongjiang province, jilin province, transport

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In accordance with the guidelines formally adopted by the Operations Evaluation Department (OED) on avoiding conflict of interest in its independent evaluations, the director general of OED did not review this report and delegated approval of this evaluation to the director of Operations Evaluation Division 2. The fieldwork was undertaken by Peter Darjes, Mingxin Shu, and Bingfang Zhong (staff consultants) under the guidance of the mission leader. Mr. Zhong was previously involved in socioeconomic data collection for the project completion report. For this report, OED used his expertise only for updating the socioeconomic data and for some social surveys. He was not involved in the assessment of the Project. To the knowledge of OED management, the individuals preparing, reviewing, or approving this report had no conflict of interest.

## BASIC DATA

### Loan 1641-PRC: Changchun–Harbin Expressway (Hashuang Expressway)

#### Project Preparation/Institution Building

TA No.	TA Name	Type	Person-Months	Amount (\$ '000)	Approval Date
TA 2846	Changchun–Harbin Expressway (formerly called Heilongjiang and Jilin Expressway")	PPTA	30	600	22 Aug 1997

Key Project Data (\$ million)	As per ADB	
	Loan Documents	Actual
Total Project Cost	397.5	403.7
Foreign Exchange Cost	191.2	162.6
Local Currency Cost	206.3	241.1
ADB Loan Amount/Utilization	170.0	142.1
ADB Loan Amount/Cancellation		27.9

Key Dates	Expected	Actual
Fact-Finding		13–29 Apr 1998
Appraisal		20 Jul–3 Aug 1998
Loan Negotiations		13-15 Oct 1998
Board Approval		27 Nov 1998
Loan Agreement		29 Mar 1999
Loan Effectiveness	27 Jun 1999	16 Aug 1999
First Disbursement		15 Nov 1999
Project Completion	31 Mar 2002	Sep 2001
Loan Closing	31 Dec 2002	22 Jan 2003
Months (effectiveness to completion)	33	25

Internal Rates of Return (%)	Appraisal	PCR	PPER
Economic Internal Rate of Return	15.2	15.3	14.8
Financial Internal Rate of Return	7.1	6.8	11.1

**Borrower** People's Republic of China

**Executing Agency** Heilongjiang Hashuang Expressway Corporation

#### Mission Data

Type of Mission	No. of Missions	No. of Person-Days
Fact-Finding	1	85
Appraisal	1	75
Project Administration		
Special Loan Administration	1	5
Review	3	27
Project Completion	1	38
Operations Evaluation	1	56

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PPTA = project preparatory technical assistance, TA = technical assistance

## BASIC DATA

### Loan 1642-PRC: Changchun–Harbin Expressway (Changyu Expressway)

#### Project Preparation/Institution Building

TA No.	TA Name	Type	Person-Months	Amount (\$ '000)	Approval Date
TA 2846	Changchun–Harbin Expressway (formerly called Heilongjiang and Jilin Expressway")	PPTA	30	600	22 Aug 1997

Key Project Data (\$ million)	As per ADB	
	Loan Documents	Actual
Total Project Cost	540.4	470.0
Foreign Exchange Cost	230.0	184.5
Local Currency Cost	310.4	285.5
ADB Loan Amount/Utilization	220.0	91.2
ADB Loan Amount/Cancellation		128.8

Key Dates	Expected	Actual
	Fact-Finding	
Appraisal		20 Jul–3 Aug 1998
Loan Negotiations		13–15 Oct 1998
Board Approval		27 Nov 1998
Loan Agreement		14 Jan 1999
Loan Effectiveness	13 Apr 1999	16 Aug 1999
First Disbursement		15 Nov 1999
Project Completion	30 Sep 2002	Sep 2002
Loan Closing	31 Dec 2002	5 Mar 2003
Months (effectiveness to completion)	42	38

Economic Internal Rates of Return (%)	Appraisal	PCR	PPER
Economic Internal Rate of Return	21.5	17.1	18.0
Financial Internal Rate of Return	7.6	7.5	12.4

**Borrower** People's Republic of China

**Executing Agency** Jilin Provincial Expressway Corporation

#### Mission Data

Type of Mission	No. of Missions	No. of Person-Days
Fact-Finding	1	85
Appraisal	1	75
Project Administration		
Special Loan Administration	1	5
Review	3	21
Project Completion	1	40
Operations Evaluation	1	56

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PPTA = project preparatory technical assistance, TA = technical assistance

## EXECUTIVE SUMMARY

This report presents the findings of an evaluation of the Changchun–Harbin Expressway Project in Heilongjiang and Jilin provinces in the People’s Republic of China (PRC).

In November 1998, the Asian Development Bank (ADB) approved two loans for the construction of the Changchun–Harbin Expressway Project (262 kilometers [km]). The first loan of \$170 million was to finance the 102 km Hashuang Expressway, the Heilongjiang portion of the expressway; the second loan for \$220 million was to finance the 160 km Changyu Expressway, the Jilin portion of the expressway. The Project included the procurement of equipment for traffic management and road maintenance, and consulting services for project supervision and training. The cost of the entire expressway covering the two sections was estimated at \$937.9 million, of which 45% was the foreign exchange cost. The executing agencies were the Heilongjiang Hashuang Expressway Corporation (HHEC) for the Hashuang Expressway and Jilin Provincial Expressway Corporation (JPEC) for the Changyu Expressway.

The Changchun–Harbin Expressway was one of the priority sections of the PRC’s national trunk highway system. The expressway was to complete a 262 km missing link between existing expressways in the northeast corridor section, and to complement and enhance previous investments. The Project was expected to stimulate domestic employment, production, specialization, and trade through infrastructure investment and transport cost reductions. The Project aimed at promoting economic growth in northeastern PRC, and was in line with ADB’s overall strategic objective of promoting growth and reducing poverty. The Project outcome was road transport efficiency and improved safety in the project impact area of the expressway. The policy dialogue with the Government during project formulation focused on mobilizing nongovernment resources for the highway subsector, supporting corporatization and commercialization, improving highway design standards and road safety, and introducing appropriate pricing policies. Expected beneficiaries were vehicle owners, transport operators, and bus passengers who would use the expressway.

The Project was formulated using domestic feasibility studies supported by a project preparatory technical assistance grant that refined and augmented the feasibility studies. The TA carried out a detailed review of the studies, prepared an environmental impact assessment, formulated resettlement action plans, and undertook social impact assessments. The TA was completed satisfactorily.

The two executing agencies, HHEC and JPEC, were established as separate companies for the construction, operation, and maintenance of their respective expressways. During implementation, HHEC and JPEC liaised with the municipalities, counties, and districts along the expressways and set up local coordinating teams to help with land acquisition, resettlement and relocation, environmental protection, and coordination with local governments.

According to the audited accounts of HHEC and JPEC, the overall project cost was \$873.7 million, about 7% lower than the estimate at appraisal. While the cost of the Hashuang Expressway was 1.6% higher than the appraisal estimate, the cost of the Changyu Expressway was 13% less. The principal reasons for the difference include (i) decreased foreign exchange costs, which were about 20% less than projected because of much lower than expected price and physical contingencies, (ii) lower interest cost during construction, and (iii) less than envisaged equipment procurement.

Physical construction was generally as planned. In Heilongjiang, construction started with a slight delay in September 1999. Despite the delay, the expressway was completed ahead of time. In Jilin, construction was originally scheduled to start in May 1999. Some problems arose because ADB did not approve JPEC's evaluation and recommendations for the award of some civil works contracts. Likewise, JPEC decided to use national competitive bidding procedures instead of the agreed international competitive bidding procedures without prior ADB approval. The ensuing discussions led to a delay of about 6 months in the start of some civil works packages. In the end, JPEC decided to finance the contracts in question from alternative sources. Nonetheless, construction was largely on schedule throughout implementation. With the completion of the civil works on the Jilin component by July 2002, the entire expressway was completed 2 months ahead of the original schedule.

The Hashuang Expressway was opened for traffic in September 2001 and the Changyu Expressway was opened 1 year later. Both expressways are performing well. The geometric design is consistent with international expressway standards and the pavement can cope with current and anticipated traffic loads; however, overloaded trucks with higher than expected axle loads have resulted in wearing, particularly of the southbound lanes. Overall, the pavement is in reasonable condition allowing a generally smooth riding quality. Minor surface deterioration has occurred on selected sections owing mainly to the impact of harsh climate and normal wear and tear that would be expected after 4–5 years of operation.

Loan- and TA-financed international consultants provided training in expressway design; long-span bridge construction and maintenance; environmental protection, regulation, and design; road safety; expressway operation and maintenance; and expressway commercial development and business planning. About 600 staff were trained, including some employees of the civil works contractors. A total of 60 staff from HHEC and JPEC participated in international training. The consultants also set up a detailed training system and schedule for domestic training. HHEC and JPEC have managed to retain most of their staff, which has contributed to effective implementation and operation of the entire Project.

In general, compliance with loan covenants was satisfactory. The progress reports, including monthly, quarterly, and annual reports, as well as audited project accounts and financial statements, were submitted as required. Required reports on changes in the toll tariff were not submitted regularly. Both HHEC and JPEC have encountered problems in achieving the targeted financial ratios. However, the ratios will likely be achieved within the next few years so that the issues may be regarded as timing, rather than structural.

Overall, the Project is rated borderline highly successful. It is considered highly relevant, highly effective, efficient, and highly likely to be sustainable. Individually, the Changyu expressway component is rated highly successful, while the Hashuang expressway component is rated successful. The effectiveness of the Project is measured by the degree to which it has attained its expected outcome: improvement in road transport efficiency and safety in the project impact area of the expressway. The Project has largely achieved this expected outcome. Traffic was reduced substantially on the existing national highway, passenger and freight services have expanded greatly, average travel time from Harbin to Changchun was reduced from 4 hours to 2.5 hours, freight and passenger fares/charges were reduced by 10%–15%, and the accident rate per 100 million vehicle-km has steadily decreased. However, the expected increase in traffic volume was only partially achieved, since volume is still well below the appraisal estimate.

Traffic forecasts were adjusted consistent with the growth trend generated by actual volumes on the expressway from 2002 to 2005. While traffic growth has been about 11% per annum since the opening of the expressway, it has not reached the level expected at appraisal. Much of the initial traffic growth was accounted for by traffic that deviated from the national highway 102, which before the Project was the shortest link between Harbin and Changchun. Traffic on the national highway dropped after the opening of the expressway, but has since recovered and reached the appraisal level. This is indicative of the economic significance of the entire transport corridor and the preferences of transport operators with respect to time and cost involved in the available highway options.

The economic reevaluation indicates that the expressway generates high economic returns, an economic internal rate of return of 16.8% for the entire expressway, ranging between 14.8% for Hashuang and 18% for Changyu expressways, lower than forecast at appraisal (18.9%), but higher than forecast at project completion (16.3%). The result is sensitive to variations in traffic so that a substantial reduction in future traffic growth would adversely affect the viability of the Project. Overall, the Project and its components are rated efficient.

The financial performance of both expressway corporations is satisfactory and their financial sustainability highly likely. The covenanted financial targets were achieved after 3 years of operation. Since 2004, HHEC and JPEC have been generating net earnings, which they are required to transfer back to the respective provincial communication departments. This requirement has precluded a more vigorous expansion of the equity base and may thus stand in the way of a possible future listing of the corporations at a stock exchange.

No negative socioeconomic and environment impacts were reported. The performance of both the borrower/s and ADB has been noted satisfactory. The only issue that could jeopardize project sustainability and that has a negative impact on its performance is related to overloading of trucks and the enforcement of axle-load legislation. Government authorities and ADB have ongoing programs to address this issue. Lessons include the need for closer supervision by ADB of resettlement issues, the need to be more circumspect in the use of financial ratios as loan covenants, and a greater involvement of international consultants in bidding procedures. The Operations Evaluation Mission recommends that the issues of road user revenues and road financing be taken up in policy dialogue with the PRC authorities.

Ramesh B. Adhikari  
Director  
Operations Evaluation Department 2

118°00'E

130°00'E

# CHANGCHUN-HARBIN EXPRESSWAY PROJECT IN THE PEOPLE'S REPUBLIC CHINA (as implemented)

- ★ National Capital
- Provincial Capital
- City/Town
- ⚓ Major Port
- National Trunk Highway System
- ADB-Financed Projects Open to Traffic
- Changchung-Harbin Expressway
- Major Route
- River
- Provincial Boundary
- International Boundary
- Boundaries are not necessarily authoritative.



0 100 200 300 400  
Kilometers

52°00'N

52°00'N



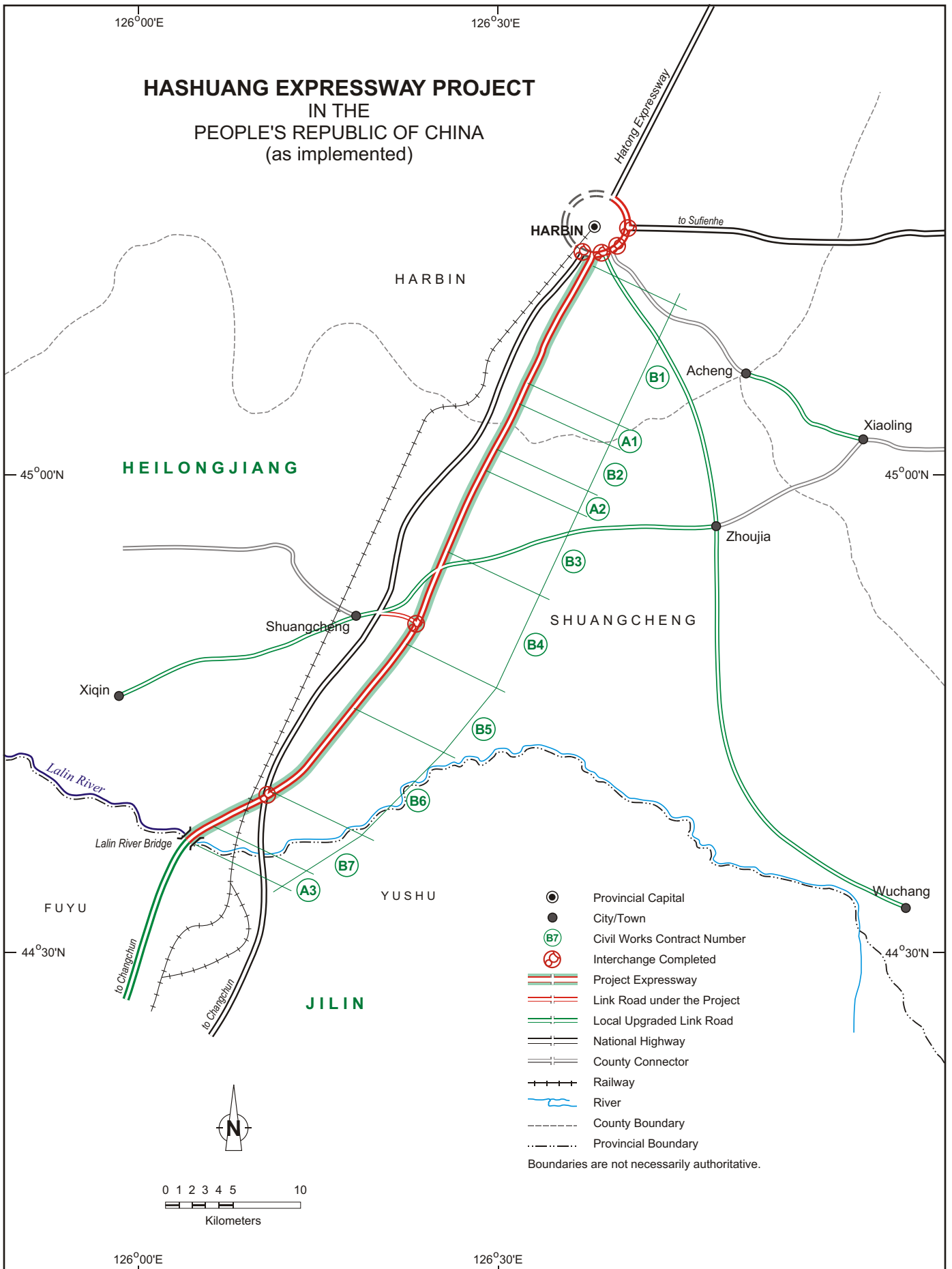
40°00'N

40°00'N

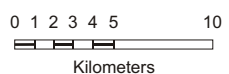
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# HASHUANG EXPRESSWAY PROJECT IN THE PEOPLE'S REPUBLIC OF CHINA (as implemented)

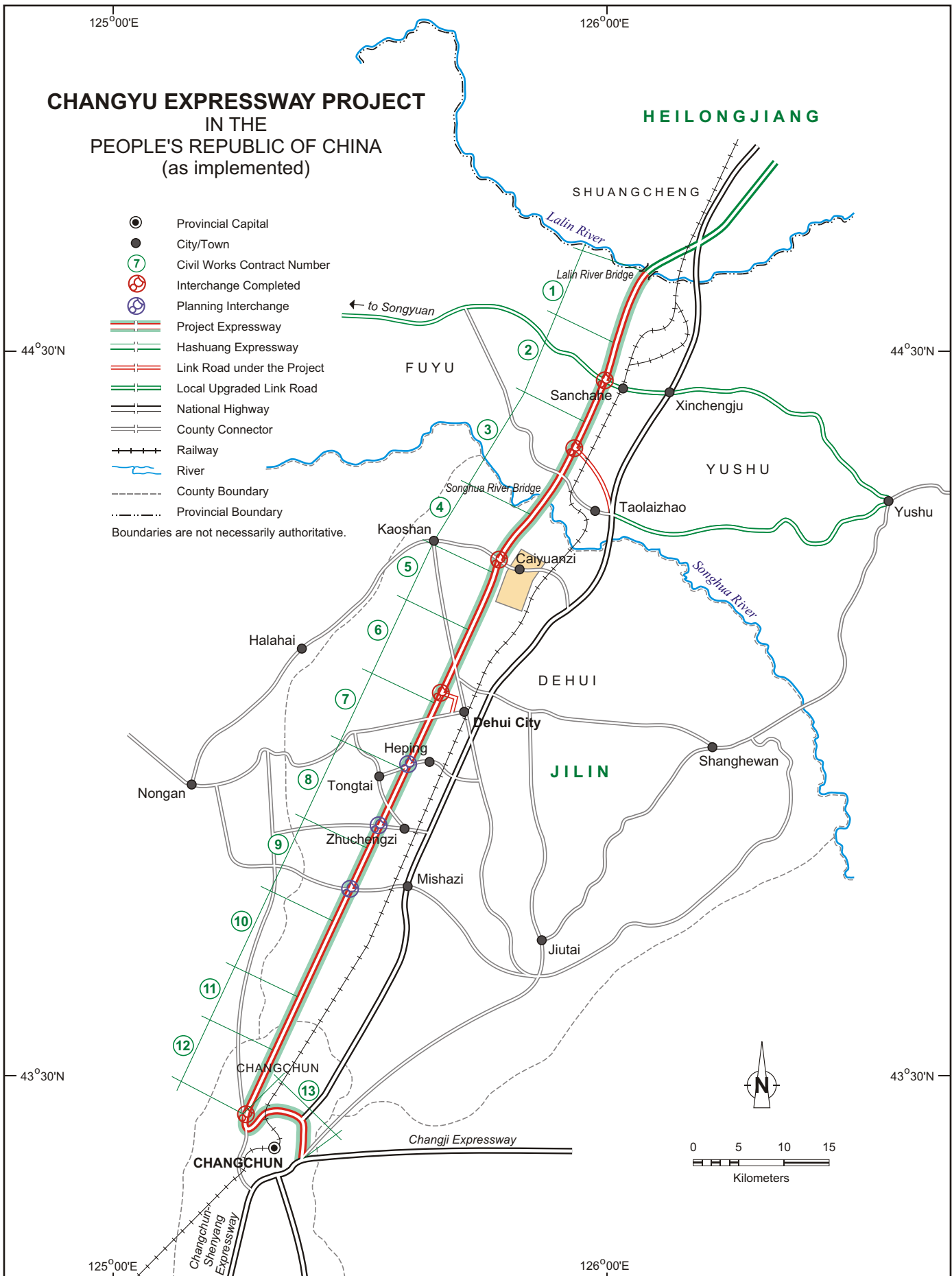


- Provincial Capital
  - City/Town
  - Ⓡ Civil Works Contract Number
  - Ⓢ Interchange Completed
  - ▬▬▬ Project Expressway
  - ▬▬▬ Link Road under the Project
  - ▬▬▬ Local Upgraded Link Road
  - ▬▬▬ National Highway
  - ▬▬▬ County Connector
  - ++++ Railway
  - ▬▬▬ River
  - County Boundary
  - ..... Provincial Boundary
- Boundaries are not necessarily authoritative.



# CHANGYU EXPRESSWAY PROJECT IN THE PEOPLE'S REPUBLIC OF CHINA (as implemented)

- Provincial Capital
  - City/Town
  - ⑦ Civil Works Contract Number
  - ⊗ Interchange Completed
  - ⊕ Planning Interchange
  - Project Expressway
  - Hashuang Expressway
  - Link Road under the Project
  - Local Upgraded Link Road
  - National Highway
  - County Connector
  - Railway
  - River
  - - - County Boundary
  - - - Provincial Boundary
- Boundaries are not necessarily authoritative.



## I. INTRODUCTION

### A. Evaluation Purpose and Process

1. The Changchun–Harbin Expressway Project (consisting of the Hashuang Expressway in Heilongjiang province and the Changyu Expressway in Jilin province) in the People's Republic of China (PRC) was selected as part of the annual random sample of completed projects for postevaluation by the Operations Evaluation Department (OED) of the Asian Development Bank (ADB). The Operations Evaluation Mission (OEM) visited the PRC and carried out discussions with government staff and site evaluation from 19 June to 3 July 2006. By that time, expressway operation had been under way from more than 3 years; this was deemed to provide a sufficient basis for evaluating project performance.

