

People's Republic of China

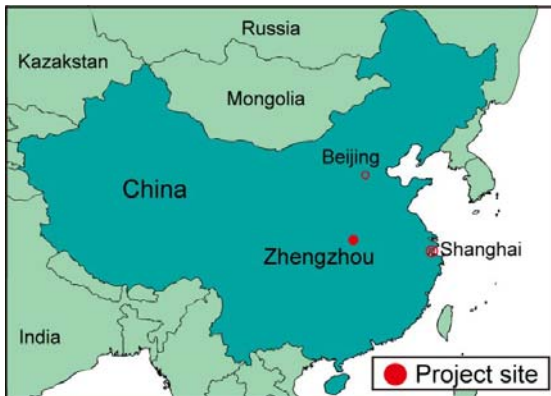
## Xinxiang-Zhengzhou Expressway Construction Project (CXXI-P112)

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Study Period: April 2009 to December 2009<sup>1</sup>

### 1. Project Profile and Japan's ODA Loan



Location of Project Site



Xinxiang-Zhengzhou Expressway

#### 1.1 Background

China's road transport has been rapidly expanding its share among transport modes since late 1970s with the adoption of the government's open-door policy. As of 1998, the total length of the national road network had reached 1.279 million km, but the total length was short relative to China's land area (960 million km<sup>2</sup>), with road density of 110 m/km<sup>2</sup> (3,160 m/km<sup>2</sup> in Japan as of 2005). Moreover, in over 2,000 townships, and 190,000 villages, roads were not well developed. Furthermore, roads had in general mixed traffic including several transport modes such as automobiles, tractors, animal-drawn carts, bicycles, and pedestrians, and thus moving speed was slow and transport efficiency was further deteriorated.

In order to make the road transport a main logistics mode, the Chinese government formulated a plan for the national high-grade trunk highway system (NTHS), covering the whole nation. First, a plan to construct 12 trunk highway routes, which traverse from north to south and from east to west in China, and serve as part of the NTHS was developed. NTHS was planned to be implemented in a series of five-year plan's period. NTHS was planned to connect between the nation's capital (Beijing) and central government ruled municipalities/provincial capitals, and between cities with population of over 1 million and those with 0.5 million. Xinxiang-Zhengzhou Expressway (XZE),

<sup>1</sup> Field surveys were conducted in June and August 2009