2. The evaluation draws upon a review of project documents and other relevant studies, and discussions between ADB staff and officials of Government agencies concerned with the Project, international financial institutions resident in the PRC, and consultants. It incorporates the results of the OEM's field inspections of the expressway, traffic studies, and updated road accident data. A copy of the draft evaluation report was shared with other ADB departments and offices, the Government, the executing agencies—the Heilongjiang Hashuang Expressway Corporation (HHEC) and the Jilin Provincial Expressway Corporation (JPEC)—and their views have been incorporated and acknowledged where relevant.

3. In 2004, the project completion reports (PCR)<sup>1</sup> rated both expressways successful.<sup>2</sup> The expressways were considered highly relevant to addressing the needs of the transport sector, effective in achieving their intended outcomes well ahead of schedule, efficient in use of resources, and likely to be sustainable.

4. The PCRs generally found implementation arrangements to be adequate and performances of executing and implementing agencies to be generally satisfactory. The PCRs also found that in general the expressway was well designed and properly constructed, and was being efficiently maintained. In terms of operations, the PCRs found that the financial performance of HHEC and JPEC had not lived up to expectations; the PCRs attributed this to overoptimistic traffic forecasts and lower tolls in the initial years of operation. The PCRs highlighted two important lessons: (i) the need for closer ADB supervision of resettlement issues, including the need to devote more attention to resettlement monitoring and submission of monitoring reports on time; and (ii) advisability of including specific local/connector road components in the project scope of future road loans.

### B. Expected Results

5. The Project was classified as an economic growth project. According to the project framework of the report and recommendation of the President (RRP),<sup>3</sup> its expected impact was to stimulate domestic employment, production, specialization, and exchange through infrastructure investment and transport cost reduction. Its four expected outcomes were (i)

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<sup>1</sup> ADB. 2004. *Project Completion Report on the Changchun–Harbin Expressway Project (Hashuang Expressway) in the People's Republic of China*. Manila (Loan 1641-PRC); and ADB. 2004. *Project Completion Report on the Changchun–Harbin Expressway Project (Changyu Expressway) in the People's Republic of China*. Manila (Loan 1642-PRC).

<sup>2</sup> The Project Completion Review Mission was fielded during 17–27 August 2004.

<sup>3</sup> ADB. 1998. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan for the Changchun–Harbin Expressway Project*. Manila.

increased road transport capacity and more efficient movement of freight and passengers, (ii) reduced transport costs, (iii) enhanced road safety and reduced accident rates in the transport corridor, and (iv) enhanced institutional capacity through corporate planning and management.<sup>4</sup>

6. The project framework identified four categories of expected outputs. The first category, accounting for nearly all of the estimated project cost, was for construction. This category included the construction of a 262-kilometer (km) access-controlled expressway from Changchun to Harbin, with 65 km of paved link roads, 14 interchanges, 5 service areas, underpasses, and overpasses; procurement and installation of communications, vehicle-load weighing, safety, emergency, and maintenance equipment; and relocation and reallocation of land and resettlement of households. Three additional categories of expected outputs were (i) consulting services and training advisory inputs and training events for road safety, design and maintenance, business planning and operations, pavement design and construction, environmental protection, and monitoring and evaluation; (ii) corporatization through continued operation by HHEC and JPEC; and (iii) environmental protection through implementation of environmental mitigation and monitoring activities.

7. The statement of project impact in the project framework was inconsistent with the statement in the main text of the RRP. In the main text, the statement mentioned promotion of economic and social development in the northeast of the PRC by completing a key section of transport infrastructure. In contrast, the project framework mentioned the stimulation of domestic employment, production, specialization, and exchange through infrastructure investment and transport cost reductions. The impact statement in the main text is considered more appropriate as a statement of the medium-term impact of the Project.

8. The grouping of project outcomes in the project framework was inconsistent with their grouping in the main text of the RRP. The main text identified six outcomes, whereas the project framework identified only four; the two extra outcomes were (i) improved access for trade between the PRC and the Russian Federation and Mongolia, and (ii) support for the corporatization of expressway construction and operation. The project outputs in the main text were fully consistent with those in the project framework.<sup>5</sup>

9. The project framework lacked monitorable indicators suitable for evaluating the success of the impact statement and several of the outcome and output statements. Most of the indicators and targets were not specific, measurable, and time-bound; and did not specify a base situation, a desired target, and a due date for achievement. As an example, "increase in interprovincial trade ratios for both provinces," was included as an impact indicator in the project framework, but does not fulfill the attributes of well-defined indicators.

10. In line with design and monitoring framework (DMF) guidelines,<sup>6</sup> the OEM revised the Project's DMF to show a single project outcome, instead of the four outcomes shown in the RRP's DMF. The new project outcome is road transport efficiency and improved safety in the project impact area of the expressway. The evaluation has grouped project outputs to reflect the OEM's understanding of the major distinct categories of support under the Project, taking into account both the main cost elements and the RRP's emphasis on institutional and policy

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<sup>4</sup> The project goal stated in the RRP is equated with project impact, and the project purpose is equated with outcome.

<sup>5</sup> A small inconsistency with respect to the project outputs was found in the RRP's Loan and Project Summary, which listed five project outputs. The difference was due to the civil works output being broken down into two separate categories for the expressway and for the provincial/country roads in the Loan and Project Summary.

<sup>6</sup> ADB. 2006. *Guidelines for Preparing a Design and Monitoring Framework*. Manila.

initiatives. The evaluation considered five project outputs: (i) road infrastructure and associated equipment and facilities improved along the expressway between Changchun and Harbin, (ii) corporate governance promoted in expressway operations in Heilongjiang and Jilin provinces, (iii) private sector participation encouraged for the Hashuang and Changyu expressways, (iv) environmental mitigation measures carried out as per environmental impact assessment (EIA) reports, and (v) HHEC, JPEC, and national consultant capacity strengthened. Modified outcome and output groupings and additional indicators/targets are reflected in the summary DMF in Appendix 1.

## **II. DESIGN AND IMPLEMENTATION**

### **A. Formulation**

11. Project formulation followed the pattern adopted under previous ADB expressway projects in the PRC and centered on the use of local expertise. This ensured a high degree of ownership. National consultants prepared feasibility studies based on guidelines provided by the Ministry of Communications (MOC).<sup>7</sup> The studies defined the scope of the Project, provided preliminary designs and cost estimates, and included economic and financial evaluations. Overall, the studies provided a convincing justification for the Project. The results of the feasibility studies were reviewed and supplemented by international consultants under project preparatory technical assistance (TA) provided by ADB in 1997.<sup>8</sup> The output of the TA together with the feasibility studies constituted an adequate basis for project appraisal. The TA contributed to the formulation process by reviewing and updating the Environmental Impact Assessment (EIA), preparing a supplementary EIA, reviewing the land acquisition and resettlement report, and preparing a social impact assessment. The Jilin expressway section of the Project may have benefited from greater scrutiny by the TA consultants in reviewing the need for maintenance equipment under that component, given that a substantial portion of the ADB loan was allocated for maintenance equipment and remained unused at project completion.

12. In formulating the Project, ADB followed recognized approaches to implementation arrangements, consulting services, and procurement; and included use of international competitive bidding, FIDIC,<sup>9</sup> and international road construction standards. Overall, project formulation benefited from available domestic and international expertise; and active participation of and coordination with counterpart institutions, people affected, and development partners.

### **B. Rationale**

13. The principal concern underlying the rationale for the Project was that major roads in the PRC were congested, dangerous, and unable to cope with existing and anticipated traffic volume. This situation emanated from the PRC's rapid economic growth since the 1980s. Economic growth brought about an unprecedented expansion in intra- and interprovincial traffic. The economy's changing structure and increasing diversification altered the modal

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<sup>7</sup> Heilongjiang Province Highway Survey and Design Institute and Jilin Province Highway Survey and Design Institute prepared feasibility studies relating to each of the expressway sections. Heilongjiang Scientific Research Institute for Environmental Protection and Northeast Normal University prepared EIAs.

<sup>8</sup> ADB. 1997. *Technical Assistance to the People's Republic of China for Preparing the Changchun–Harbin Expressway Project*. Manila.

<sup>9</sup> Fédération Internationale des Ingénieurs Conseils. (International Federation of Consulting Engineers).

split, in which the demand for road transport became dominant. Weaknesses in the road network raised transport and logistics costs in traffic moving between the interior provinces and the coastal ports. To address these constraints, in the early 1990s the Government designed the national trunk highway system (NTHS), which includes the Project. The project expressway from Changchun in Jilin province to Harbin in Heilongjiang province was to complete a missing link between existing expressways in the northeast corridor section of the NTHS, and was thus expected to complement and enhance previous investments. The expressway was expected to promote interprovincial trade and provide greater opportunities for trade between large agricultural areas and urban centers in the influence area of the Project.

14. In view of the substantial financing needs for NTHS development and to limit the burden on Government budgets, the Government decided to partially finance the NTHS with foreign and domestic loans. Consistent with the general Government policy that loan-financed projects should generate funds to service the debt, the NTHS highways were to be tolled and access-controlled expressways. This requirement led to the creation of expressway corporations, whose mandate included the collection of tolls sufficient to ensure debt service. The Project's objective was to mobilize private-sector financing by securitizing the assets of the corporations emanating from this concept.

15. ADB's strategy was responsive to the transport needs and focused on eliminating key transport bottlenecks. The strategy was based on a succinct diagnosis of existing constraints, and consistent in its identification of projects to overcome the constraints. The Project was in line with ADB's operational strategy for the PRC, which was to support (i) the construction of expressways and highways between major growth centers and linking hinterland economies; (ii) institutional strengthening to increase the commercial orientation and managerial efficiency of expressway organizations; (iii) improvement of highway planning, evaluation techniques, and safety standards; (iv) adoption of appropriate pricing policies to ensure optimum utilization of road transport capacity; (v) utilization of alternative methods of investment financing, including private sector participation to meet the huge financing requirements of the highway development program; (vi) promotion of road traffic safety; and (vii) integration of the network so that the NTHS is supported by a system of feeder roads that provide access for the local population to the main economic centers. The design of the Project addressed several of the strategic concerns prevailing at the time of project formulation. Given the sustained high economic growth and ensuing increased transport demand, the project rationale remains valid at the time of project evaluation.

## **C. Cost, Financing, and Executing Arrangements**

### **1. Hashuang Expressway**

16. Overall, actual project cost stayed reasonably close to the original estimates. The total cost of the Hashuang Expressway at completion was \$403.7 million, 1.6% higher than the appraisal estimate of \$397.5 million. Local currency costs increased by 16.9% from \$206.3 million equivalent estimated at appraisal to \$241.1 million at completion. In contrast, the actual foreign exchange cost (\$162.6 million) was below the appraisal estimate (\$191.2 million). Details of actual costs and financing are shown in Appendix 2. The development of the main cost items is as follows:

- (i) The actual cost of civil works increased by 1.9% from the appraisal estimate of \$281.9 million to the actual amount of \$287.4 million.

- (ii) The cost of consulting services and training showed the relatively highest increase (92%) from the appraisal estimate of \$7.7 million to the final amount of \$14.8 million. Because the expressway was completed on time with no major changes in the scope of work, such a significant cost overrun may have been due to inadequate planning and estimation.
- (iii) The actual cost of construction and maintenance equipment was \$13.0 million compared with the appraisal estimate of \$14.4 million.
- (iv) The actual cost of land acquisition and resettlement increased from \$27.8 million to \$32.6 million (17.3%) due to the (a) need for additional temporary land acquisition for borrow pits; and (b) greater number of people to be resettled and buildings to be demolished.

17. Compared with the plan envisaged at appraisal, the actual financing arrangements turned out as follows:

- (i) The ADB loan of \$170 million was to account for 42.8% of the total project cost estimated at appraisal. ADB's actual contribution was \$142.1 million or 35.2% of the total cost. ADB's contribution to the overall financing thus decreased by about 18%, which is largely consistent with the observed drop in the share of foreign exchange cost in the total cost.
- (ii) Heilongjiang Provincial Communications Department (HPCD) reduced its involvement in the financing. While at appraisal HPCD was expected to contribute \$21.2 million to the financing of the foreign exchange cost, HPCD limited its role to local currency cost financing. With that change, HPCD's financing decreased from \$134 million equivalent to \$61 million equivalent.
- (iii) China Development Bank (CDB), which was not included in the appraisal financing plan, substituted a portion of the ADB loan, the entire HPCD share of the foreign exchange financing, and took over from HPCD a major share of the local currency financing. CDB also replaced the entire ADB loan when HPCD decided to prepay the loan about 1 year after the commencement of expressway operation.

18. The implementing arrangements closely followed the agreements reached at appraisal. This applied to (i) HPCD and MOC, the overall supervisors of implementation; (ii) HHEC as the Executing Agency and responsible for construction and operation of the expressway; and (iii) the project implementation unit responsible for day-to-day project implementation under the supervision of the HHEC general manager. HHEC is responsible for the operation of the toll stations and for routine road maintenance. HHEC's management has been competent and professional (Appendix 3 provides HHEC's current organization chart). The coordination and interaction among all stakeholders was effective and ensured smooth project implementation.

## **2. Changyu Expressway**

19. The actual cost of the Changyu Expressway component was \$470 million, 13% less than the appraisal estimate of \$540.4 million. The actual foreign exchange cost decreased by about 20% owing to much lower than expected price and physical contingencies, lower interest charges during construction, and reduced scope of equipment purchases. Local currency costs were 8% lower than estimated at appraisal, mainly due to a significant decrease (by 61%) of the land acquisition and resettlement cost. Based on experience with other road projects, estimates of land acquisition and resettlement cost seem to be particularly susceptible to over- or underestimation. As appraisal estimates are based on preliminary, often only conceptual,

designs, which do not include land and household surveys, the potential for unrealistic estimates is substantial. Details of actual costs and financing are shown in Appendix 2. The development of the other main cost items is as follows:

- (i) The actual cost of civil works amounted to \$363 million, 4% above the appraisal estimate, due to contract variations and additional quantities.
- (ii) The actual cost of equipment was \$5.3 million compared with the \$14.0 million estimated at appraisal. Less equipment was procured, and selected equipment was purchased locally where prices proved lower than estimated at appraisal.
- (iii) The actual cost of consulting services and training was \$20.1 million, which is about the same as the appraisal estimate of \$20.4 million.

20. The financing plan at appraisal included an ADB loan of \$220 million to finance 40.7% of the total project cost and about 95.7% of the foreign exchange costs. Upon completion of the expressway, ADB financing had decreased to \$91.2 million or 19.4% of the total cost. The Jilin Provincial Communications Department (JPCD) chose to cancel \$93 million or 42% of the original loan amount in response to a procurement issue involving six contracts that ADB had declined to finance (para. 22). JPEC, in turn, proposed to finance the packages from available alternative sources. At project completion, \$35.8 of the ADB loan was still not utilized because the need for maintenance equipment had been overestimated. Overall, 41.5% of the ADB loan originally allocated to the Changyu Expressway was utilized. CDB substituted a portion of the ADB loan and the entire foreign exchange grants of \$10 million that Jilin Provincial Government/JPCD had been expected to contribute. One year after commencement of operations, JPEC prepaid the entire ADB loan and refinanced it through another loan from CDB. From a debt management point of view, this was a sound decision as CDB at that time was able to offer more attractive loan conditions than those applicable to ADB's pool-based loan. According to JPEC, the loan from CDB could match ADB's long amortization. The actual local currency cost of \$285.5 million equivalent was financed through (i) grants from MOC for \$128.6 million, (ii) grants from Jilin Provincial Government for \$86.8 million, and (iii) a loan from CDB for \$70.1 million.

21. JPEC was the Executing Agency, and JPEC's general manager became project director responsible for approval of contracts and payments. A project implementation unit was established under JPEC's construction management office (Appendix 4 provides JPEC's current organization chart). Jilin Provincial Highway Survey and Design Institute carried out surveys and engineering, which were completed prior to tendering. National consultants were engaged under the project implementation unit to carry out day-to-day supervision and quality control of the construction activities. The implementation arrangements were largely consistent with the appraisal agreements and resulted in overall smooth implementation.

#### **D. Procurement, Construction, and Scheduling**

22. **Procurement.** The civil works for the Hashuang Expressway were divided into 32 contract packages, of which 19 were awarded on the basis of national competitive bidding and 13 on the basis of international competitive bidding (ICB). At appraisal, only 12 contracts had been envisaged, including 7 ICB and 5 national competitive bidding contracts. Twenty contracts were awarded for the procurement of equipment as compared with 11 envisaged at appraisal. Thirteen of the equipment contracts were awarded based on ICB. All procurement funded from the ADB loan was undertaken in accordance with ADB's guidelines on procurement. No major problems were encountered in the packaging of contracts, preparation of

bidding documents, and evaluation of bids. Procurement for the Changyu Expressway was carried out through 26 contracts as compared to 21 envisaged at appraisal. Of the 26 contracts, 18 were awarded based on ICB; one less than agreed at appraisal. Tendering of all 11 equipment contracts followed ICB procedures. Two issues arose in connection with the awards of selected civil works contracts. The first involved four contract packages and was related to deficiencies in JPEC's bid evaluation. Rather than rectifying the deficiencies and coming up with a fresh evaluation of the four contracts, JPEC decided to cancel the portion of the ADB loan allocated for the four packages. The concern underlying JPEC's action was that a new round of evaluations would delay construction beyond the end of the construction season, which in northern PRC is limited to about 6 months per year. The second issue also emanated from a concern over an expeditious construction schedule. To accelerate construction, JPEC decided to award two contracts based on national competitive bidding, rather than ICB as agreed with ADB. As ADB's approval for this variation was not obtained, ADB declined to finance the two contract packages. Overall, a total of six civil works contracts originally earmarked for ADB financing were refinanced by domestic loans and \$93 million of the ADB loan canceled.

23. **Construction and Scheduling.** The loan for the Hashuang Expressway was approved on 27 November 1998, signed on 29 March 1999, and became effective on 16 August 1999. The time taken from loan approval to effectiveness (8.5 months) is about the PRC average, which was 8.0 months in 1997. To meet the implementation schedule and the short construction period because of severe winter conditions in the project area, on 19 June 1998 ADB approved advance action for prequalification of contractors who tendered for the civil works and for recruitment of international consultants. Advance action helped enable timely completion of preconstruction activities. The main civil works originally set to start in May 1999, actually started in September 1999 due to a 3-month delay in the signing of subsidiary and onlending agreements. Despite this delay, the civil works were substantially completed six months ahead of schedule in September 2001. The control and communications systems were delayed by about 2 years due to complicated and lengthy internal government procedures. The loan for the Changyu Expressway was approved on 27 November 1998 and became effective on 16 August 1999, 8.5 months after loan approval. Civil works construction was originally scheduled to start in May 1999. Advance action on procurement and recruitment of consultants<sup>10</sup> enabled JPEC to commence work on three civil works contracts in April 1999. Work on the other 10 civil works contracts commenced in April 2000. Substantial delays occurred because of JPEC's evaluation and recommendations for award of the first six civil works contracts. Nonetheless, owing to extra efforts to make up time, all civil works were substantially completed by July 2002, 2 months ahead of the original construction schedule. On the other hand, the dispute over bidding issues and consequent delay could have been avoided if the assignment of the international capacity-building consultants, whose terms of reference included training in contract management, better aligned with the implementation schedule for civil works. A chronology of major project events is provided in Appendix 5.

#### **E. Design Changes**

24. Detailed designs followed closely the preliminary designs discussed at appraisal. No major changes in scope were made during implementation.

#### **F. Outputs**

25. The actual outputs of the Project covering both expressways include:

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<sup>10</sup> Approved by ADB on 19 June 1998.

- (i) construction of about 262 km of four-lane, access-controlled, toll expressway between Changchun and Harbin with associated link roads and three urban ring-road sections, 11 interchanges, and five service areas; along with procurement and installation of communications, vehicle-load weighing, safety, emergency, and maintenance equipment;
- (ii) promotion of corporate governance in commercial expressway operations in Heilongjiang and Jilin provinces;
- (iii) encouragement of private sector participation in highway construction financing;
- (iv) environmental mitigation measures carried out as per EIA reports, relocation and reallocation of land, and resettlement of households; and
- (v) strengthening of HHEC, JPEC, and national consultant capacity.

26. **Expressway Construction, Design, and Maintenance.** At appraisal, 262 km of four-lane, access-controlled, toll expressway were expected to be constructed from Harbin, the capital of Heilongjiang province, to Changchun, the capital of Jilin province, including a major bridge over the river, a section of the Harbin ring road, two sections of the Changchun ring road, 14 interchanges, five service areas, and link roads. The actual completed length of expressway is 262 km, consisting of 102 km of the Hashuang Expressway and 160 km of the Changyu Expressway. Urban ring roads for Harbin (29 km) and for Changchun (16 km) were constructed as integral parts of the expressway. Only five of the planned eight interchanges on the Changyu Expressway were constructed, with the others deferred to a later stage as traffic increases. To determine a reliable pavement design, trials were carried out to test pavement susceptibility to cracking, which was a chronic problem in northern PRC. The final pavement design was based on the results of the trials. While limited cracking appears to be a normal consequence of the harsh weather conditions, the approach adopted was successful and the extent of cracking kept to a minimum. Under routine maintenance the cracks are sealed using equipment procured under the Project. The current riding quality of the expressway is good and consistent with the traffic load after nearly 4 years of operations.

27. Equipment procured under the Project comprised road maintenance equipment and traffic engineering facilities. JPEC also purchased additional items of equipment funded from its own resources. Additional equipment needs, primarily related to road maintenance and safety, were identified during implementation and later assessed by the Project Completion Review Mission to be appropriate and adequate. Equipment for toll collection, the telecommunications and surveillance system, and vehicle axle-load testing was also procured under the Project. The vehicle-weighing equipment does not appear to be adequately used. The telecommunications system included an emergency telephone system, emergency surveillance control systems, and speed control equipment. The toll collection system has been installed in all the toll stations and is functioning well. All items procured under this component are well maintained and are being used for their intended purpose.

28. **Corporate Governance in Commercial Expressway Operation.** The Project attempted to improve corporate governance with respect to toll-collection methods and outsourcing certain activities, including service stations along the expressway and routine maintenance. The OEM found that this was largely achieved. Private companies under long-term lease contracts operate service stations and toll-collection methods appear to be sufficiently modernized to cope with the existing traffic. As for routine maintenance, the expressway corporations will continue to provide this service with their own labor force. Large-scale maintenance is contracted out to private contractors based on competitive bidding procedures. The training conducted during project implementation imparted on staff modern

management knowledge of design, construction, environment, and highway operation and maintenance.

**29. Private Sector Participation in Highway Construction Financing.** Following the recommendations of an ADB-financed TA,<sup>11</sup> the Project attempted to promote corporatization, leasing, and securitization as alternatives to the traditional financing concepts in road construction. HHEC and JPEC assured the OEM that this objective is being kept in view. The financial analysis and discussions held by the OEM identified a number of issues that need to be considered when assessing the progress achieved toward this end:

- (i) Commercially viable expressway operations must achieve scale economies with respect to the length of an expressway and traffic volume at a given toll tariff. During the first years of project operation, traffic volume and toll revenues on the project expressways did not warrant securitization. Commercial expressway operations would also have benefited from consolidating HHEC and JPEC into one corporation.
- (ii) The existing Northeast Expressway Company Ltd. is among the few cases, where the Government has gone forward with the securitization of expressway assets. Northeast Expressway Company also includes assets of the ADB-financed Changchun–Siping Expressway along with those of other expressways.<sup>12</sup> While the consolidation of several expressways into one corporation has achieved the critical mass necessary for securitization, the operation has fallen short of the underlying goal to mobilize private financing. Shares of the Northeast Expressway Corporation are listed at the Shenzhen stock exchange and are held by several government agencies, including Jilin Provincial Communications Department and MOC. This structure indicates that the objective of securitization, which is to harness private capital sources, has yet to be met. A related issue is whether the Government would be willing to permit private ownership of state-owned transport infrastructure assets.
- (iii) A condition for the expressway corporations to become attractive to private investors is their commercial and managerial autonomy. While the expressway corporations under the Project enjoy relative freedom in the management of day-to-day operations, they are financially dependent on their respective provincial governments. This is reflected in the obligation to transfer net income generated by the expressways to the provincial communication departments and in the departments funding periodic maintenance operations of the corporations.

**30. Environmental Mitigation Measures, Relocation and Reallocation of Land, and Resettlement of Households.** The EIA recommendations were incorporated into the project design and adequate measures were implemented to minimize potential adverse environmental impacts of the construction activities. During construction, appropriate environmental monitoring and mitigation measures were undertaken, including (i) slope protection to control soil erosion and reduce dust; (ii) landscaping and planting of trees; (iii) installation of sound-barrier walls near schools and villages; and (iv) installation of facilities for liquid waste, solid waste, and smog

<sup>11</sup> ADB. 1995. *Technical Assistance to the People's Republic of China for Corporatization, Leasing, and Securitization in the Road Sector*. Manila.

<sup>12</sup> This was the first time that the future revenue from an ADB-financed expressway in the PRC was used as a basis for securitization. ADB played an important role in this process by reviewing the securitization proposal and Northeast Expressway Company's initial financial projections.

treatment. Borrow and spoil areas and construction campsites were restored to their original condition, resulting in no irreversible environmental impact. In September 2002, an independent environmental review headed by the State Environmental Protection Administration inspected the Project to assess the environmental impact and performance. The inspection concluded that the mitigation of environmental impacts was successful.

31. All resettlement activities and payment of compensation were completed successfully. Prior to and during resettlement, proper consultation of affected people was conducted. Affected people also participated in the refinement of the alignment, location of overpasses, and detailed measurement surveys. All compensation was paid to the affected collective and individuals in accordance with the ADB-supported Land Administration Law, effective 1 January 1999. The impact of land loss was insignificant because the average landholding in the project area is relatively large (0.2 hectare/capita); consequently, the cash compensation enabled affected farmers to invest in more diversified livelihood activities and thereby improve their income. The compensation standards for housing were also very good, which enabled relocated households to build larger houses and improve their living standards.

32. **Strengthening of Executing Agency and National Consultant Capacity.** International consultants were engaged to advise on road safety issues, review pavement design and construction methods, support human resource development and training, introduce a contract management system, and establish a monitoring and evaluation system. The international consultants also organized international training for selected executing agency staff. The training subjects focused on pavement design, road safety, long-span bridge construction and maintenance, environmental protection, and expressway operation and management. The consultants also set up a detailed training system and schedule for domestic training. This resulted in the training of about 600 staff, including some employees of the civil works contractors.

## **G. Consultants**

33. International consultants financed by the loans were recruited according to ADB's guidelines on the use of consultants. HHEC and JPEC engaged the consultants promptly, and ADB processed the recruitment expeditiously. National consultants for construction supervision and quality control were recruited under local procedures that were satisfactory to ADB. The international and national consultants performed satisfactorily and established good working relationships with HHEC and JPEC. Although the total amount of international inputs was only 18 months (8 months for the Hashuang Expressway and 10 months for the Changyu Expressway), the EAs both indicated that this was sufficient. The international consultants prepared modules for staff training in expressway design (including pavement design); long-span bridge construction and maintenance; environmental protection, regulation, and design; road safety; expressway operation and maintenance; and expressway commercial development and business planning. A total of 60 staff from HHEC and JPEC participated in international training activities and more than 126 staff attended domestic workshops. HHEC and JPEC have managed to retain most of their staff; this has contributed to the effective implementation and operation of both the Project and its component expressways.

## **H. Loan Covenants**

34. In general, compliance was satisfactory and HHEC and JPEC carried out their respective expressway component of the Project efficiently and diligently. The progress reports,

including monthly, quarterly, and annual reports, as well as audited project accounts and financial statements were submitted as required.

35. In the case of the Hashuang Expressway, one covenant has not been complied with and two covenants have only been partly complied with. The covenant on two financial ratios (working and debt service ratios) was not met during the first years of operations. In hindsight, expecting compliance with the ratios shortly after the start of expressway operation was unrealistic. As shown in the financial projections (Appendix 6), HHEC has recently achieved or will soon achieve the targeted ratios. The covenant requiring HHEC to review the toll structure and levels annually and submit a report to ADB for the first 5 years of operations has been only partly complied with. HHEC submitted a detailed report on toll structure with their PCR in March 2003, but neglected to provide subsequent reports, despite having adjusted the tolls on 23 September 2004.<sup>13</sup> HHEC staff indicated that they would submit the next annual toll review together with the scheduled monitoring and evaluation report in January 2007. In addition, the covenant on land acquisition and resettlement was only partly complied with, since ADB was not kept regularly informed of the resettlement activities and no external monitor was engaged, as required in the Loan Agreement.

36. For Changyu Expressway, several covenants were partly complied with. JPEC contravened the covenant on procurement for some of the initial civil works contracts, despite the provisions in the Loan Agreement (para. 24). JPEC met the covenant on the two financial ratios, but with a delay of 1 year after commencement of operation. The covenant requiring JPEC to review the toll structure and levels annually and submit a report to ADB for the first 5 years of operations has been only partly complied with. JPEC submitted a report on toll structure and rates in October 2002 and October 2003, but neglected to provide subsequent reports. JPEC staff indicated that they would submit the next annual review in due course. In addition, the covenant on land acquisition and resettlement was only partly complied with, since ADB was not kept regularly informed of the resettlement activities and no external monitor was engaged, as required in the Loan Agreement.

## **I. Policy Setting**

37. Since the 1980s the PRC's economic growth has resulted in unprecedented expansion of intra- and interprovincial traffic. The economy's changing structure and increasing diversification have altered the transport demand pattern, in which the demand for road transport has increased faster than that for other transport modes. The movement of goods and passengers by road is increasing rapidly, as road transport is more flexible and responsive than other modes to the needs of a market economy. The shift in transport demand also reflects the loosening of anticompetitive restrictions in the road transport industry. With the country's robust economic growth, the expansion of vehicle fleets will maintain its fast pace in the coming years. However, the road network is still underdeveloped in both quality and extent; expressways and class I highways account for only 12% of the total network. The remaining 88% are medium- to low-grade paved roads and gravel roads. The growing demand for road transport has thus put a strain on road infrastructure, as manifested by congestion and bottlenecks in the network. Weaknesses in the road network have raised transport and logistics costs, and pointed to the need for changes in the policy and regulatory framework governing the transport sector.

38. The Project supported many of the strategic transport sector priorities of ADB's country strategy for the PRC. Selected priorities and their outcomes are discussed below:

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<sup>13</sup> Although finalized in October 2004, the Hashuang Expressway PCR did not indicate the adjustment of the toll rate.

- (i) **Upgrade highway design and construction standards to promote transport efficiency, project quality, road safety, and environmental protection.** Through the project expressways, ADB has indirectly supported this initiative; and through policy dialogue and fund allocations has directly supported road safety and environmental protection measures. ADB, in ensuring sound implementation arrangements and project management, has promoted project quality.
- (ii) **Increase cost recovery.** One approach to achieving greater cost recovery from road users is the collection of tolls. ADB has supported this objective and contributed to greater efficiency in the generation of road user revenues. While progress has been achieved, all road user charges, including taxes, fees, and tolls, need to be reviewed with a view to aligning all of these charges with an optimal pricing principle. Given the mix of current charges, whether the overall road user tariff would enable optimum capacity utilization or act as a deterrent to traffic is not clear. The overriding concern in the PRC for levying tolls is that loan-financed infrastructure projects need to generate sufficient funds to cover their debt service. As a consequence, the toll tariff is determined based on financing terms and structure, rather than by pricing considerations and capacity utilization. This is demonstrated by the different toll tariffs of HHEC and JPEC, despite the fact that sections under their purview are part of the same expressway.
- (iii) **Mobilize private sector financing and foreign capital for highway construction and operation.** ADB has consistently pursued this objective. However, real progress has been slow because most expressways, including the project expressway, have not attracted enough traffic to ensure profitable operation. Operation of the project expressway still relies to a large extent on financial support of the provincial communication departments (para 31). As the outlook is for sustained strong growth of traffic, the departments remain committed to commercializing and corporatizing the expressway entities.
- (iv) **Address traffic safety and vehicle overloading.** These concerns have been addressed by incorporating geometric expressway designs that are safe, providing traffic-engineering facilities to ensure safe driving, and including vehicle-weighing facilities to monitor axle loads on the expressways. While these have contributed to greater traffic safety, highway accidents caused by, among other factors, tired drivers and overloaded trucks remain a concern. Based on the OEM's observation of traffic, overloading is rampant. The problem is rooted in the transformation of the formerly state-owned transport sector into a private and highly competitive forwarding industry that needs more regulation. Competitive pressure causes truck operators to manipulate axles to increase the payload, overload their vehicles, and maximize operating hours. These factors not only contribute to accidents, but have a detrimental impact on the economic life of the pavement and thus the sustainability of the expressway. Because of the social dimension of the problem, enforcement of the existing legislation seems to be difficult. The OEM was informed that trucks on the Changyu Expressway staged a blockade in front of a weigh station to protest attempts of the authorities to take a random sample of axle loads. The OEM visited one of the stations and obtained data on overloading. The data indicates that the station was used only sporadically. Of the sample received by the OEM, the excess of weight over the

allowed maximum ranged from 18 to 27 tons per truck, equivalent to 3.6–4.5 tons of excess weight per axle. Weigh-station staff suggested that enforcement of the road safety regulation had become increasingly difficult. This applied, in particular, to interprovincial traffic, which makes up the majority of total traffic. More effective cooperation between the Heilongjiang and Jilin authorities is needed to enforce axle-load legislation at the origin of traffic, as well as complementary efforts by government authorities to apply axle load limits to vehicle manufacturers.

### III. PERFORMANCE ASSESSMENT

#### A. Overall Assessment

39. The overall assessment of the Project is highly successful (Table 1 and Appendix 7). The Changyu expressway component is rated highly successful, while the Hashuang expressway component is rated successful.

40. To arrive at the overall assessment, the individual component ratings were aggregated using equal weightings for the two expressways. The rating of each component group used four criteria: relevance (20% weight), effectiveness (30%), efficiency (30%), and sustainability (20%). Individual criterion ratings ranged from 0 to 3, in increasing order of project performance.

**Table 1: Overall Performance Assessment**

<b>Criterion</b>		<b>Hashuang Expressway</b>	<b>Changyu Expressway</b>	<b>Overall</b>
1. Relevance	20%	3	3	3
2. Effectiveness	30%	3	3	3
3. Efficiency	30%	2	2.8	2.4
4. Sustainability	20%	2.5	2.5	2.5
<b>Total Rating<sup>a</sup></b>		<b>2.6</b>	<b>2.8</b>	<b>2.72</b>

<sup>a</sup> Highly successful > 2.7; 2.7 ≥ successful ≥ 1.6; 1.6 > partly successful ≥ 0.8; unsuccessful < 0.8.  
Source: Operations Evaluation Mission.

#### B. Relevance

41. The Project is rated highly relevant (Table 1). The rating takes account of (i) relevance to the country's priorities and ADB's country and sector strategies, and (ii) extent that each intervention was appropriately designed to achieve the intended impact and outcome.

42. The Project was fully consistent with Government priorities at the time of appraisal and evaluation. It formed part of the Government's NTHS, connecting Harbin and Changchun, the provincial capitals of Heilongjiang and Jilin provinces. The Project was in line with the NTHS strategy to (i) connect major areas of economic growth, (ii) foster regional and international trade, and (iii) provide better access to less developed and disadvantaged areas. The Project was also in line with the Northeast Regional Transport Network Development Strategy, which called for the strengthening of linkages in northeast region of the PRC with the better developed southern and eastern regions. With the completion of the sections under the NTHS from Beijing to Tongjiang on the border with the Russian Federation, the project expressway will help to provide both Heilongjiang and Jilin provinces with direct road access to Beijing, as well as to major seaports and centers of economic activity on the east coast. The Project was also in line

with ADB's operational strategy for the PRC's road subsector, which focused on the construction of expressways and highways connecting major growth centers and facilitating policy and institutional reforms in the road subsector.

43. The OEM reformulated the DMF to better gauge the achievement of the project impact and outcome (paras. 7–10). The interventions under the Project have by and large achieved the outcome and are on course to achieve the intended impact. Thus OEM concludes that the interventions were appropriately designed to achieve their aims.

### **C. Effectiveness**

44. The Project is rated highly effective. The OEM assessed effectiveness in light of the project outcome and the expected outputs as defined in the reformulated DMF (Appendix 1).

45. The expected outcome of the Project was to improve road transport efficiency and safety in the project impact area of the expressway. The outcome was to be reflected in reduced congestion on the existing NH102, increased number and quality of transport services for freight and passengers, increased traffic in the road corridor, reduced vehicle travel time, reduced freight and passenger charges, and reduced traffic accidents. The Project has generally achieved the expected outcome. Traffic was reduced by 4,000 vehicles per day on the NH102, passenger and freight services have expanded greatly, average travel time from Harbin to Changchun was reduced from 4 hours to 2.5 hours, freight and passenger fares/charges were reduced by 10%–15% between 1999 and 2004, and the accident rate per 100 million vehicle-km has steadily decreased. However, the expected increase in traffic volume was only partially achieved, since volume is still 30% below the appraisal estimate.

### **D. Efficiency**

46. The Project is rated efficient, although very close to the upper bounds of the criterion. The Changyu expressway is rated highly efficient, whereas the Hashuang expressway is rated efficient. Both the Hashuang and Changyu expressways achieved their expected outcome of improving road transport capacity through efficient use of resources. All the physical project facilities were completed before loan closing and are in operation.

47. Updated information on traffic growth and composition as well as on vehicle operating costs were used to recalculate the economic internal rates of return (EIRRs) as the principal indicator for efficiency. The recalculated EIRR for the entire Changchun-Harbin Expressway was 16.8%, compared with 18.9% at appraisal and 16.3% in the PCR. The recalculated EIRR for Hashuang Expressway was 14.8% compared with 15.2% estimated at appraisal and 15.3% in the PCR. For the Changyu Expressway, the recalculated EIRR was 18.0% compared with the appraisal estimate of 21.5% and the PCR estimate of 17.1%. The reason for the differences in the EIRRs calculated at the various stages is explained by a variation in the major determinants of project viability, including cost estimates, actual and forecast traffic, and operating costs. The reevaluation also considered the impact of vehicle overloading, which would lead to premature pavement deterioration and shorter intervals between periodic maintenance interventions. As this raises the annualized average cost of operation, the impact on the EIRR is negative. Nonetheless, the viability of the expressway as a whole and its component expressways is robust and can tolerate adverse developments in terms of benefits and costs. This was tested in the sensitivity analysis accompanying the EIRR recalculation. The assumptions and methodology used for the revised traffic forecast and the recalculation of the EIRR are in Appendix 8.

48. The OEM evaluated the relative efficiency of the two expressways. The various estimates undertaken at the appraisal, PCR, and OEM stages share the result that the Hashuang Expressway component appears to be less efficient than the Changyu Expressway in terms of the EIRR. Given that both expressways largely carry the same traffic volume, the principal explanation for the difference is that the longer Changyu Expressway benefits from scale economies. Other factors include differences in the unit cost of construction, resettlement, and the share of costly bridge construction in the total length of the expressways, all contributing to lower returns of the Hashuang Expressway. Its significantly higher toll rate could not offset these cost disadvantages.

**Table 2: Comparative Efficiency: Hashuang and Changyu Expressways**

Item	Hashuang Expressway	Changyu Expressway
Length of Expressway (kilometer [km])	102	160
Cost of Civil Works (CNY million/km)	2.82	2.27
Cost of Resettlement (CNY/km)	0.32	0.12
Cost of Supervision (CNY/km)	0.14	0.13
Bridge Construction (meters [m]/km of road)	26.5	18.3
Weighted Average Toll (CNY/vehicle km)	0.89	0.76
Economic Internal Rate of Return (%)	14.8 (15.2, 15.3)	18.0 (21.5, 17.1)

CNY = yuan

Note: Figures in parenthesis relate to the respective appraisal and project completion report estimates.

Source: Operations Evaluation Mission.

## E. Sustainability

49. The Project is rated very likely to be sustainable, but very close to the lower bounds of the criterion (Table 1). Financial internal rates of return (FIRRs) were recalculated for the Project using updated traffic forecasts, revised post-2005 toll rates, and actual and forecast operating costs. The recalculated FIRR for the Hashuang Expressway is 11.1%, and for the Changyu Expressway 12.4%. Both FIRRs exceed the results at appraisal and PCR because of toll tariffs increases since the PCR, which surpass the assumptions underlying the appraisal and PCR estimates. The recalculated FIRRs exceed the weighted average cost of capital, estimated at 6% per annum, by more than 20% and thus support the “very likely to be sustainable” rating. Appendix 8 presents the actual and projected financial performance of HHEC and JPEC and details of the financial reestimation.

50. Robust economic and financial returns driven by substantial traffic growth underpin the long-term viability of the expressways. Human and financial resources are available to manage the operation and maintenance of the toll roads, and pavement management systems are in place to schedule maintenance interventions at optimal times. However, the observed lax handling of truck overloading could jeopardize financial performance and sustainability.

51. The institutional strengthening activities undertaken by the Project are assessed as most likely sustainable. Given the observed inconsistent approach to competitive bidding procedures and the increasingly severe traffic safety problem, limited evidence is available to indicate that the capacity-building measures in these critical areas have already taken root.

## IV. OTHER ASSESSMENTS

### A. Impact

#### 1. Impact on Institutions

52. **Institutional Capacity.** The Project provided a wide range of support for institutional development, generally through international training (60 person-months) and through domestic staff working with the international consultants on project preparation and supervision. Directly, the Project provided capacity-building programs in expressway design (including pavement design); long-span bridge construction and maintenance; environmental protection, regulation, and design; road safety; expressway operation and maintenance; and expressway commercial development and business planning.

53. **Governance.** The project implementation arrangements helped to improve governance of expressway construction and operation in Heilongjiang and Jilin provinces. Specifically, separate expressway corporations—HHEC and JPEC—were set up to construct and operate the expressways. The use of ICB bidding for the expressway contracts further exposed HHEC and JPEC and the respective provincial communications departments to the use of FIDIC standards (footnote 9).

#### 2. Socioeconomic Impact

54. Road projects have two main types of socioeconomic impacts: (i) immediate impacts in the form of improved transport for communities directly served by the road, and (ii) indirect impacts related to economic growth for a wider catchment.<sup>14</sup>

55. Few immediate benefits can be identified along most of the project alignment as use of the expressways is limited both by access and by vehicle type (e.g., farm tractors are prohibited from using the expressway). Indirect benefits, however, are apparent. Intertown bus services from towns served by expressway interchanges has increased providing a faster, safer, and more comfortable ride to people in the project area to services not available in their townships/villages. Prior to the Project, 14 buses operated each day from Harbin to Changchun. By 2004, this had risen to 40 buses per day on the expressway in addition to 9 buses per day on the NH102. Faster and cheaper travel has reduced the cost of freight delivery; the benefits of this are gradually being passed on to residents in the project area.

56. Indirect benefits have arisen through development of businesses in the project area, which increased demand for employment and contributed to general prosperity. In general, the impact indicators included in the revised DMF are on target to be achieved. Gross domestic product (GDP) in Harbin city has increased since completion of the Project, with GDP growing by 14.7% year-over-year in 2004, compared with 10.2% in 1999. Pre-project GDP data was unavailable for Changchun city, but the latest statistics indicate that GDP grew by a strong 12.2% year-over-year in 2004. In terms of interprovincial trade, the annual average export value of goods exported from Heilongjiang province grew by 106% year-over-year in 2004, compared with an average annual increase of 17% during 2000–2002. Given that most goods exported

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<sup>14</sup> The ensuing discussion of the socioeconomic impact of the Project is limited by the absence of a “without project” assessment that would allow the separation of impacts due to the Project from impacts from other developments in the two provinces.

from Heilongjiang province are transported via Jilin province, this indicates a substantial increase in interprovincial trade.

57. Fixed investment in Heilongjiang province increased by 26.5% year-over-year in 2004, compared with an average annual increase of 17.6% during 2000–2002. Similarly, fixed investment in Jilin province increased by 32.3% year-over-year in 2004, compared with a decline of 35.8% in 1999.

58. The OEM collected limited data on agricultural production and rural incomes. Agricultural GDP in Harbin city grew by 24% year-over-year in 2004 (compared with a 1% increase in 2000), with farming registering growth of 24% (compared with a 5% decline in 1999). Farmers' net income in Shuangcheng county in Heilongjiang province grew by 18% year-over-year in 2004, compared with 6.5% in 2000. Appendix 9 provides details on socioeconomic development in project impact areas.

59. Given that the expressway is strategically important in both the NTHS and in the Northeast Regional Transport Network Development Strategy, the indirect effects and benefits to people in the project area of more efficient transport will continue to grow, in particular in 2008 when the link from Dongning in Heilongjiang province to Vladivostok in the Russian Federation is complete.

60. At the time of appraisal, land acquisition under the Project was expected to affect an estimated 8,110 people, of which 843 were to be affected by housing demolition. Actual land acquisition affected 8,984 people (11% increase), of which 958 (14% increase) were affected by house demolition. Total actual land acquisition was 2,106 hectares, 1.6% more than estimated at appraisal. Total actual resettlement compensation was \$52 million, which was considerably lower than the preliminary base cost of \$77.6 million indicated in the land acquisition and resettlement report. The reasons for the much lower total compensation were (i) the waiver of several taxes and fees in Jilin province, (ii) decreased compensation rates in line with provincial policy, and (iii) unused contingency.

61. The OEM conducted interviews with people affected by the Project and collected data on resettlement in the Project's impact area. The OEM visited Xinmin village with a population of 3,800 persons, located in Xinxing township, Shuangcheng county, Heilongjiang province, and situated 1.5 km away from the expressway. Twenty households were affected by land acquisition along about 1 kilometer of the expressway alignment, with each household losing on average 0.2-0.3 hectares of family contracted farmland. The OEM interviewed three people affected who indicated they were satisfied with the compensation received for their land. The Xinmin village leader reported that a village road improvement program for CNY5 million is being implemented by the village to improve all the unpaved earth village roads to cement concrete pavement at a cost of CNY80 per square meter. Two underpasses and one overpass have been built along the one kilometer long expressway section to facilitate access to farmland on the other side of the Hashuang Expressway.

### **3. Environmental Impact**

62. The Project had no significant adverse environmental impacts. The recommendations and requirements of the EIA and summary EIA were incorporated in the project design and adequate measures were implemented to minimize potential adverse environmental impacts of the construction activities. As an indication of the generally successful efforts to address environmental issues, in June 2006 the Ministry of Land and Resources nominated the

Changyu Expressway as a national model project for the successful rehabilitation of the borrow pits to farmland.

63. The OEM noted one mitigation measure in the summary EIA that was not fully implemented at the time of project completion: preparation of a simple spills contingency plan for the expressway system. Jilin Provincial Communications Department advised that they have already prepared an emergency plan for the Changyu Expressway, which includes a simple spills contingency plan. HPCD advised that they are currently preparing a spills contingency plan and undertaking other measures to improve their emergency response to road accidents involving hazardous and toxic goods. These activities are the result of heightened government awareness following the refinery explosion that contaminated Songhua River in 2005.

## **B. Asian Development Bank and Borrower Performance**

64. ADB's performance is rated satisfactory. The OEM found that ADB performed satisfactorily in formulating the Project and project supervision was generally adequate. Three joint loan review missions were carried out to monitor project progress and resolve implementation issues. A special loan administration mission was also fielded in August 1999 to review the bids for civil works contracts. The OEM concurs with the findings in both PCRs that the resettlement process could have benefited from closer ADB supervision (para. 60). ADB should have been more active in monitoring implementation of the land acquisition and resettlement activities.

65. The OEM sought the views of HHEC and JPEC on ADB's performance. Both HHEC and JPEC staff indicated that they were generally satisfied with ADB's performance. HHEC staff particularly appreciated that their suggestions for improving project processing, after their first loan,<sup>15</sup> were taken into account during the processing of the Project. JPEC staff highly appreciated the efficient loan administration, but indicated that ADB could have better reflected the northeastern PRC's special climatic conditions in the appraisal report's project implementation schedule.

66. The Borrower's performance is rated satisfactory. HHEC and JPEC have implemented the Project in a timely and efficient manner. Both HHEC and JPEC were well staffed. Land acquisition and resettlement actions were completed on time and to the satisfaction of those affected. Environmental protection measures were appropriate to ensure compliance with the requirements. The one shortcoming of HHEC's performance relates to the unrealistic cost estimate for consulting services and training (para. 16[iii]), while the main shortcoming in JPEC's performance related to procurement issues (para. 22).

## **V. ISSUES, LESSONS, AND FOLLOW-UP ACTIONS**

### **A. Issues**

67. Implementation of the Changyu Expressway component, involving the preparation of designs, bidding documents, and evaluation of bids along with other preconstruction activities, was marred by issues revolving around very tight construction schedules, proper bidding procedures, and the leverage ADB has to impart its knowledge and experience in project management and administration to its clients. In the case of JPEC, the client opted to sacrifice proper bidding procedures for more expeditious construction activities. This left ADB no other

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<sup>15</sup> ADB. 1994. *Report and Recommendation to the President for the Heilongjiang Expressway Project*. Manila

choice than to cancel a portion of its loan allocated for selected contract packages. JPEC refinanced the packages with domestic loans; the conditions of the refinancing were reportedly more favorable than those of the ADB loan. From the point of view of financial efficiency, the shift in financing has benefited the financial performance of the JPEC. As the shortened bidding procedures were also completed successfully, the overall outcome for JPEC is positive in hindsight. Nonetheless, better planning and scheduling of activities could have prevented the poor utilization of the ADB loan. Overall, 58.5% of the loan amount originally allocated to the Changyu Expressway was not utilized, which may be considered as inefficient fund utilization given the real and opportunity costs involved in the provision of ADB loans.

68. Road traffic safety and overloading of trucks are interrelated issues, both emanating from rapid private sector development in the transport industry and a regulatory framework and capacity to enforce legislation that may not have kept step with that development. ADB through the construction of the project expressways has provided facilities to improve the safety situation and to prevent overloading. Despite these efforts, overloading is rampant and a source of traffic accidents. The issue cannot be addressed at the project level. The central Government is aware of the problems and has set up an interministerial committee to develop and implement special measures to enforce regulations nationwide on overloaded trucks.<sup>16</sup> ADB has provided assistance to the Traffic Management Department of the Ministry of Public Security to improve the road safety situation via enforcement.<sup>17</sup>

69. The coherence of the entire set of road user charges needs review. The overriding concern in the PRC for levying tolls is that loan-financed infrastructure projects need to generate sufficient funds to cover the debt service. A toll tariff is determined based on the loan terms and financing structure of a project, rather than by considerations of optimal pricing and capacity utilization. This is demonstrated by different HHEC and JPEC toll tariffs despite the fact that the sections under their purview are portions of the same expressway. Likewise, several sections of the national highway, which the project expressway sought to decongest, were tolled after they received loan-financed rehabilitation.

70. The expressway corporations under the Project have achieved the Government's objective to generate sufficient funds for the servicing of the debt incurred with construction of the expressways. An expected project output was to take resource mobilization to a higher level by either securitizing the assets of the expressway corporations or by leasing them to private operators. The purpose was to use the proceeds of such operations for the financing of future road construction. The Project has not yet achieved this output. Several reasons underlie the shortfall. Commercial expressway operations require scale economies that cannot be achieved if the corporations cover relatively short sections limited to the administrative confines of their provincial governments. Commercial attractiveness of the Project would have benefited from having only one corporation that straddled the provincial borders between Heilongjiang and Jilin. A further condition would be greater financial autonomy of the corporation with respect to retaining operational surpluses and to using them for major road works required periodically in the form of pavement overhauls and rehabilitation. An overriding concern is the Government's willingness to allow private ownership of strategic road infrastructure assets. While the Government has reiterated its commitment to exploring the potential for alternative resource

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<sup>16</sup> The interministerial committee is coordinated by MOC and includes Ministry of Public Security, National Development and Reform Commission, National Quality Control Bureau, National Safety Bureau, National Industry and Commerce Bureau, and the State Council's Law and Regulation Office.

<sup>17</sup> ADB. 2005. *Technical Assistance to the People's Republic of China for Road Safety Improvement* (Cofinanced by the Global Road Safety Partnership). Manila.

mobilization, little progress has been made and this could be a suitable subject of future policy dialogue.

## **B. Lessons**

71. The PCRs provided lessons from implementation of the resettlement activities. The lessons include the need for closer ADB supervision of resettlement issues, more attention to resettlement monitoring and timely submission of monitoring reports. While the OEM reconfirms these lessons, it notes that at the time of project formulation ADB's staff skills did not include those of a resettlement specialist and that ADB therefore hired a consultant for one of the supervision missions. An additional lesson is that early review missions to projects with significant resettlement and/or substantial increase in the number of resettled people above appraisal estimates would do well to include a resettlement specialist.

72. The experience gained with the Project raises questions about the usefulness of including financial targets as covenants in loan agreements. The targets referred to relate to ratios that evolve over time as a result of the interplay of various financial and operational variables, including the scale of the project, the costs and revenues involved, and the demand for project services. Obviously, this is too complex a matter to require executing agencies to adhere to fixed ratios and ADB to monitor them. Furthermore, covenanted ratios escape the dynamics of the financial performance of a project during its economic life. In the case of the working ratio, a better practice would be to state a minimum reduction in the ratio to be achieved by a specified date.<sup>18</sup> Given the declared objective that the expressway operations should generate enough income to cover their debt service, the inclusion of a debt service target had merits. But even here, greater flexibility should have been allowed.

73. Implementation of projects in the PRC in general, and due to harsh climatic conditions especially in the northeastern provinces, follows tight construction schedules. A shorter implementation period contributes to project viability and has been one explanation for the positive performance of projects in the PRC. While this should not be at the expense of sound project management principles, project formulation should mitigate against the risk of slippages. In the case of the Changyu Expressway, the requirement to stay on schedule prevailed over the adherence to ADB-approved contract management standards. The dispute over bidding issues and thus the delay could have perhaps been avoided if the assignment of the international capacity-building consultants, whose terms of reference included training in contract management, had been better aligned with the implementation schedule for civil works. This would have meant fielding the consultants prior to the start of bidding procedures, rather than at a stage when contracts had largely been awarded.

## **C. Follow-Up Actions**

74. Based on the evaluation findings, one follow-up action is proposed for Government consideration and pertains to truck overloading: The weigh stations should resume their activities and legislation should be enforced more rigorously. HHEC, JPEC, and the provincial public security bureaus would be responsible for implementing this recommendation, which is recommended to be implemented by the end of 2007.

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<sup>18</sup> This is consistent with of ADB. 2001. *Guidelines for the Financial Governance and Management of Investment Projects Financed by the Asian Development Bank*. Manila (para. 3.6.2.5.1).

## SUMMARY DESIGN AND MONITORING FRAMEWORK

Design Summary <sup>a</sup>	Performance Targets/Indicators <sup>b</sup>	Results	Monitoring Mechanism
<p><b>Impact</b> Promote economic growth in Heilongjiang and Jilin provinces and the project impact area.</p>	<p>Sustained growth in gross domestic product (GDP) for affected counties and cities.</p> <p>Inter- and intraprovincial trade in Heilongjiang and Jilin provinces increased.</p> <p>Direct foreign investment in the project area increased.</p> <p>Cash crop area increased in project area counties by 2005.<sup>c</sup></p> <p>Per capita rural income in project area increased by 2005.<sup>c</sup></p>	<p>On target. <b>Heilongjiang province:</b> GDP in Harbin city grew by 14.7% during 2003/04 (compared with 10.2% increase during 1998/1999). GDP in Shuangcheng County grew by 16.2% during 2003/04 (compared with 11.1% increase during 1998/99). <b>Jilin province:</b> GDP in Changchun city grew by 12.2% during 2003/04, while GDP growth in Dehui and Fuyu counties was 14% and 19.9%.</p> <p>On target. Complete statistics on inter- and intraprovincial trade are not available. However, the annual average export value of goods exported from Heilongjiang province grew by 106% during 2003/04, compared with 17% increase during 2000/02. Given that most goods from Heilongjiang province are exported via Jilin province, this indicates a substantial increase in interprovincial trade.</p> <p>On target. <b>Heilongjiang province:</b> Annual average foreign direct investment increased by 26.5% during 2003/04, compared with 17.6% increase during 2000/02. <b>Jilin province:</b> Annual average foreign direct investment increased by 32.3% during 2003/04, compared with a decline of 35.8% during 1998/99.</p> <p>On target. Statistics on cash crop area are not available. Agriculture GDP in Harbin grew by 24% during 2003/04 (compared with 1% increase in 1999/2000), with farming registering growth of 24% (compared with 5% decline in 1999/2000).</p> <p>On target. Only partial statistics are available. Farmers' net income in Shuangcheng county, Heilongjiang province grew by 18% during 2003/04, compared with 6.5% increase during 1999/2000.</p>	<p>People's Republic of China (PRC), Heilongjiang, and Jilin statistics yearbooks.</p> <p>Heilongjiang and Jilin provinces statistics yearbooks.</p> <p>PRC, Heilongjiang, and Jilin statistics yearbooks.</p> <p>Heilongjiang and Jilin statistics yearbooks.</p> <p>Heilongjiang and Jilin statistics yearbooks.</p>

Design Summary <sup>a</sup>	Performance Targets/Indicators <sup>b</sup>	Results	Monitoring Mechanism
<p><b>Outcome</b> Road transport efficiency and safety improved in the project impact area for the expressway.</p>	<p>Reduced congestion on existing roads, especially national highway (NH) 102.</p> <p>Increase in number and quality of transport service providers for both freight and passengers.</p> <p>Increased traffic in the road corridor.</p> <p>Reduced vehicle travel time.</p> <p>Reduced freight and passenger charges.</p> <p>Reduction in accidents through separation of slow- and fast-moving traffic and elimination of opposing flows.</p>	<p>Achieved. Traffic reduced by 4,000 vehicles per day, starting in 2003.</p> <p>Achieved. The number of short- and middle-distance expressway buses offering frequent service has increased from 14 buses per day between Harbin and Changchun on the NH102 before the expressway was opened to 40 buses per day on the expressway and 9 buses per day on the NH102 after the expressway was opened. Freight transport has doubled on the project expressway since 2002.</p> <p>Partly achieved. Traffic volume on the expressways has increased, but is still 30% below the appraisal estimate.</p> <p>Achieved. Average travel time from Harbin to Changchun was reduced from 4 hours to 2.5 hours.</p> <p>Achieved. Both freight and passenger fares/charges were reduced by 10%–15% between 1999 and 2004.</p> <p>Achieved. Accident rate per 100 million vehicle-kilometers has steadily decreased from 259 in 1998 on NH102 to 205 in the corridor (61 on the expressway and 144 on NH102) in 2003. The number of accidents and fatalities has also decreased.</p>	<p>Project performance monitoring system (PPMS) and project completion reports (PCRs).</p> <p>Heilongjiang Provincial Communications Department (HPCD) and Jilin Provincial Communications Department (JPCD) data.</p> <p>Heilongjiang Hashuang Expressway Corporation (HHEC) and Changyu Expressway Administration Division, Jilin Provincial Expressway Corporation (JPEC) data.</p> <p>Operations Evaluation Mission.</p> <p>HPCD and JPCD data.</p> <p>JPEC data.</p>

Design Summary <sup>a</sup>	Performance Targets/Indicators <sup>b</sup>	Results	Monitoring Mechanism
<p><b>Outputs</b></p> <p>1. Road infrastructure and associated equipment and facilities improved along the expressway between Changchun and Harbin.</p> <p>2. Corporate governance promoted in expressway operations in Heilongjiang and Jilin provinces.</p>	<p>Reduced vehicle costs.</p> <p>Increased road transport capacity and more efficient movement of freight and passengers.</p> <p>Procurement and installation of communications, vehicle-loading weighing, safety, emergency, and maintenance equipment.<sup>d</sup></p> <p>Relocation and reallocation of land, and resettlement of households.<sup>d</sup></p> <p>Safety audits implemented during project design and construction.<sup>c</sup></p> <p>Corporate plan, human resource development plan, and financial projections developed.</p> <p>Commercialization of service areas and other businesses.</p> <p>Expressway operations separated from provincial government functions.<sup>c</sup></p>	<p>Achieved. Vehicle operating costs reduced by about 30% on the project expressway.</p> <p>Achieved. 101 km Hashuang Expressway completed in September 2001 and 161 km Changyu Expressway completed in September 2002. Road capacity increased to 45,000 pcu per day.</p> <p>Achieved. Final procurement for Hashuang Expressway in March 2002 and for Changyu Expressway in July 2002.</p> <p>Achieved. Resettlement activities and payment of compensation for Hashuang Expressway was completed in August 1999 and for Changyu Expressway in June 1999.</p> <p>Achieved. Safety audits were implemented.</p> <p>Partly achieved. Brief report on Strategic Planning and Financial Planning for Hashuang Expressway was submitted to ADB in December 2002. A plan to strengthen corporate management of the Changyu Expressway was submitted to ADB, but needed strengthening. Human resource development plans were prepared for Changyu Expressway.</p> <p>Achieved. Two service areas on Hashuang Expressway have been leased to private operators. Three service areas on Changyu Expressway with parking areas were built under build-operate-transfer arrangements.</p> <p>Partly achieved. Expressway operations in Heilongjiang province are not separated from provincial government functions. Expressway operations in Jilin province are more separated</p>	<p>HPCD and JPCD.</p> <p>PPMS and PCR.</p> <p>PCR, HHEC, and JPEC.</p> <p>PCR.</p> <p>Progress reports and PCR.</p> <p>PCR, HHEC, and JPEC.</p> <p>PCR, HHEC, and JPEC.</p> <p>HHEC and JPEC.</p>

Design Summary <sup>a</sup>	Performance Targets/Indicators <sup>b</sup>	Results	Monitoring Mechanism
		under a “hybrid system.”	
3. Private sector participation encouraged in the Hashuang and Changyu expressways.	Existing revenue streams across both provinces securitized.	Not yet achieved. Current financial returns of both Hashuang and Changyu expressways are not sufficiently high to attract outside investment.	HHEC and JPEC.
4. Environmental mitigation measures carried out as per environmental impact assessment (EIA) reports.	An operation and maintenance concession awarded when the expressway meets the required financial performance.	Not yet achieved. Current financial returns of Hashuang and Changyu expressways are not sufficiently high to attract outside investment.	HHEC and JPEC.
4. Environmental mitigation measures carried out as per environmental impact assessment (EIA) reports.	Mitigation measures are included in civil works contracts.	Achieved.	Civil works contracts.
4. Environmental mitigation measures carried out as per environmental impact assessment (EIA) reports.	Monitoring plans agreed.	Achieved. State Environmental Protection Administration of the PRC approved EIAs containing monitoring plans for the Hashuang and Changyu expressways in June 1998.	EIA and summary EIA.
4. Environmental mitigation measures carried out as per environmental impact assessment (EIA) reports.	Number of trees planted along alignment.	Indicator was not sufficiently specific and, hence, achievement difficult to monitor. Nevertheless, Changyu PCR reports that more than 3 million trees, shrubs, and other plants were planted along the Changyu Expressway. The Hashuang PCR reports 54,890 trees were planted.	PCR, HHEC, and JPEC.
4. Environmental mitigation measures carried out as per environmental impact assessment (EIA) reports.	The environment at the project site is protected and adverse environmental impacts are minimized by mitigation measures included in the EIA and summary EIA. <sup>c</sup>	Achieved. PCRs report that adequate measures were taken to minimize any adverse environmental impacts of the construction activities. In particular, the Ministry of Land Administration designated the Changyu Expressway a national model project for effective mitigation measures to recultivate the construction borrow pits.	PCR, HHEC, and JPEC.
5. HHEC, JPEC, and national consultant capacity strengthened	Completion of 18 months of international advisory services and 9,900 months of national consulting services.	Achieved. 63 person-months of international consulting and 10,920 person-months of national consulting were utilized.	PCR, HHEC, and JPEC.
5. HHEC, JPEC, and national consultant capacity strengthened	Completion of domestic and international training programs.	Achieved. 60 staff were trained internationally and more than 126 staff attended domestic workshops.	PCR, HHEC, and JPEC.

<b>Activities with Milestones</b>		<b>Results</b>
1. Expressway and civil works	Civil works contracts awarded in 1999 and completed by third quarter 2002	Achieved. Civil works contracts awarded in 1999. Hashuang Expressway completed September 2001. Changyu Expressway completed August 2002.
2. Equipment	Road operating equipment procured.	Final procurement for Hashuang Expressway in March 2002 and for Changyu Expressway in July 2002.
3. Resettlement	Resettlement and compensation measures completed.	Resettlement activities and payment of compensation for Hashuang Expressway were completed in August 1999 and for Changyu Expressway in June 1999.
4. Consulting and training services	Consultants recruited.	National and international consultants for Hashuang Expressway were recruited October 1998 and September 1999, respectively. National and international consultants for Changyu Expressway were recruited April 1999 and August 1999, respectively.

ADB = Asian Development Bank, EIA = environmental impact assessment, GDP = gross domestic product, HHEC = Heilongjiang Hashuang Expressway Corporation, HPCD = Heilongjiang Provincial Communications Department, JPCD = Jilin Provincial Communications Department, JPEC = Jilin Provincial Expressway Corporation, NH = national highway, PCR = project completion report, PPMS = project performance monitoring system, PRC = People's Republic of China

<sup>a</sup> The design summary statements have been modified in accordance with ADB's *Guidelines for Preparing a Design and Monitoring Framework* and to reflect design summaries included in design and monitoring frameworks of reports and recommendations of the President (RRPs) of recent PRC expressway loans.

<sup>b</sup> Performance indicator/targets are, by and large, the same as those included in the RRP's design and monitoring framework. However, new indicators/targets have been added and other indicators/targets revised in order to better measure the attainment of the design summary statements.

<sup>c</sup> Performance indicator added at evaluation stage in order to better measure the attainment of design summary statement.

<sup>d</sup> Indicator/target originally included as a design summary element in the RRP.

## APPRAISAL AND ACTUAL COSTS AND FINANCING

### A. Hashuang Expressway

**Table A2.1: Appraised and Actual Project Costs**  
(\$ million)

Component	Appraised			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
<b>A. Base Cost</b>						
1. Civil Works	132.5	149.4	281.9	135.0	152.4	287.4
2. Equipment	14.4	0.0	14.4	12.5	0.5	13.0
3. Land Acquisition and Resettlement	0.0	27.8	27.8	0.0	32.6	32.6
4. Consulting Services and Training	0.7	7.0	7.7	0.5	14.3	14.8
<b>Subtotal (A)</b>	<b>147.6</b>	<b>184.2</b>	<b>331.8</b>	<b>148.0</b>	<b>199.8</b>	<b>347.8</b>
<b>B. Contingencies</b>						
1. Physical	11.8	14.7	26.5	0.0	0.0	0.0
2. Price	5.9	7.4	13.3	0.0	0.0	0.0
<b>Subtotal (B)</b>	<b>17.7</b>	<b>22.1</b>	<b>39.8</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>C. IDC and Other Charges</b>	<b>25.9</b>	<b>0.0</b>	<b>25.9</b>	<b>14.6</b>	<b>41.3</b>	<b>55.9</b>
<b>Total</b>	<b>191.2</b>	<b>206.3</b>	<b>397.5</b>	<b>162.6</b>	<b>241.1</b>	<b>403.7</b>

IDC = interest during construction.

Sources: Project completion report and Heilongjiang Hashuang Expressway Corporation.

**Table A2.2: Appraised and Actual Financing**  
(\$ million)

Source	Appraised			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
ADB	170.0	0.0	170.0	142.1	0.0	142.1
Ministry of Communications	0.0	72.3	72.3	0.0	68.8	68.8
China Development Bank	0.0	0.0	0.0	20.5	111.3	131.8
HPG/HPCD	21.2	134.0	155.2	0.0	61.0	61.0
<b>Total</b>	<b>191.2</b>	<b>206.3</b>	<b>397.5</b>	<b>162.6</b>	<b>241.1</b>	<b>403.7</b>

ADB = Asian Development Bank, HPCD = Heilongjiang Provincial Communications Department, HPG = Heilongjiang provincial government,

Sources: Project completion report and Heilongjiang Hashuang Expressway Corporation.

## B. Changyu Expressway

**Table A2.3: Appraised and Actual Project Costs**  
(\$ million)

Component	Appraised			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
<b>A. Base Cost</b>						
1. Civil Works	163.7	184.6	348.3	169.0	194.0	363.0
2. Equipment	14.0	0.0	14.0	4.0	1.3	5.3
3. Land Acquisition and Resettlement	0.0	49.8	49.8	0.0	19.4	19.4
4. Consulting Services and Training	8.0	19.6	20.4	9.0	19.2	20.1
<b>Subtotal (A)</b>	<b>178.5</b>	<b>254.0</b>	<b>432.5</b>	<b>173.9</b>	<b>233.9</b>	<b>407.8</b>
<b>B. Contingencies</b>						
1. Physical	14.3	20.3	34.6	0.0	0.0	0.0
2. Price	9.9	14.1	24.0	0.0	0.0	0.0
<b>Subtotal (B)</b>	<b>24.2</b>	<b>34.4</b>	<b>58.6</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>C. IDC and Other Charges</b>	<b>27.3</b>	<b>22.0</b>	<b>49.3</b>	<b>10.6</b>	<b>51.6</b>	<b>62.2</b>
<b>Total</b>	<b>230.0</b>	<b>310.4</b>	<b>540.4</b>	<b>184.5</b>	<b>285.5</b>	<b>470.0</b>

IDC = interest during construction.

Sources: Project completion report and Jilin Provincial Communications Department.

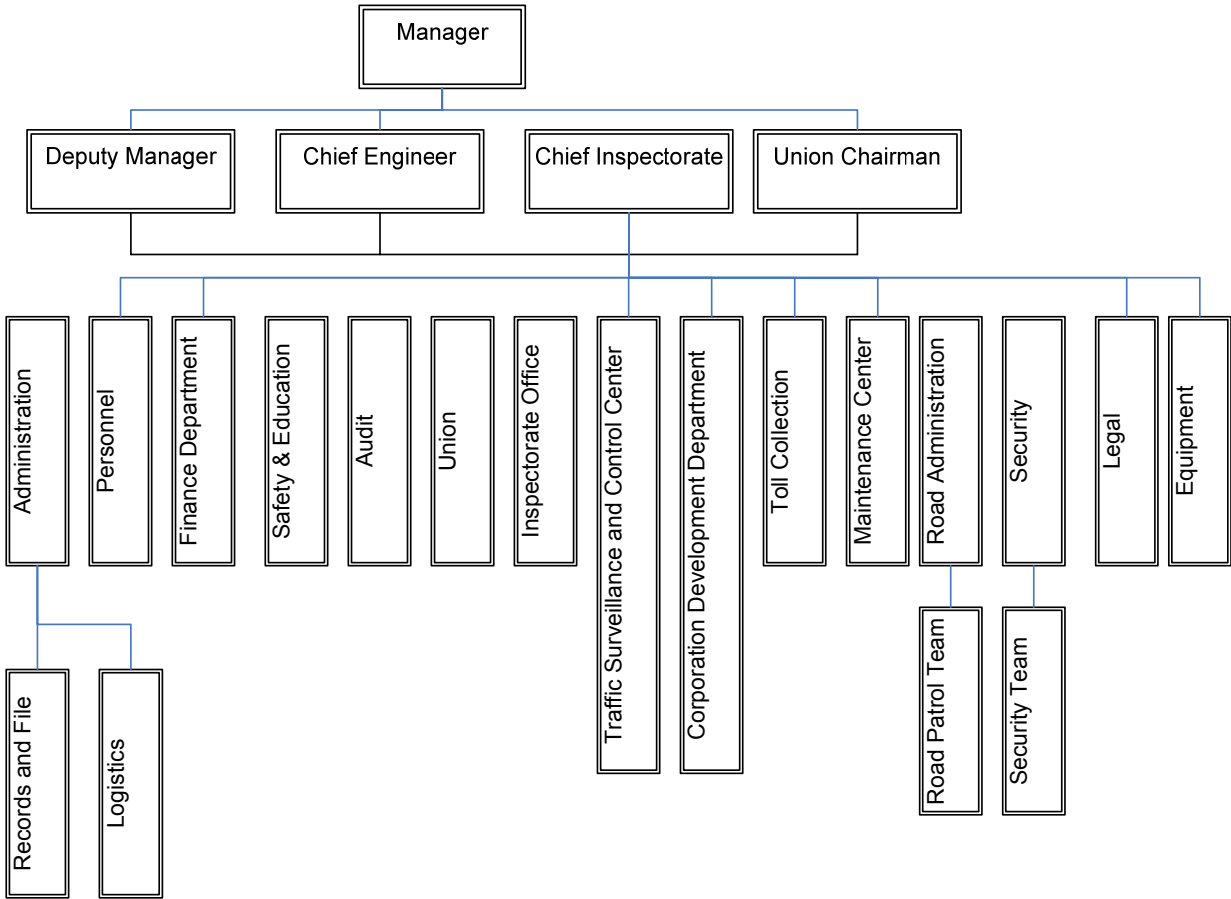
**Table A2.4: Appraised and Actual Financing**  
(\$ million)

Source	Appraised			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
ADB	220.0	0.0	220.0	91.2	0.0	91.2
Ministry of Communications	0.0	96.4	96.4	0.0	128.6	128.6
China Development Bank	0.0	132.5	132.5	93.3	70.1	163.4
JPG/JPCD	10.0	81.5	91.5	0.0	86.8	86.8
<b>Total</b>	<b>230.0</b>	<b>310.4</b>	<b>540.4</b>	<b>184.5</b>	<b>285.5</b>	<b>470.0</b>

ADB = Asian Development Bank, JPCD = Jilin Provincial Communications Department, JPG = Jilin provincial government.

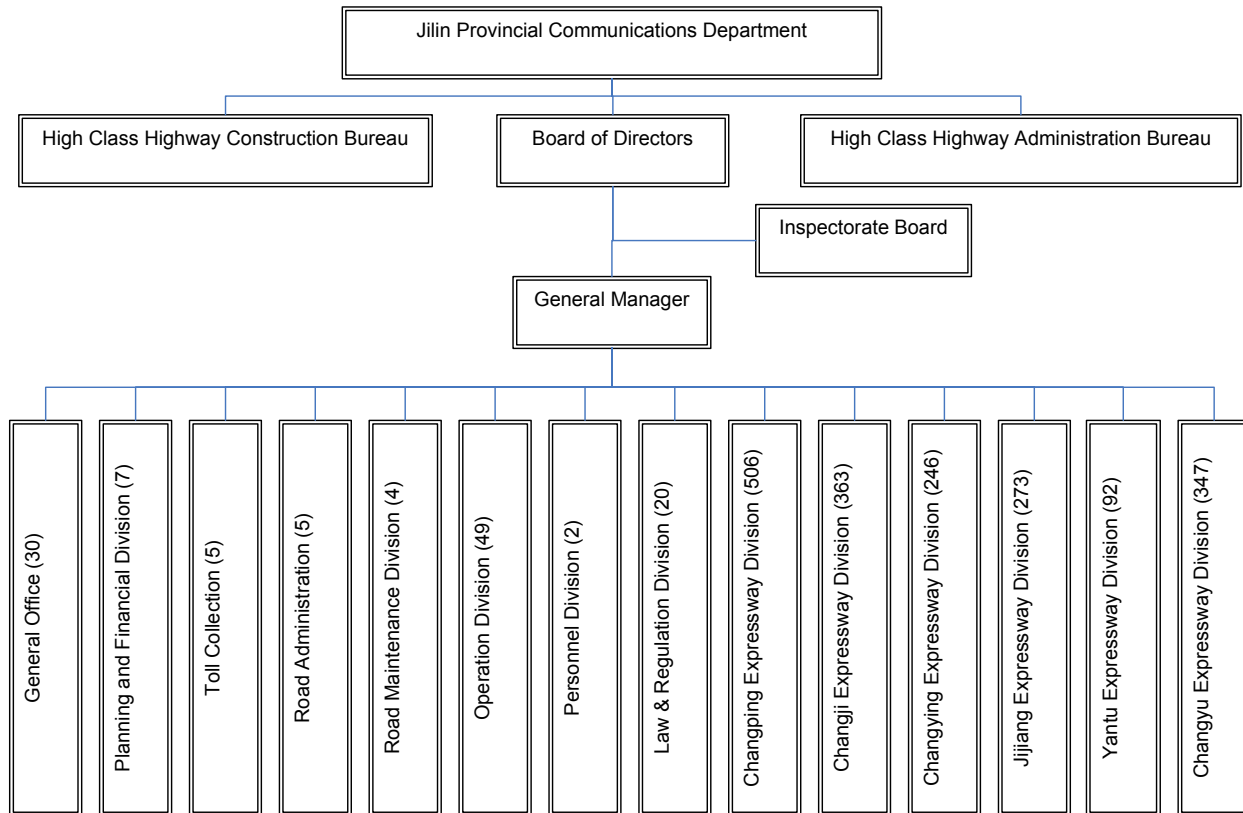
Sources: Project completion report and Jilin Provincial Communications Department.

## ORGANIZATION CHART OF HEILONGJIANG HASHUANG EXPRESSWAY CORPORATION



Source: Heilongjiang Hashuang Expressway Corporation.

## ORGANIZATION CHART OF JILIN PROVINCIAL TRANSPORT AGENCIES



Note : Numbers in brackets show the number of staff in the division.  
 Source: Jilin Provincial Communications Department.

## CHRONOLOGY OF MAJOR EVENTS IN THE PROJECT'S HISTORY

**Table A5.1: Hashuang Expressway**

Year	Date	Events
1997	22 August	Approval of project preparatory technical assistance.
1998	1 April	Project brief meeting.
	13-29 April	Fact-finding mission.
	19 June	Management review meeting. Approval of advance action for civil works, equipment, and international consulting services.
	20 July-3 August	Appraisal mission
	27 July	Circulation of the SEAI to the Board.
	August	Completion of detailed design.
	1 September	Approval of prequalification documents for ICB civil works.
	8 September	Issuance of prequalification documents.
	24 September	Staff review committee meeting.
	28 September	Contract signing of LCB contracts A1-A3.
	13-15 October	Loan negotiations.
	16 November	Deadline for submission of prequalification applications.
	27 November	Loan approval.
	1999	5 February
12 February		Approval of prequalification documents for ICB civil works contractors and shortening of the bidding period from 90 to 60 days.
12 February		Approval of bidding documents for ICB civil works.
29 March		Loan and Project Agreements signed.
5 April		Deadline for submission of bids and bid opening for ICB civil works.
25 June		Extension of loan effectiveness up to 27 September 1999.
2 August		Approval of the consultants' ranking for international consulting services.
16 August		Loan effectiveness.
23-27 August		Special loan administration mission to review the bids for civil works contracts.
3 September		Approval of award for civil works contracts-expressway (B1-B7).
16 September		Contract signing for civil works contracts-expressway (B1-B7) and commencement works.
29 September		Signing of the international consultants' contract.
15 November		First disbursement.
2000		28 February
	7 March	Issuance of bidding documents for road maintenance equipment.
	8 May	Deadline for submission of bids and bid opening for road maintenance equipment.
	16-22 May	Loan review 1.
	11 July	Approval of contract award for service jeep and road testing buses.
	28 July	Delivery of four service jeeps and two road testing buses.
	24 July and 30 August	Approval of award for road maintenance equipment.
	30-31 August	Contract signing of road maintenance contracts.
4 October	Approval of award for building works contracts.	

<b>Year</b>	<b>Date</b>	<b>Events</b>
2001	20 October	Contract signing for building works.
	2 January	Delivery of three asphalt pavers.
	18 January	Approval of overseas training in France.
	9 February	Delivery of crane.
	17 February	Delivery of eight vibratory rollers.
	24 February	Delivery of three soil stabilizing machines.
	25 February	Delivery of two asphalt mixing plants.
	6 March	Delivery of two loaders.
	14 March	Delivery of excavator.
	6 April	Delivery of two milling machines.
	23 and 25 May	Approval of award for traffic engineering facilities contracts.
	25 May	Approval of award for afforestation works contracts.
	28 May	Contract signing for traffic engineering facilities.
	29 May	Contract signing for afforestation works and related services.
	29 May - 2 June	Midterm review mission.
	3 June	Delivery of graders.
	25 June	Delivery of 13 line markers.
	31 July	Completion of international consulting services.
	15 September	Completion of all civil works contracts.
	26 September	Delivery of two emergency ambulances.
28 September	Opening of the project expressway.	
2 October	Delivery of remaining one emergency ambulance.	
10 November	Delivery of two guardrail cleaning vehicles.	
15 November	Delivery of two sweeping vehicles.	
15 December	Delivery of one special purpose vehicle.	
2002	23 January	Approval of award for tolling, monitoring, and communications system.
	18 March	Contract signing for tolling, monitoring, and communications system.
	15 September	Completion of installation for tolling, monitoring, and communications system.
	15 September	Completion of services of all domestic construction supervision consultants.
	22-26 September	Review mission 2.
2003	25 November	Final disbursement.
	31 December	Scheduled loan closing date.
	22 January	Loan closing and cancellation of unutilized loan proceeds of \$27.9 million.
	16 October	Repayment of pool-based loan.
2004	14 November	Repayment of London interbank offered rate-based loan.
	17-21 August	Project completion review mission.

Source : Project Completion Report

**Table A5.2: Changyu Expressway**

<b>Year</b>	<b>Date</b>	<b>Events</b>	
1997	22 August	Approval of project preparatory technical assistance.	
1998	1 April	Project brief meeting.	
	13-29 April	Fact-finding mission.	
	19 June	Management review meeting. Approval of advance action for civil works, equipment, and international consulting services.	
	20 July-3 August	Appraisal mission	
	28 August	Prequalification documents for ICB civil works approved.	
	15 September	Signing of civil works LCB contract 01.	
	16 September	Prequalification documents for ICB civil works were issued.	
	24 September	Staff review committee meeting.	
	16 November	Deadline for submission of prequalification documents for ICB civil works.	
	13-15 October	Loan negotiations.	
	27 November	Loan approval.	
	1999	4 January	Prequalification Evaluation Report for ICB civil works was received.
		14 January	Loan and Project Agreements were signed.
12 February		Prequalification of civil works contractors and shortening of the bidding period from 90 to 60 days was approved.	
5 February		Bidding documents for ICB civil works were issued to the pre-qualified contractors.	
5 April		Deadline for submission of bids and bid opening for ICB civil works contracts.	
7 April		ADB approved the first extension of loan effectiveness by 3 months from 14 April 1999 to 13 July 1999.	
12 April		ADB received a representation (dated 10 April 1999) alleging irregularities in the bidding process.	
4 May		ADB received the bid evaluation report for civil works.	
17 May		ADB received bid evaluation report for civil works.	
8 June		ADB requested clarifications on the bid evaluation reports.	
6 July		Approval of the ranking of international consultants and contract negotiations with the first-ranked firm.	
20 July		ADB approved the second extension of loan effectiveness by 3 months from 13 July 1999 to 13 October 1999.	
30 July		ADB received the results of the investigation by the Ministry of Communications of the procurement issue in the evaluation of bids.	
16 August		Loan effectiveness.	
17 August		Approval of the draft negotiated contract of the international consultants.	
23-27 August		Special loan administration mission to review the bids for ICB civil works contracts.	
1 October		First procurement committee meeting for civil works.	
29 October		Second procurement committee meeting for civil works.	
9 November		ADB approved the award of three civil works contracts 03, 07, and 11 and requested reevaluation of contracts 02, 04, 08, 09, 10, 12, and 13.	
15 November	First disbursement.		

Year	Date	Events
	24 November	ADB received the revised evaluation for packages 02, 04, 08, 09, 10, 12, and 13.
	9 December	Signing of civil works contracts 03, 07, and 11.
	15 December	Approval of another three civil works contracts (Packages 09, 10, and 13).
	22 December	Signing of civil works contract 10.
	23 December	Signing of civil works contracts 9 and 13.
2000	2 March	ADB rejected EA's recommendations for the award of contracts 02, 04, 08, and 12 due to lack of valid bids (all bids expired on 1 January 2000) and approved the re-bidding of the four ICB contracts.
	5 April	EA advised that contracts 02, 04, 08, and 12 would be financed from their own resources and requested partial cancellation of loan proceeds allocated to these contracts.
	23-27 May	Review mission 1.
	31 May	ADB received Ministry of Finance official request to cancel \$93 million loan proceeds.
	23 June	ADB approved the cancellation of \$93 million effective 31 May 2000, thereby reducing the loan amount to \$127.0 million.
2001	3-7 June	Midterm review mission.
	4 October	Approval of contracts IFB-3 and IFB-4 for traffic management-road safety facilities.
	16 October	Signing of contracts IFB-3 and IFB-4 for traffic management-road safety facilities.
	16 November	Approval of six contracts for road maintenance equipment.
	30 November	Signing of six contracts for road maintenance equipment.
	19 December	Approval of contracts IFB-1 and IFB-2 for traffic management-road safety facilities.
	26 December	Signing of contracts IFB-1 and IFB-2 for traffic management-road safety facilities.
2002	24 July	Approval of the award traffic management, monitoring system, communications system and tolling system contract.
	26 July	Contract signing for traffic management, monitoring system, communications system, and tolling system.
	July	Substantial completion of the civil works contracts for the main expressway.
	August	Substantial completion of the (i) traffic management-road safety facilities contracts and (ii) traffic management monitoring system, communications system, and tolling system. Delivery of road maintenance equipment.
	16-21 September	Review mission 2.
	18 September	Project expressway was opened to traffic.
	September	Completion of services of both international and domestic consultants.
	31 December	Scheduled loan closing date. Delivery of road maintenance equipment financed by the EA.
2003	5 March	Loan closing and cancellation of unutilized loan proceeds of \$35.8 million.
	16 October	Prepayment of the loan.
2004	22-27 August	Project Completion Review Mission.

Source: Project Completion Report

## FINANCIAL EVALUATION

### A. General

1. Financial statements of the Hashuang and Changyu expressway corporations were prepared for 10 years starting with the first construction year (1998). Both expressways were completed in 2001, and the first year of partial operation was 2002. The first full year of operation for both expressways was 2003. At appraisal the exchange rate between the yuan and US dollar was CNY8.28 per dollar; the same rate was used for the reevaluation. Taxes include business taxes of 5.5% on gross revenues. Since information on the corporations' liability for corporate income tax that is levied at 33% of net profits was conflicting, this tax was not included in the projections. The cost assumptions in Table A6.1 apply to both expressways.

**Table A6.1: Expressway Operating Costs**

Cost Item	CNY (Million)	Unit of Measurement
Administration and Overhead	14.000	Prorated based on the share of expressway revenues in total revenues (60%)
Salaries and Wages	12.000	As above
Routine Maintenance	0.042	Per kilometer per annum
Periodic Maintenance	2.000	Per kilometer every 6 years

CNY = yuan

Sources: Heilongjiang Hashuang Expressway Corporation and Jilin Provincial Expressway Corporation.

### B. Hashuang Expressway

#### 1. Financial Projections

2. Operating revenues from tolls are projected based on the updated traffic projection and the unit toll rates valid during a given period. Table A6.2 provides an overview over the rates for two periods. The toll rate adopted after 2004 is assumed to continue to be in force until the end of the evaluation period.

**Table A6.2: Hashuang Expressway Corporation Toll Rate (Before 2004)**  
(CNY per vehicle-km)

Vehicle Type	Specifications	Expressway	Class II Road
1. Small	Passenger vehicles, ≤ 19 seats; Trucks, ≤ 2 tons	0.45	0.35
2. Medium	Passenger vehicles, 20 ~ 39 seats; Trucks, 2.5 ~ 7 tons (including 7 ton truck)	0.85	0.50
3. Large	Passenger vehicles, > 40seats; Trucks, 7.5 ~ 15 tons (including 10 ton truck);	1.10	0.70
4. Special Large	Trucks, > 16 tons	1.20	0.80

CNY = yuan

Source: Heilongjiang Hashuang Expressway Corporation.

**Table A6.3: Hashuang Expressway Corporation Toll Rate (After 2004 )**  
(CNY per vehicle-km)

Vehicle Type	Specifications	Expressway
1. Small	Passenger vehicles, ≤ 7 seats; Trucks, ≤ 2 tons	0.47
2. Medium	Passenger vehicles, 8 ~ 19 seats; Trucks, 2 ~ 5 tons (including 5 ton truck)	0.70
3. Large	Passenger vehicles, 20 ~ 39 seats; Trucks, 5 ~ 10 tons (including 10 ton truck);	0.91
4. Special Large	Passenger vehicle, ≥ 40 seats; Trucks, 10 ~ 15 tons (including 15 ton truck); 20-foot container truck	1.05
5. Extra Large	Trucks > 15 tons 40 foot container truck	1.33

CNY = yuan

Source: Heilongjiang Hashuang Expressway Corporation.

3. The Project was funded by equity or grants (32%) and long-term loans (68%). In 2003, both Heilongjiang Hashuang Expressway Corporation and Jilin Provincial Expressway Corporation prepaid the principal and interest of the Asian Development Bank loans and replaced them with loans from China Development Bank (CDB). The loans include a US dollar loan borrowed for prepayment of the Asian Development Bank loan and a capital construction loan in domestic currency borrowed during construction. The local currency loans from CDB comprised a term loan with 25-year maturity, including a 5-year grace period, and a fixed interest rate of 5.93% repayable from 2003. In 2003, an additional \$142 million term loan was obtained from CDB, repayable over 20 years from 2003, based on the 6-month London interbank offered rate and a fixed spread of 100 basis points per annum. The two CDB loans are included in the financial statement in Table A6.10.

4. The main conclusions from the financial statement are as follows: (i) the forecast revenues under the base assumptions are sufficient to cover annual recurrent costs, depreciation, and debt servicing; and to generate reasonable profits from the expressway operations; (ii) the working ratio is less than 15% from 2005 onward; (iii) the debt service coverage ratio is expected to remain above 1.2 from the fifth year of the expressway opening to traffic (2006); and (iv) the debt-to-equity ratio will be almost constant at about 2 for the two corporations taken together. In view of the requirement that operating surpluses be returned to the provincial authorities, the corporations have no potential to expand their equity base.

### 1. Financial Analysis

5. The assumptions used for calculating the financial internal rate of return (FIRR) are (i) all projections are expressed in constant 2003 prices and cover 1998–2021; (ii) capital costs reflect the actual capital expenditures incurred during 1998–2005, but exclude interest during construction; (iii) operation and maintenance are based on annual prorated expenses up to 2005; and (iv) operating revenues beyond 2005 are based on the revised traffic forecast and adjusted to 2005 prices.

6. The estimated weighted average cost of capital, after tax, was calculated using the actual capital mix and cost of funds. Costs are considered as follows: (i) the applicable 10-year fixed swap rate plus a provision for CDB's spread of 100 basis points is used for US

dollar debt, (ii) the estimated fixed interest costs of 5.93% per annum are used for the domestic loan funds, and (iii) the cost of equity is assumed to be 8%. The weighted average cost of capital (WACC) calculated on this basis was 6%.

7. The recalculated FIRR for the Hashuang Expressway in 2003 constant prices, computed on a before-tax basis, is 11.1% (Table A6.9), compared with 6.8% estimated in the project completion report (PCR), and 7.1% estimated at appraisal. The differences are due mainly to higher toll rates (compared with the appraisal result) and lower operating costs. The FIRR calculated on an after-tax basis was 10.6%. However, this result may still be subject to deduction of corporate income tax of 33%.<sup>1</sup> The Expressway is considered financially viable and sustainable. Sensitivity tests indicate that the conditions causing the Expressway's viability to fall below the weighted average cost of capital are unlikely to occur. The sensitivity of the Expressway's financial indicators to cost and revenue variations is shown in Table A6.4. Applicable business taxes at a rate of 5.5% are charged on revenue.

**Table A6.4: Sensitivity Tests for the Hashuang Expressway**

Test		FIRR
(a) Best Estimate		11.1%
(b) Benefits	-10%	10.1%
(c) Benefits	-20%	8.6%
(d) Traffic Growth	+10%	12.1%
(e) Traffic Growth	-10%	10.0%
(f) Traffic Growth	-20%	8.9%
(g) O&M costs	+ 50%	10.9%
(h) Combination (g) and (f)		8.6%

FIRR = financial internal rate of return.  
Source: Operations Evaluation Mission estimates.

## C. CHANGYU EXPRESSWAY

### (i) Financial Projections

8. Operating revenues from tolls are projected based on the updated traffic projection and the unit toll rates valid at a given period. Tables A6.5 and A6.6 provide an overview of the tolls rates for each period. The toll rate adopted after 2006 is assumed to continue to be in force until the end of the evaluation period.

<sup>1</sup> The corporate tax basis is income after business taxes, depreciation, interest charges, and operating expenses. Because the FIRR calculation captures capital costs in the form of initial capital outlays (rather than annual depreciation) and determines for an interest rate as a benchmark for the cost of capital involved in the Project, calculation of an FIRR net of corporate taxes would be inconsistent with the FIRR methodology.

**Table A6.5: Changyu Expressway Toll Rate (September 2002-November 2003)**  
(CNY per vehicle-km)

Vehicle Type	Specifications	Rate
1. Small	Passenger vehicles, ≤ 7 seats; Trucks, ≤ 2.5 tons	0.35
2. Medium	Passenger vehicles > 7 seats ≤ 28 seats; Trucks > 2.5 tons ≤ 7 tons	0.50
3. Large	Passenger vehicles, > 40seats; Trucks > 7.5 tons ≤ 14 tons	0.60
4. Special Large	Trucks > 14 tons	1.20

CNY = yuan

Source: Jilin Provincial Expressway Corporation.

**Table A6.6: Changyu Expressway Toll Rate (After November 2003)**  
(CNY per vehicle-km)

Vehicle Type	Specifications	Effective November 2003	Effective February 2006
1. Small	Passenger vehicles, ≤ 7 seats; Trucks, ≤ 2.5 tons	0.40	0.40
2. Medium	Passenger vehicles > 7 seats ≤ 28 seats; Trucks > 2.5 tons ≤ 7 tons	0.60	0.60
3. Large	Passenger vehicles, > 40seats; Trucks > 7.5 tons ≤ 14 tons	0.80	0.80
4. Special Large	Passenger vehicles, > 40seats; Trucks > 7.5 tons ≤ 14 tons	1.20	1.20
5. Extra Large	Trucks > 14 tons	2.00	1.40

CNY = yuan

Source: Jilin Provincial Expressway Corporation.

9. The Project was funded 46% by equity or grants and 54% by long-term loans. In October 2003, Jilin Provincial Expressway Corporation prepaid the principal and interest of the ADB loan. At present, two outstanding loans come from the China Development Bank (CDB), including a US dollar loan borrowed for prepayment of the ADB loan and a local currency loan borrowed during construction. The local currency loan from CDB has a term of 17 years with a fixed interest rate of 5.76%, including a 5-year grace period repayable from 2003. In November 2003, to prepay the ADB loan, a US dollar loan was obtained from CDB with a term of 20 years repayable from 2004, at 6-month London interbank offered rate and a fixed spread of 0.8% per annum. The two CDB loans are included in the financial statement shown in Table A6.11.

10. The financial projections indicate that the forecast revenues under the base assumptions are sufficient to cover annual recurrent costs, depreciation, and debt service, and to generate reasonable profits from expressway operation. The working ratio remains below the targeted 15% from the first year of full operation (2003). The debt service coverage ratio is expected to grow to above 3 after it dropped to below 1 in 2003 due to the prepayment of the ADB loan. The debt-equity remains almost constant at about 1.84. Given the obligation to transfer net earning to the provincial authorities, there is no potential for the share of equity in total capital to rise. A boost to equity will occur with the infusion of fresh funds from Jilin Provincial Communications Department for the financing of periodic maintenance in 2008.

## (ii) Financial Analysis

11. The assumptions used for calculation of the FIRR are: (i) all projections were expressed in constant 2005 prices and covered the period 1998-2021; (ii) capital costs reflected the actual capital expenditures incurred during 1998-2005, but excluded interest during construction; (iii) O&M was based on annual pro rated expenses up to 2005; and (iv) operating revenues beyond 2005 were based on the revised traffic forecast and adjusted to 2005 prices.

12. The estimated weighted average cost of capital (WACC), after tax, in real terms was calculated using the actual capital mix and costs of funds. Costs have been considered as follows: (i) the applicable 10-year fixed swap rate plus a provision for CDB's spread of 100 basis points is used for US dollar debt; (ii) the estimated fixed interest costs of 5.93% per annum are used for the domestic loan funds; and (iii) the cost of equity is assumed to be 8%. The WACC calculated on this basis was 6%.

13. The recalculated FIRR in 2003 constant prices, computed on a before-tax basis, is 12.4% (Table A6.10), compared with 7.5% estimated in the PCR, and 7.6% estimated at appraisal. The differences are due mainly to higher toll rates (compared to the appraisal result), and relatively lower operating costs, notably equipment cost involved in maintenance operations. The FIRR calculated on an after-tax basis was 11.9%. The Project is considered financially viable and sustainable. Sensitivity tests indicate that the conditions causing the Project's viability to fall below WACC are unlikely to occur. The sensitivity of the Project's financial indicators to cost and revenue variations is shown in Table A6.7.

**Table A6.7: Sensitivity Tests for the Changyu Expressway**

<b>Test</b>	<b>Variation</b>	<b>FIRR (%)</b>
1. Best Estimate		12.4
2. Benefits	-10%	8.6
3. Benefits	-20%	6.9
4. Traffic Growth	+10%	13.1
5. Traffic Growth	-10%	7.9
6. Traffic Growth	-20%	5.7
7. Operation and Maintenance Costs	+ 50%	12.1
8. Combination (6) and (7)		5.4

FIRR = financial internal rate of return.

Source: Operations Evaluation Mission estimates

**Table A6.8 : Hashuang Expressway  
Financial Reevaluation  
(CNY million)**

Year	Traffic	Project Costs			Revenues			Income			
	Vehicles	Capital	O&M	Total	Toll	Other	Total	Net	Tax	NIAT <sup>a</sup>	
1998	0	614.63	0	614.63	0	0	0	(614.63)	0	(614.63)	
1999	0	520.53	0	520.53	0	0	0	(520.53)	0	(520.53)	
2000	0	630.81	0	630.81	0	0	0	(630.81)	0	(630.81)	
2001	581,343	711.21	0	711.21	51.29	0.90	52.19	(659.02)	0	(659.02)	
2002	2,055,863	495.61	13.28	508.89	181.39	4.38	185.77	(323.12)	0	(323.12)	
2003	2,852,509	0.00	13.28	13.28	251.68	5.62	257.29	244.01	12.20	231.81	
2004	3,166,285	0.00	13.28	13.28	279.36	6.10	285.46	272.18	13.61	258.57	
2005	3,514,577	0.00	13.28	13.28	325.15	6.64	331.79	318.51	15.93	302.58	
2006	3,901,180	0.00	13.28	13.28	360.91	7.24	368.15	354.87	17.74	337.13	
2007	4,205,472	0.00	13.28	13.28	389.07	7.71	396.78	383.49	19.17	364.32	
2008	4,535,746	204.00	13.28	217.28	419.62	8.22	427.84	210.56	10.53	200.03	
2009	4,894,410	0.00	13.28	13.28	452.80	8.78	461.58	448.30	22.41	425.88	
2010	5,284,112	0.00	13.28	13.28	488.85	9.38	498.23	484.95	24.25	460.70	
2011	5,601,158	0.00	13.28	13.28	518.19	9.87	528.06	514.77	25.74	489.03	
2012	5,937,228	0.00	13.28	13.28	549.28	10.39	559.67	546.38	27.32	519.07	
2013	6,293,462	0.00	13.28	13.28	582.23	10.94	593.18	579.89	28.99	550.90	
2014	6,671,069	204.00	13.28	217.28	617.17	11.53	628.70	411.41	20.57	390.84	
2015	7,071,333	0.00	13.28	13.28	654.20	12.15	666.34	653.06	32.65	620.41	
2016	7,495,613	0.00	13.28	13.28	693.45	12.80	706.25	692.97	34.65	658.32	
2017	7,945,350	0.00	13.28	13.28	735.06	13.50	748.56	735.27	36.76	698.51	
2018	8,422,071	0.00	13.28	13.28	779.16	14.24	793.40	780.11	39.01	741.11	
2019	8,927,396	0.00	13.28	13.28	825.91	15.02	840.93	827.65	41.38	786.26	
2020	9,463,039	204.00	13.28	217.28	875.46	15.85	891.31	674.03	33.70	640.33	
2021	10,030,822	(981.02)	13.28	(967.74)	927.99	16.73	944.72	1,912.46	95.62	1,816.83	
								<b>FIRR</b>	<b>11.1%</b>	<b>FIRR</b>	<b>10.6%</b>

( ) = negative, CNY = yuan, FIRR = financial internal rate of return, NIAT = net income after tax, O&M = operation and maintenance.

Source: Operations Evaluation Mission estimates.

<sup>a</sup> NIAT: Net Income after Tax of 5%

**Table A6.9 : Changyu Expressway  
Financial Reevaluation  
(CNY million)**

Year	Traffic Vehicles	Project Costs			Revenues			Net	Income Tax	NIAT <sup>a</sup>	
		Capital	O&M	Total	Toll	Other	Total				
1998	0	196.42	0	196.42	0	0	0	(196.42)	0	(196.42)	
1999	0	830.13	0	830.13	0	0	0	(830.13)	0	(830.13)	
2000	0	716.97	0	716.97	0	0	0	(716.97)	0	(716.97)	
2001	0	626.34	0	626.34	0	0	0	(626.34)	0	(626.34)	
2002	1,027,931	946.23	20.80	967.03	97.45	2.19	99.64	(867.39)	0	(867.39)	
2003	2,852,509	0	20.80	20.80	270.42	4.21	274.63	253.83	12.69	241.14	
2004	3,166,285	0	20.80	20.80	390.22	6.10	396.33	375.53	18.78	356.75	
2005	3,514,577	0	20.80	20.80	433.15	6.64	439.79	418.99	20.95	398.04	
2006	3,901,180	0	20.80	20.80	477.50	7.24	484.74	463.94	23.20	440.75	
2007	4,205,472	0	20.80	20.80	514.75	7.71	522.46	501.66	25.08	476.58	
2008	4,535,746	320.00	20.80	340.80	555.18	8.22	563.40	222.60	11.13	211.47	
2009	4,894,410	0	20.80	20.80	599.08	8.78	607.85	587.05	29.35	557.70	
2010	5,284,112	0	20.80	20.80	646.78	9.38	656.16	635.36	31.77	603.59	
2011	5,601,158	0	20.80	20.80	685.58	9.87	695.45	674.65	33.73	640.92	
2012	5,937,228	0	20.80	20.80	726.72	10.39	737.11	716.31	35.82	680.49	
2013	6,293,462	0	20.80	20.80	770.32	10.94	781.26	760.46	38.02	722.44	
2014	6,671,069	320.00	20.80	340.80	816.54	11.53	828.07	487.27	24.36	462.90	
2015	7,071,333	0	20.80	20.80	865.53	12.15	877.68	856.88	42.84	814.03	
2016	7,495,613	0	20.80	20.80	917.46	12.80	930.27	909.47	45.47	863.99	
2017	7,945,350	0	20.80	20.80	972.51	13.50	986.01	965.21	48.26	916.95	
2018	8,422,071	0	20.80	20.80	1,030.86	14.24	1,045.10	1,024.30	51.22	973.09	
2019	8,927,396	0	20.80	20.80	1,092.71	15.02	1,107.73	1,086.93	54.35	1,032.59	
2020	9,463,039	320.00	20.80	340.80	1,158.28	15.85	1,174.13	833.33	41.67	791.66	
2021	10,030,822	(1,094.31)	20.80	(1,073.51)	1,227.77	16.73	1,244.50	2,318.01	115.90	2,202.11	
								<b>FIRR</b>	<b>12.4%</b>	<b>FIRR</b>	<b>11.9%</b>

( ) = negative, CNY = yuan, FIRR = financial internal rate of return, NIAT = net income after tax, O&M = operation and maintenance.

Source: Operations Evaluation Mission estimates.

<sup>a</sup> NIAT: Net Income after Tax of 5%

**Table A6.10: Financial Projections - Heilongjiang Hashuang Expressway Corporation**  
(CNY million)

Income Statements	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>Operating Revenues</b>											
Toll Revenue	0	0	0	51.29	181.39	251.68	279.36	325.15	360.91	389.07	419.62
Other Revenues	0	0	0	0.90	4.38	5.62	6.10	6.64	7.24	7.71	8.22
<b>Total Operating Revenues</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>52.19</b>	<b>185.77</b>	<b>257.29</b>	<b>285.46</b>	<b>331.79</b>	<b>368.15</b>	<b>396.78</b>	<b>427.84</b>
Income Tax	0	0	0	2.87	10.22	14.15	15.70	18.25	20.25	21.82	23.53
Net Operating Revenues	0	0	0	49.32	175.55	243.14	269.76	313.54	347.90	374.95	404.31
<b>Operating Expenses</b>											
Operation and Maintenance Costs	0	0	0	3.10	13.28	21.38	22.88	23.38	23.38	23.38	23.38
<b>Total Operating Expenses</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3.10</b>	<b>13.28</b>	<b>21.38</b>	<b>22.88</b>	<b>23.38</b>	<b>23.38</b>	<b>23.38</b>	<b>23.38</b>
<b>Operating EBDIT</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>46.22</b>	<b>162.27</b>	<b>221.76</b>	<b>246.88</b>	<b>290.16</b>	<b>324.52</b>	<b>351.57</b>	<b>380.93</b>
Depreciation	0	0	0	0	49.05	98.10	98.10	98.10	98.10	98.10	98.10
<b>Operating EBIT</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>46.22</b>	<b>113.22</b>	<b>123.66</b>	<b>148.78</b>	<b>192.05</b>	<b>226.42</b>	<b>253.47</b>	<b>282.83</b>
Interest Charges on ADB loan	7.45	21.22	35.18	51.45	66.09	72.10	36.62	0	0	0	0
Interest charges on Domestic Loan (first CDB)	5.95	16.94	28.08	41.07	52.76	57.55	55.98	54.31	52.54	50.66	48.68
Interest charges on Domestic Loan (second CDB)	0	0	0	0	0	0	18.31	35.66	34.33	32.95	31.53
Total Financing Charges	13.40	38.16	63.26	92.53	118.84	129.65	110.91	89.97	86.87	83.61	80.21
<b>Operating EBT</b>	<b>(13.40)</b>	<b>(38.16)</b>	<b>(63.26)</b>	<b>(46.31)</b>	<b>(5.62)</b>	<b>(6.00)</b>	<b>56.17</b>	<b>137.74</b>	<b>173.88</b>	<b>202.81</b>	<b>234.15</b>
Cash Flow Statements	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>Cash Inflows</b>											
Operating EBDIT	0	0	0	46.22	162.27	221.76	246.88	290.16	324.52	351.57	380.93
Proceeds ADB Loan	216.35	183.22	222.04	250.35	174.45	0	0	0	0	0	0
Proceeds Domestic Loan (first CDB)	200.67	169.94	205.95	232.19	161.81	0	0	0	0	0	0
Proceeds from MOC Grant	104.73	88.71	107.50	121.21	84.46	0	0	0	0	0	0
Proceeds from HPCD Grant	92.88	78.66	95.32	107.46	74.89	0	0	0	0	0	0
Total Loan and Grant Financing	614.63	520.53	630.81	711.21	495.61	0	0	0	0	0	0
Proceeds Domestic Loan (second CDB)	0	0	0	0	0	1,046.41	0	0	0	0	0
<b>Total Cash Inflow</b>	<b>614.63</b>	<b>520.53</b>	<b>630.81</b>	<b>757.43</b>	<b>657.88</b>	<b>1,268.17</b>	<b>246.88</b>	<b>290.16</b>	<b>324.52</b>	<b>351.57</b>	<b>380.93</b>
<b>Cash Outflows</b>											
Disbursements towards Construction Account	614.63	520.53	630.81	711.21	495.61	0	0	0	0	0	0
Interest Charges on Loans	13.40	38.16	63.26	92.53	118.84	129.65	110.91	89.97	86.87	83.61	80.21
Prepayment ADB loan	0	0	0	0	0	1,046.41	0	0	0	0	0
Repayment of First CDB Loan	0	0	0	0	0	26.59	28.16	29.83	31.60	33.48	35.46
Repayment of Second CDB Loan	0	0	0	0	0	0	27.66	37.97	39.30	40.68	42.10
Total Debt Services	13.40	38.16	63.26	92.53	118.84	1,202.65	166.73	157.77	157.77	157.77	157.77
<b>Total Cash Outflow</b>	<b>628.03</b>	<b>558.69</b>	<b>694.07</b>	<b>803.74</b>	<b>614.45</b>	<b>1,202.65</b>	<b>166.73</b>	<b>157.77</b>	<b>157.77</b>	<b>157.77</b>	<b>157.77</b>
<b>Net Cash Flow</b>	<b>(13.40)</b>	<b>(38.16)</b>	<b>(63.26)</b>	<b>(46.31)</b>	<b>43.43</b>	<b>65.52</b>	<b>80.14</b>	<b>132.39</b>	<b>166.75</b>	<b>193.80</b>	<b>223.16</b>
Accumulated Net Cash Flow	(13.40)	(51.56)	(114.82)	(161.13)	(117.70)	(52.18)	27.96	160.35	327.10	520.90	744.06
BALANCE SHEET	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>Assets</b>											
Work in progress	614.63	1,135.16	1,765.97	2,477.18	0	0	0	0	0	0	0
Fixed assets	0	0	0	0	2,972.79	2,923.74	2,825.64	2,727.53	2,629.43	2,531.33	2,433.23
Depreciation	0	0	0	0	49.05	98.10	98.10	98.10	98.10	98.10	98.10
<b>Total net assets</b>	<b>614.63</b>	<b>1,135.16</b>	<b>1,765.97</b>	<b>2,477.18</b>	<b>2,923.74</b>	<b>2,825.64</b>	<b>2,727.53</b>	<b>2,629.43</b>	<b>2,531.33</b>	<b>2,433.23</b>	<b>2,335.13</b>
<b>Liabilities</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Long-term liabilities	417.02	770.18	1,198.17	1,680.71	2,016.97	1,990.38	1,934.56	1,866.76	1,795.86	1,721.70	1,644.14
<b>Total liabilities</b>	<b>417.02</b>	<b>770.18</b>	<b>1,198.17</b>	<b>1,680.71</b>	<b>2,016.97</b>	<b>1,990.38</b>	<b>1,934.56</b>	<b>1,866.76</b>	<b>1,795.86</b>	<b>1,721.70</b>	<b>1,644.14</b>
<b>Equity</b>											
Paid-in capital (MOC, HPCD)	197.61	364.98	567.80	796.47	955.82	955.82	955.82	955.82	955.82	955.82	955.82
Losses/earnings	0	0	0	0	(49.05)	(120.57)	(162.85)	(193.15)	(220.35)	(244.30)	(264.84)
Total equity	197.61	364.98	567.80	796.47	906.77	835.25	792.97	762.67	735.47	711.52	690.98
<b>Total capital</b>	<b>614.63</b>	<b>1,135.16</b>	<b>1,765.97</b>	<b>2,477.18</b>	<b>2,923.74</b>	<b>2,825.64</b>	<b>2,727.53</b>	<b>2,629.43</b>	<b>2,531.33</b>	<b>2,433.23</b>	<b>2,335.13</b>
<b>RATIOS</b>											
Debt-equity ratio	2.11	2.11	2.11	2.11	2.22	2.38	2.44	2.45	2.44	2.42	2.38
Debt-service ratio	0	0	0	0.50	0.95	0.10	0.89	1.22	1.44	1.61	1.79
Working ratio	0	0	0	0.06	0.08	0.09	0.08	0.07	0.07	0.06	0.06

(-) = negative, ADB = Asian Development Bank, CDB = China Development Bank, EBDIT = earnings before depreciation, interest and tax, EBIT = earnings before interest and tax, EBT = earnings before tax, MOC = Ministry of Communications, HPCD = Heilongjiang Provincial Communications Department.

Source: Heilongjiang Hashuang Expressway Corporation for 1998-2004. Projections are Operations Evaluation Mission and consultant estimates.

**Table 6.11: Financial Projections - Jilin Provincial Expressway Corporation**  
(CNY million)

<b>Income Statements</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
<b>Operating Revenues</b>											
Toll Revenue	0	0	0	0	97.45	270.42	390.22	433.15	477.50	514.75	555.18
Other Revenues	0	0	0	0	2.19	4.21	6.10	6.64	7.24	7.71	8.22
Total Operating Revenues	0	0	0	0	99.64	274.63	396.33	439.79	484.74	522.46	563.40
Income Tax	0	0	0	0	5.48	15.10	21.80	24.19	26.66	28.74	30.99
Net Operating Revenues	0	0	0	0	94.16	259.53	374.53	415.60	458.08	493.73	532.41
<b>Operating Expenses</b>											
Operation and Maintenance Cost:	0	0	0	0	20.80	20.80	20.80	20.80	20.80	20.80	20.80
<b>Total Operating Expenses</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>20.80</b>	<b>20.80</b>	<b>20.80</b>	<b>20.80</b>	<b>20.80</b>	<b>20.80</b>	<b>20.80</b>
<b>Operating EBDIT</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>73.36</b>	<b>238.73</b>	<b>353.73</b>	<b>394.80</b>	<b>437.28</b>	<b>472.93</b>	<b>511.61</b>
Depreciation	0	0	0	0	54.72	109.43	109.43	109.43	109.43	109.43	109.43
<b>Operating EBIT</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>18.64</b>	<b>129.29</b>	<b>244.30</b>	<b>285.37</b>	<b>327.85</b>	<b>363.49</b>	<b>402.18</b>
Interest Charges on ADB Loan	0	0	6.07	19.13	39.05	51.99	0	0	0	0	0
Interest on Bond Issue	0.83	2.19	4.64	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57
Interest Charges on Domestic Loan (first CDB)	4.41	22.76	39.92	43.50	55.50	67.15	65.31	63.36	61.29	59.11	56.79
Interest Charges on Domestic Loan (second CDB)	0	0	0	0	0	13.20	25.71	24.75	23.76	22.73	21.67
Total Financing Charges	5.24	24.95	50.63	69.19	101.12	138.90	97.59	94.68	91.62	88.41	85.03
<b>Operating EBT</b>	<b>(5.24)</b>	<b>(24.95)</b>	<b>(50.63)</b>	<b>(69.19)</b>	<b>(82.47)</b>	<b>(9.61)</b>	<b>146.71</b>	<b>190.69</b>	<b>236.24</b>	<b>275.09</b>	<b>317.15</b>
<b>Cash Flow Statements</b>											
<b>Cash Inflows</b>											
Operating EBDIT	0	0	0	0	73.36	238.73	353.73	394.80	437.28	472.93	511.61
Proceeds ADB Loan	0	0	176.30	202.70	375.50	0	0	0	0	0	0
Proceeds from Bond Issue	47.63	30.00	110.00	0	0	0	0	0	0	0	0
Proceeds Domestic Loan (first CI)	148.71	470.13	108.67	12.00	392.80	0	0	0	0	0	0
Proceeds from MOC Grant	0	330.00	133.00	402.94	172.00	0	0	0	0	0	0
Proceeds from JPCD Grant	0	0	189.00	8.70	6.00	0	0	0	0	0	0
Total Loan and Grant Financing	196.34	830.13	716.97	626.34	946.30	0	0	0	0	0	0
Proceeds Domestic Loan (second CDB)	0	0	0	0	0	754.50	0	0	0	0	0
<b>Total Cash Inflow</b>	<b>196.34</b>	<b>830.13</b>	<b>716.97</b>	<b>626.34</b>	<b>1,019.66</b>	<b>993.23</b>	<b>353.73</b>	<b>394.80</b>	<b>437.28</b>	<b>472.93</b>	<b>511.61</b>
<b>Cash Outflows</b>											
Disbursements towards Construction Account	196.34	830.13	716.97	626.34	946.30	0	0	0	0	0	0
Interest charges on Loans and Bonds	5.24	24.95	50.63	69.19	101.12	138.90	97.59	94.68	91.62	88.41	85.03
Prepayment ADB Loan	0	0	0	0	0	754.50	0	0	0	0	0
Repayment of First CDB Loan	0	0	0	0	0	31.01	32.85	34.80	36.87	39.05	41.37
Repayment of Second CDB Loan	0	0	0	0	0	19.94	27.38	28.34	29.33	30.36	31.42
Total Debt Services	5.24	24.95	50.63	69.19	101.12	944.36	157.82	157.82	157.82	157.82	157.82
<b>Total Cash Outflow</b>	<b>201.58</b>	<b>855.08</b>	<b>767.60</b>	<b>695.53</b>	<b>1,047.42</b>	<b>944.36</b>	<b>157.82</b>	<b>157.82</b>	<b>157.82</b>	<b>157.82</b>	<b>157.82</b>
<b>Net cash flow</b>	<b>(5.24)</b>	<b>(24.95)</b>	<b>(50.63)</b>	<b>(69.19)</b>	<b>(27.76)</b>	<b>48.87</b>	<b>195.91</b>	<b>236.98</b>	<b>279.47</b>	<b>315.11</b>	<b>353.79</b>
Accumulated net cash flow	(5.24)	(30.19)	(80.83)	(150.02)	(177.78)	(128.91)	67.00	303.98	583.45	898.56	1,252.35
<b>BALANCE SHEET</b>											
<b>Assets</b>											
Work in progress	196.34	1,026.47	1,743.44	2,369.78	3,316.08	0	0	0	0	0	0
Fixed assets	0	0	0	0	0	3,261.36	3,151.93	3,042.50	2,933.07	2,823.64	2,714.21
Depreciation	0	0	0	0	54.72	109.43	109.43	109.43	109.43	109.43	109.43
<b>Total net assets</b>	<b>196.34</b>	<b>1,026.47</b>	<b>1,743.44</b>	<b>2,369.78</b>	<b>3,261.36</b>	<b>3,151.93</b>	<b>3,042.50</b>	<b>2,933.07</b>	<b>2,823.64</b>	<b>2,714.21</b>	<b>2,604.78</b>
<b>Liabilities</b>											
Long-term liabilities	196.34	696.47	1,091.44	1,306.14	2,074.44	2,023.48	1,963.25	1,900.11	1,833.91	1,764.50	1,691.71
<b>Total liabilities</b>	<b>196.34</b>	<b>696.47</b>	<b>1,091.44</b>	<b>1,306.14</b>	<b>2,074.44</b>	<b>2,023.48</b>	<b>1,963.25</b>	<b>1,900.11</b>	<b>1,833.91</b>	<b>1,764.50</b>	<b>1,691.71</b>
<b>Equity</b>											
Paid-in capital (MOC, JPCD)	0	330.00	652.00	1,063.64	1,241.64	1,241.64	1,241.64	1,241.64	1,241.64	1,241.64	1,241.64
Losses/earnings	0	0	0	0	(54.72)	(113.19)	(162.39)	(208.68)	(251.91)	(291.93)	(328.57)
Total equity	0	330.00	652.00	1,063.64	1,186.92	1,128.45	1,079.25	1,032.96	989.73	949.71	913.07
<b>Total capital</b>	<b>196.34</b>	<b>1,026.47</b>	<b>1,743.44</b>	<b>2,369.78</b>	<b>3,261.36</b>	<b>3,151.93</b>	<b>3,042.50</b>	<b>2,933.07</b>	<b>2,823.64</b>	<b>2,714.21</b>	<b>2,604.78</b>
<b>RATIOS</b>											
Debt-equity ratio	0	2.11	1.67	1.23	1.75	1.79	1.82	1.84	1.85	1.86	1.85
Debt-service ratio	0	0	0	0	0.73	0.25	2.24	2.50	2.77	3.00	3.24
Working ratio	0	0	0	0	0.22	0.08	0.06	0.05	0.05	0.04	0.04

( ) = negative, ADB = Asian Development Bank, CDB = China Development Bank, EBDIT = earnings before depreciation, interest and tax, EBIT = earnings before interest and tax, EBT = earnings before tax, JPCD = Jilin Provincial Communications Department, MOC = Ministry of Communications.

Source: Jilin Provincial Expressway Corporation for 1998-2004. Projections are Operations Evaluation Mission and consultant estimates.

## ASSESSMENT OF OVERALL PERFORMANCE

**Table A7.1: Hashuang Expressway**  
(50% weighting in overall rating)

Criterion	Weight <sup>a</sup>	Assessment	Rating Value(0–3)	Weighted Rating
1. Relevance	20%	Highly relevant	3.0	0.6
2. Effectiveness	30%	Highly effective	3.0	0.9
3. Efficiency	30%	Efficient	2.0	0.6
4. Sustainability	20%	Very likely	2.5	0.5
<b>Total</b>	<b>100%</b>			<b>2.6</b>

**Table A7.2: Changyu Expressway**  
(50% weighting in overall rating)

Criterion	Weight <sup>a</sup>	Assessment	Rating Value(0–3)	Weighted Rating
1. Relevance	20%	Highly relevant	3.0	0.6
2. Effectiveness	30%	Highly effective	3.0	0.9
3. Efficiency	30%	Highly efficient	2.8	0.84
4. Sustainability	20%	Very likely	2.5	0.5
<b>Total</b>	<b>100%</b>			<b>2.84</b>

**Table A7.3: Overall Rating for Changchun-Harbin Expressway Project**

Criterion	Weight <sup>a</sup>	Assessment	Rating Value(0–3)	Weighted Rating
1. Relevance	20%	Highly relevant	3.0	0.6
2. Effectiveness	30%	Highly effective	3.0	0.9
3. Efficiency	30%	Highly efficient	2.4	0.72
4. Sustainability	20%	Very likely	2.5	0.5
<b>Total</b>	<b>100%</b>	<b>Highly Successful</b>		<b>2.72</b>

<sup>a</sup> Weighted average of rating values for each component rounded to whole numbers.

Highly successful (HS): Overall weighted average (OWA) is  $> 2.7$ . Successful (S): OWA is between  $1.6 \leq S \leq 2.7$ . Partly successful (PS): OWA is between  $0.8 \leq PS \leq 1.6$ . Unsuccessful (US): OWA is  $< 0.8$ .

Source: Operations Evaluation Mission.

## ECONOMIC REEVALUATION

### A. General

1. The economic viability of the Project was reevaluated with updated information on traffic and vehicle operating cost (VOC). The methodology followed the approach adopted at appraisal and by the project completion reports (PCR)<sup>1</sup> for the Hashuang and Changyu Expressways and is based on with and without project scenarios. In the without-project case, traffic on the existing national roads would reach maximum capacity and VOC would grow exponentially and cause traffic congestion unless traffic deviated to other routes. An increasing frequency of road accidents would add to the cost of not undertaking the Project. In addition, development benefits associated with the expressway project would not occur. The with-project scenario assumes a diversion of traffic from the national roads to the expressway Project; time saving benefits accruing to drivers, freight, and vehicles; fewer road accidents; and induced traffic due to reduced VOC.

### B. Costs

2. The actual investment cost for the two expressway components was converted to economic cost reflecting consumption of economic resources. As a consequence, taxes and duties were eliminated from the cost, and wages were adjusted to reflect opportunity cost indicating the actual scarcity of labor in the project provinces. Based on these considerations, a conversion factor of 0.95 was used to convert financial to economic costs. This factor is in line with the latest roads feasibility study<sup>2</sup> in Heilongjiang province and constitutes an insignificant variation from the assumptions of the PCR. For recurrent cost items, data obtained from the executing agencies for routine and periodic maintenance were applied together with other operating costs. Periodic maintenance is assumed to be carried out at 6-year intervals, instead of the usual 7-year cycle. The reason for the shortened cycle is provided by overloaded trucks that are causing visible damage to the pavement.

### C. Traffic

3. The actual traffic data for the Hashuang and Changyu Expressways and traffic forecasts were reviewed and updated based on the PCRs, traffic-count data from the National Trunk Highway Traffic Counting Manual, and information collected by the Operations Evaluation Mission. A significant gap was found between traffic recorded by the Heilongjiang and the Jilin authorities; traffic on the Hashuang Expressway in Heilongjiang was much lower than that on the Changyu Expressway in Jilin. As most of the traffic on the expressway is interprovincial through traffic, no plausible explanation can be given for the apparent decrease in traffic. The Heilongjiang authorities suggested that their traffic records might not reflect the actual situation, as the automatic traffic counters had not been fully operational over the last 2 years. The Operations Evaluation Mission therefore used the more reliable traffic records of the Changyu Expressway.

4. The Changyu Expressway is an important link in the transport corridor connecting Heilongjiang, the northeast border province, with the capital Beijing and the eastern port cities of Dalian and Dandong as well as the hinterland of the country. Traffic data for the expressway

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<sup>1</sup> ADB. 2004. *Project Completion Report on the Changchun-Harbin Expressway Project (Hashuang Expressway) in the People's Republic of China*. Manila (Loan 1641-PRC); ADB. 2004. *Project Completion Report on the Changchun-Harbin Expressway Project (Changyu Expressway) in the People's Republic of China*. Manila (Loan 1642-PRC).

<sup>2</sup> The feasibility study prepared for the Heilongjiang Road Network Development Project, approved on 26 July 2006.

and national highway (NH) 102 were collected from the National Trunk Highway Traffic Counting Manual (Tables A8.1 and A8.2). On the whole, the actual expressway traffic volume is less than the appraisal forecast. The composition of traffic is also at variance with the appraisal forecast. The overwhelming dominance of heavy vehicles and buses accounting for more than 70% of the traffic was not anticipated at appraisal, or that buses would account for more than 70% of the traffic by 2003 and that more than 50% of the NH102 traffic would be diverted to the Changyu Expressway. Trucks accounted for most of this diversion.

5. Based on the average growth rate of 11% of annual average daily traffic recorded for the Changyu Expressway over the last 2 years, the annual average daily traffic for 2006–2010 is projected to grow at 10% per annum and thereafter at 6% per annum until 2020.

**Table A8.1: National Highway 102 Traffic (Jilin Section)**

Year	Truck				Passenger Vehicle			AADT	
	Small	Medium	Large	Trailer	Total	Small	Large		Total
1999	1,025	1,077	1,018	490	3,610	1,959	525	2,484	6,094
2000	957	981	1,688	393	4,019	2,126	331	2,457	6,476
2001	1,034	706	2,766	414	4,920	2,570	399	2,969	7,889
2002	793	541	2,951	505	4,790	2,204	456	2,660	7,450
2003	479	297	845	207	1,828	1,428	271	1,699	3,527
2004	750	377	422	164	1,713	1,689	336	2,025	3,738
2005	750	507	620	171	2,048	1,983	329	2,312	4,360

AADT = annual average daily traffic.

Source: Actual traffic volume is from the *National Trunk Highway Traffic Counting Manual* (2002–2005).

**Table A8.2: Actual and Expected Expressway Traffic**

Year	Truck				Passenger Vehicle			AADT (vehicle)	
	Small	Medium	Large	Trailer	Total	Small	Large		Total
2002	886	768	828	177	2,659	2,777	473	3,250	5,909
2003	356	2,525	227	1,557	4,665	1,190	223	1,413	6,078
2004	403	2,495	573	1,563	5,034	1,351	292	1,643	6,677
2005	443	2,844	642	1,719	5,648	1,553	309	1,862	7,510
2006	492	3,157	713	1,908	6,269	1,724	343	2,067	8,336
2010	746	4,792	1,082	2,897	9,617	2,617	521	3,138	12,655
2015	1,046	6,721	1,518	4,063	13,488	3,670	731	4,401	17,749
2020	1,400	8,994	2,031	5,437	18,050	4,911	978	5,890	23,752

AADT = annual average daily traffic.

Source: Actual traffic volume is from the *National Trunk Highway Traffic Counting Manual* (2002–2005).

## D. Benefits

6. Four types of benefits were recalculated: (i) VOC savings of expressway traffic due to shorter distance, better road conditions, and higher speed; (ii) travel time savings for passengers; (iii) savings to generated traffic (calculated as half normal traffic savings); and (iv) freight time savings.

### 1. VOC Savings

7. The reevaluation is based on VOC relationships generated by HDM-4 calibrated for road and traffic conditions in the PRC. The VOCs for the with- and without-project scenarios and the savings resulting from the comparison of the two scenarios are in Table A8.3.

**Table A8.3: Average Vehicle Operating Cost**  
(CNY/kilometer)

Section	Jeep	Car	Small Bus	Medium Bus	Large Bus	Small Truck	Medium Truck	Heavy Truck	Tractor Trailer
Without Project	2.344	1.588	2.457	3.085	5.789	1.325	2.499	5.010	6.855
With Project	1.355	1.167	1.535	1.839	2.973	0.971	1.757	3.451	4.466
Savings	0.989	0.421	0.922	1.246	2.816	0.354	0.742	1.559	2.389

CNY = yuan

Note: Vehicle operating cost (VOC) will increase with traffic growth due to a slowdown in traffic flow and an increase in standard axles and life of the pavement. Using these relationships, HDM-4 calculates the VOC for each year and respective traffic volume.

Source: Operations Evaluation Mission estimates.

### 2. Time Savings

8. Time savings are related to passengers and freight. For the reevaluation, 50% of passengers were assumed to accrue a monetary benefit from the saving in travel time. As for freight, the reduction in interest related to capital tied up in the shipment was conservatively assumed to correspond to the cost of transport on a given route. Specifically, the value of the freight in transit was assumed to exceed the transport cost by 100%. This assumption is conservative, given the rule-of-thumb share of transport cost in the value of shipments of about 20%.

## E. Economic Internal Rate of Return Reevaluation for the Expressway

9. The recalculated economic internal rate of return (EIRR) for the Changchun–Harbin Expressway is 16.8% (Table A8.5), compared with 18.9% at appraisal. The recalculated EIRR for Hashuang Expressway was 14.8% compared with 15.2% estimated at appraisal and 15.3% in the PCR. For the Changyu Expressway, the recalculated EIRR was 18.0% compared with the appraisal estimate of 21.5% and the PCR estimate of 17.1%. The PCRs did not consider the cost of periodic pavement overlays; this accounts for the lower EIRRs. A countervailing factor is the elimination of interest during construction from the project cost, which the PCRs included. The net present value at 9% is CNY4.57 million for the entire expressway.

10. Sensitivity analysis shows that the Project is sensitive to traffic growth and cost increases. Table A8.4 sets out the results. A 20% reduction in the future traffic growth produces an EIRR of 13.92% reflecting the high initial traffic flows. By contrast, a 20% reduction in benefits produces a sharper drop in EIRR to 9.9%.

**Table A8.4: Sensitivity Tests for the Changchun-Harbin Expressway**

Test		EIRR	NPV
		%	(CNY million)
1. Best Estimate		16.8	6,140.90
2. Benefits	-10%	14.7	6,063.69
3. Benefits	-20%	9.9	5,393.34
4. Traffic Growth	+10%	20.0	7,123.30
5. Traffic Growth	-10%	14.8	6,322.80
6. Traffic Growth	-20%	13.9	6,007.10
7. Operation and Maintenance Cost	+ 50%	18.0	4,774.60
8. Combination (6) and (7)		9.4	4,115.40

CNY = yuan, EIRR = economic internal rate of return, NPV= net present value.

Source: Operations Evaluation Mission estimates.

**Table A8.5: Changchun-Harbin Expressway Project**  
**Economic Reevaluation**  
(CNY million)

YEAR	ANNUAL COSTS						ANNUAL BENEFITS						
	TRAFFIC Million vehicles	PROJECT COSTS			VOC		VOC SAVINGS		TIME SAVINGS		ACCIDENT	BENEFITS	
		Capital	O&M	Total Cost	w/out Proj	w/t Proj	Induced	Normal	Passenger	Freight	Savings	Gross	Net
1998	0	770.50	0	770.50	0	0	0	0	0	0	0	0	(770.50)
1999	0	1,283.12	0	1,283.12	0	0	0	0	0	0	0	0	(1,283.12)
2000	0	1,280.39	0	1,280.39	0	0	0	0	0	0	0	0	(1,280.39)
2001	0.58	1,270.67	0	1,270.67	974.51	613.49	35.27	139.34	1.40	7.23	7.65	190.90	(1,079.77)
2002	2.06	1,369.75	34.06	1,403.81	1,009.63	635.60	138.41	492.14	7.02	36.17	26.08	699.82	(703.99)
2003	2.85	0	34.06	34.06	1,046.01	658.50	198.97	707.45	7.44	38.34	36.19	988.39	954.33
2004	3.17	0	34.06	34.06	974.51	682.23	166.58	592.29	7.88	40.65	40.17	847.57	813.51
2005	3.51	0	34.06	34.06	1,009.63	706.81	191.57	681.13	8.36	43.08	44.59	968.73	934.67
2006	3.90	0	34.06	34.06	1,046.01	732.28	220.30	783.30	8.86	45.67	49.50	1,107.63	1,073.57
2007	4.21	0	34.06	34.06	1,083.71	758.67	253.35	860.22	9.39	48.41	52.47	1,223.83	1,189.77
2008	4.54	524.00	34.06	558.06	1,122.76	786.01	291.35	944.69	9.95	51.31	55.61	1,352.92	794.86
2009	4.89	0	34.06	34.06	1,163.22	797.53	351.19	1,087.43	10.55	54.39	58.95	1,562.52	1,528.46
2010	5.28	0	34.06	34.06	1,205.14	826.27	403.87	1,194.21	11.18	57.66	62.49	1,729.41	1,695.35
2011	5.60	0	34.06	34.06	1,023.24	856.05	188.92	558.61	11.85	61.12	66.24	886.74	852.68
2012	5.94	0	34.06	34.06	1,095.48	886.90	249.83	738.73	12.56	64.78	70.21	1,136.12	1,102.06
2013	6.29	0	34.06	34.06	1,172.82	918.86	322.44	953.42	13.32	68.67	74.42	1,432.27	1,398.21
2014	6.67	524.00	34.06	558.06	1,255.62	951.97	408.66	1,208.36	14.12	72.79	78.89	1,782.81	1,224.75
2015	7.07	0	34.06	34.06	1,344.27	889.56	648.67	1,918.07	14.96	77.16	83.62	2,742.48	2,708.42
2016	7.50	0	34.06	34.06	1,439.17	921.61	782.63	2,314.17	15.86	81.79	88.64	3,283.08	3,249.02
2017	7.95	0	34.06	34.06	1,540.78	954.82	939.21	2,777.18	16.81	86.69	93.96	3,913.86	3,879.80
2018	8.42	0	34.06	34.06	1,266.87	989.23	471.71	1,394.82	17.82	91.90	99.60	2,075.85	2,041.79
2019	8.93	0	34.06	34.06	1,356.31	1,024.88	596.90	1,764.98	18.89	97.41	105.57	2,583.75	2,549.69
2020	9.46	524.00	34.06	558.06	1,452.06	1,061.81	745.01	2,202.93	20.02	103.25	111.91	3,183.12	2,625.06
2021	10.03	(197.16)	34.06	(163.10)	1,554.58	1,100.08	919.73	2,719.56	21.23	109.45	118.62	3,888.59	4,051.68
												<b>EIRR %</b>	<b>16.8</b>
												<b>NPV</b>	<b>\$4,568.64</b>

( ) = negative, CNY = yuan, EIRR = economic internal rate of return, O&M = operation and maintenance, NPV = net present value, VOC = vehicle operating cost.

Source: Operation Evaluation Mission estimates.

**Table A8.6: Hashuang Expressway  
Economic Reevaluation  
(CNY million)**

YEAR	ANNUAL COSTS						ANNUAL BENEFITS						
	TRAFFIC Million vehicles	PROJECT COSTS			VOC		VOC SAVINGS		TIME SAVINGS		ACCIDENT	BENEFITS	
		Capital	O&M	Total Cost	w/out Proj	w/t Proj	Induced	Normal	Passenger	Freight	Savings	Gross	Net
1998	0	583.90	0	583.90	0	0	0	0	0	0	0	0	(583.90)
1999	0	494.50	0	494.50	0	0	0	0	0	0	0	0	(494.50)
2000	0	599.27	0	599.27	0	0	0	0	0	0	0	0	(599.27)
2001	0.58	641.87	0	641.87	974.51	613.49	35.27	139.34	1.40	7.23	7.65	190.90	(450.97)
2002	2.06	470.83	13.28	484.11	393.76	247.88	53.98	191.93	2.74	14.11	10.17	272.93	(211.18)
2003	2.85	0	13.28	13.28	407.95	256.81	77.60	275.90	2.90	14.95	14.11	385.47	372.19
2004	3.17	0	13.28	13.28	380.06	266.07	64.97	230.99	3.07	15.85	15.67	330.55	317.27
2005	3.51	0	13.28	13.28	393.76	275.66	74.71	265.64	3.26	16.80	17.39	377.81	364.52
2006	3.90	0	13.28	13.28	407.95	285.59	85.92	305.49	3.45	17.81	19.30	431.98	418.69
2007	4.21	0	13.28	13.28	422.65	295.88	98.81	335.49	3.66	18.88	20.46	477.30	464.01
2008	4.54	204.00	13.28	217.28	437.88	306.55	113.63	368.43	3.88	20.01	21.69	527.64	310.36
2009	4.89	0	13.28	13.28	453.66	311.04	136.97	424.10	4.11	21.21	22.99	609.38	596.10
2010	5.28	0	13.28	13.28	470.00	322.25	157.51	465.74	4.36	22.49	24.37	674.47	661.19
2011	5.60	0	13.28	13.28	399.06	333.86	73.68	217.86	4.62	23.84	25.83	345.83	332.54
2012	5.94	0	13.28	13.28	427.24	345.89	97.43	288.10	4.90	25.27	27.38	443.09	429.80
2013	6.29	0	13.28	13.28	457.40	358.35	125.75	371.83	5.19	26.78	29.03	558.58	545.30
2014	6.67	204.00	13.28	217.28	489.69	371.27	159.38	471.26	5.51	28.39	30.77	695.30	478.01
2015	7.07	0	13.28	13.28	524.26	346.93	252.98	748.05	5.84	30.09	32.61	1,069.57	1,056.28
2016	7.50	0	13.28	13.28	561.28	359.43	305.23	902.53	6.19	31.90	34.57	1,280.40	1,267.12
2017	7.95	0	13.28	13.28	600.90	372.38	366.29	1,083.10	6.56	33.81	36.64	1,526.40	1,513.12
2018	8.42	0	13.28	13.28	494.08	385.80	183.97	543.98	6.95	35.84	38.84	809.58	796.30
2019	8.93	0	13.28	13.28	528.96	399.70	232.79	688.34	7.37	37.99	41.17	1,007.66	994.38
2020	9.46	204.00	13.28	217.28	566.30	414.11	290.55	859.14	7.81	40.27	43.64	1,241.42	1,024.13
2021	10.03	(920.82)	13.28	(907.54)	606.29	429.03	358.69	1,060.63	8.28	42.69	46.26	1,516.55	2,424.09
												<b>EIRR</b>	<b>14.8%</b>
												<b>NPV</b>	<b>1,576.6</b>

( ) = negative, CNY = yuan, EIRR = economic internal rate of return, O&M = operation and maintenance, NPV = net present value, VOC = vehicle operating cost.

Source: Operation Evaluation Mission estimates.

**Table A8.7: Changyu Expressway  
Economic Reevaluation  
(CNY million)**

YEAR	ANNUAL COSTS						ANNUAL BENEFITS						
	TRAFFIC Million vehicles	PROJECT COSTS			VOC		VOC SAVINGS		TIME SAVINGS		ACCIDENT	BENEFITS	
		Capital	O&M	Total Cost	w/out Proj	w/t Proj	induced	normal	Passenger	Freight	Savings	Gross	Net
1998	0	186.60	0	186.60	0	0	0	0	0	0	0	0	(186.60)
1999	0	788.62	0	788.62	0	0	0	0	0	0	0	0	(788.62)
2000	0	681.12	0	681.12	0	0	0	0	0	0	0	0	(681.12)
2001	0	595.02	0	595.02	0	0	0	0	0	0	0	0	(595.02)
2002	1.03	898.92	0	898.92	615.87	193.86	59.10	210.14	3.00	15.45	11.14	287.69	(611.23)
2003	2.85	0	20.78	20.78	638.07	401.68	121.37	431.54	4.54	23.39	22.08	580.84	560.06
2004	3.17	0	20.78	20.78	594.45	416.16	101.61	361.30	4.81	24.79	24.51	492.51	471.74
2005	3.51	0	20.78	20.78	615.87	431.16	116.86	415.49	5.10	26.28	27.20	563.73	542.95
2006	3.90	0	20.78	20.78	638.07	446.69	134.39	477.81	5.40	27.86	30.19	645.46	624.68
2007	4.21	0	20.78	20.78	661.06	462.79	154.54	524.73	5.73	29.53	32.00	714.53	693.76
2008	4.54	319.64	20.78	320.00	684.88	479.47	177.72	576.26	6.07	31.30	33.92	791.36	471.36
2009	4.89	0	20.78	20.78	709.56	486.50	214.23	663.33	6.43	33.18	35.96	917.17	896.40
2010	5.28	0	20.78	20.78	735.13	504.03	246.36	728.47	6.82	35.17	38.12	1,016.82	996.05
2011	5.60	0	20.78	20.78	624.18	522.19	115.24	340.75	7.23	37.28	40.40	500.51	479.73
2012	5.94	0	20.78	20.78	668.24	541.01	152.40	450.62	7.66	39.52	42.83	650.20	629.43
2013	6.29	0	20.78	20.78	715.42	560.50	196.69	581.59	8.12	41.89	45.40	828.28	807.51
2014	6.67	319.64	20.78	320.00	765.93	580.70	249.28	737.10	8.61	44.40	48.12	1,039.39	719.39
2015	7.07	0	20.78	20.78	820.00	542.63	395.69	1,170.02	9.13	47.07	51.01	1,621.90	1,601.13
2016	7.50	0	20.78	20.78	877.90	562.18	477.40	1,411.64	9.68	49.89	54.07	1,948.61	1,927.83
2017	7.95	0	20.78	20.78	939.87	582.44	572.92	1,694.08	10.26	52.88	57.31	2,330.14	2,309.36
2018	8.42	0	20.78	20.78	772.79	603.43	287.75	850.84	10.87	56.06	60.75	1,205.51	1,184.74
2019	8.93	0	20.78	20.78	827.35	625.18	364.11	1,076.64	11.52	59.42	64.40	1,511.69	1,490.91
2020	9.46	319.64	20.78	320.00	885.76	647.71	454.45	1,343.78	12.21	62.99	68.26	1,873.44	1,553.44
2021	10.03	(1,039.59)	20.78	(1,018.82)	948.29	671.05	561.03	1,658.93	12.95	66.76	72.36	2,299.68	3,318.49
												EIRR	18.0%
												NPV	2,955.5

( ) = negative, CNY = yuan, EIRR = economic internal rate of return, O&M = operation and maintenance, NPV = net present value, VOC = vehicle operating cost.  
Source: Operation Evaluation Mission estimates.

## SOCIOECONOMIC DEVELOPMENT IN PROJECT IMPACT AREAS

### A. General Impact

1. Heilongjiang and Jilin provinces are located in the northeastern People's Republic of China (PRC), bordering on the Russian Federation and North Korea. Heilongjiang with a population of 38 million at the end of 2004 was the 16<sup>th</sup> most populous province in the PRC, while Jilin with 27 million was the 21<sup>st</sup> most populous out of the 31 provinces in the PRC. Heilongjiang and Jilin provinces are part of the traditional northeastern PRC heavy industrial base, with Heilongjiang specializing in the production of steam turbines and Jilin being a center of automobile and chemical production. Both provinces are also important grain and animal production centers. Between 2000 and 2004, the gross domestic product (GDP) of Heilongjiang and Jilin both grew by an average rate of 13% per year. However, Heilongjiang remains a relatively richer province than Jilin, with GDP per capita of CNY13,897 in 2004, compare to CNY10,932 for Jilin and CNY10,533 nationally. The rural economy has particularly developed, with rural per capital income in both provinces increasing from CNY2,148 in 2000 to about CNY3,000 in 2004.

### B. Socioeconomic Development in the Project Impacted Areas

2. The project expressway connects the cities of Harbin and Changchun, the capitals of Heilongjiang and Jilin, respectively. The impact area for the Heilongjiang portion of the expressway (the Hashuang Expressway) includes Harbin city and Shuangcheng county. The impact area for the Jilin portion of the expressway (the Changyu Expressway) includes Changchun city, Dehui county and Fuyu county. Before the Project, National Highway (NH) 102 and the Changchun-Harbin railway were practically the only transport channels between Harbin and Changchun. The completion of the Hashuang Expressway in September 2001 and the Changyu Expressway in September 2002 significantly changed the transport conditions in the area. The travel time between Changchun and Harbin was reduced from 4 hours to 2.5 hours and vehicle operating costs are estimated to have been reduced by about 30%. The significant reduction in travel time and travel costs appears to have stimulated socioeconomic development.<sup>1</sup>

3. Since the Project expressway was opened, intertown bus services from towns served by expressway interchanges has increased providing a faster, safer, and more comfortable ride to people in the project area to services not available in their townships/villages. Prior to the Project, 14 buses operated each day from Harbin to Changchun. By 2004, this had risen to 40 buses per day on the expressway in addition to 9 buses per day on the NH 102. Faster and cheaper travel has reduced the cost of freight delivery; the benefits of this are gradually being passed on to residents in the project area.

4. The opening of the expressway appears to have greatly facilitated the export of grains and industrial products from Heilongjiang and Jilin to other parts of the PRC and to the Russian Federation. Complete statistics on inter- and intraprovincial trade are not available. However, the annual average export value of goods exported from Heilongjiang province grew by 106% during 2003/2004, compared to an average annual increase of only 17% during 2000/2002.

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<sup>1</sup> The ensuing discussion of the socioeconomic impact of the Project is limited by the absence of a "without project" assessment that would allow the separation of impacts due to the Project from impacts from other developments in the two provinces.

Given that most goods from Heilongjiang province are exported via Jilin province, this indicates a substantial increase in interprovincial trade.

## 1. Heilongjiang Province

5. In Heilongjiang, there has been an upsurge in economic growth in the project impact areas since the opening of the Hashuang Expressway. GDP growth in the province increased from 9.5% in the year before opening of the Expressway (2000/2001) to an average annual growth rate of 16.9% in the two years following the opening (2002/2004). In Harbin city, the corresponding growth rates were 11.7% before the opening and an average 16.8% afterwards, while GDP growth in Shuangcheng county increased from 13.4% before to an average 18.6% after the opening. The rural economy also appears to have picked up since the Expressway opening. Data available for Shuangcheng county indicates that rural net incomes grew by 6% in 2000/2001, compared to an average growth rate of 17.4% in 2002/2004. Table A9.1 shows socioeconomic indicators for the project impact area in Heilongjiang province.

**Table A9.1: Socioeconomic Indicators for Project Impact Area in Heilongjiang Province**

Indicator	Year	Direct Impact Area				Broad Impact Area	
		Harbin City		Shuangcheng County		Heilongjiang Province	
		Quantity	Growth (%)	Quantity	Growth (%)	Quantity	Growth (%)
Population ('000)	2000	9,413	—	799	—	38,070	—
	2001	9,411	0.0	803	0.5	38,110	0.1
	2002	9,483	0.8	805	0.2	38,130	0.1
	2003	9,543	0.6	806	0.1	38,150	0.1
	2004	9,610	0.7	809	0.4	38,168	0.0
GDP (CNY million)	2000	100,273	—	6,873	—	325,300	—
	2001	112,011	11.7	7,796	13.4	356,100	9.5
	2002	123,212	10.0	8,992	15.3	388,220	9.0
	2003	141,480	14.8	10,549	17.3	443,000	14.1
	2004	168,046	18.8	12,657	20.0	530,300	19.7
GDP per Capita (CNY)	2000	10,563	—	8,602	—	—	—
	2001	11,842	12.1	9,707	12.8	9,349	9.2
	2002	12,993	9.7	11,170	15.1	10,184	8.9
	2003	14,872	14.5	13,099	17.3	11,615	14.1
	2004	16,805	13.0	15,679	19.7	13,897	19.6
Rural Net Income (CNY /capita)	2000	4,098	—	2,359	—	2,148	—
	2001	4,291	4.7	2,500	6.0	2,280	6.1
	2002	4,457	3.9	2,807	12.3	2,405	5.5
	2003	4,686	5.1	3,217	14.6	2,509	4.3
	2004	—	—	3,868	20.2	3,005	19.8

CNY = yuan, GDP = gross domestic product.  
Source: Heilongjiang statistical yearbooks.

## 2. Jilin Province

6. In Jilin, year-over-year growth in GDP increased from an average rate of 11.1% in the two years (2000/2002) before opening of the Changyu Expressway to 17.3% in the year following the opening (2003/2004). In Dehui county the corresponding growth rates were an average 13.3% before the opening and 15% afterwards, while GDP growth in Fuyu county increased from an average 6.9% before to 19.8% after the opening. However, in Changchun

city this trend was reversed, with growth rates being slightly higher (15.6%) before the opening compared to afterwards (14.7%). The rural economy appears to have picked up since the Expressway opening. Data available for Dehui and Fuyu counties indicates that rural net incomes grew by average annual rates of 9% and 17.4% in 2000/2002, compared to a growth rates of 15% and 18.2% in 2003/2004, respectively. Table A9.2 shows socioeconomic indicators for the project impact area in Heilongjiang province.

**Table 9.2: Socioeconomic Indicators for Project Impact Area in Jilin Province**

Indicator	Year	Direct Impact Area						Broad Impact Area	
		Changchun City		Dehui County		Fuyu County		Jilin Province	
		Quantity	Growth (%)	Quantity	Growth (%)	Quantity	Growth (%)	Quantity	Growth (%)
Population ('000)	2000	6,996	—	906	—	742	--	26,273	—
	2001	7,057	0.9	910	0.4	747	0.7	26,371	0.4
	2002	7,125	1.0	913	0.3	753	0.8	26,494	0.5
	2003	7,182	0.8	913	—	760	0.9	26,586	0.3
	2004	7,241	0.8	916	0.3	766	0.8	26,619	0.1
GDP (CNY million)	2000	86,100	—	6,230	—	3,132	—	182,120	—
	2001	100,301	16.5	7,062	13.4	3,150	0.6	203,248	11.6
	2002	115,020	14.7	8,001	13.3	3,582	13.7	224,610	10.5
	2003	133,800	16.3	9,401	17.5	4,071	13.7	252,260	12.3
	2004	153,500	14.7	10,810	15.0	4,879	19.8	295,821	17.3
GDP per capita (CNY)	2000	12,381	—	6,887	—	4,238	—	6,847	—
	2001	14,274	15.3	7,786	13.1	4,231	(0.2)	7,640	11.6
	2002	16,220	13.6	8,783	12.8	4,774	12.8	8,334	9.1
	2003	18,704	15.3	10,308	17.4	5,381	12.7	9,338	12.0
	2004	21,285	13.8	11,815	14.6	6,396	18.9	10,932	17.1
Industrial Output (CNY million)	2000	31,800	—	1,802	—	268	—	80,030	—
	2001	38,100	19.8	2,020	12.1	134	(50.0)	88,084	10.1
	2002	45,030	18.2	2,455	21.5	162	20.9	97,840	11.1
	2003	54,229	20.4	2,607	6.2	254	56.8	114,340	16.9
	2004	—	—	—	—	—	—	—	—
Gross Agricultural Output Value (CNY million)	2000	12,300	—	2,540	--	1,843	--	60,937	—
	2001	13,590	10.5	2,923	15.1	1,886	2.3	69,183	13.5
	2002	14,690	8.1	3,020	3.3	2,125	12.7	73,421	6.1
	2003	15,733	7.1	3,599	19.2	2,312	8.8	79,214	7.9
	2004	—	—	—	—	—	—	94,067	18.8
Rural Net Income (CNY /capita)	2000	3,432	—	2,590	—	1,930	—	2,148	—
	2001	3,788	10.4	2,635	1.7	1,960	1.6	2,182	1.6
	2002	4,387	15.8	3,080	16.9	2,660	35.7	2,361	8.2
	2003	4,708	7.3	2,820	(8.4)	2,830	6.4	2,530	7.2
	2004	—	—	3,242	15.0	3,346	18.2	3,000	18.6

( ) = negative, CNY = yuan, GDP = gross domestic product, QTY = quantity.

Sources: Jilin statistical yearbooks.

## **C. Project Impact on Local Areas**

### **1. Dehui County**

7. Dehui county, about 80 km north of Changchun city, is a well-known agricultural county because of its grain, beef cattle, and chicken production. To take advantage of its rich and high-quality agricultural resources, the county established a provincial industrial development zone in 1992 to attract external investments in agroprocessing and other businesses.

8. From 1992 to 2000, 151 enterprises were introduced to the zone (17 enterprises per annum). Then from 2001 to 2005, facilitated by the opening of the expressway, 153 enterprises were introduced to the zone (31 annually). These 153 enterprises have provided more than 10,000 employment opportunities for locals, including farmers.

9. Caiyuanzi township is a traditional and well-known tomato-producing township in Dehui county. The township has 10,000 greenhouses and produces more than 90,000 tons of tomatoes each year. The opening of the expressway has raised the farm-gate price of tomatoes by more than CNY0.1 per kilogram. This alone brings an additional CNY9 million of income to its 45,000 rural residents (CNY200 per rural capita).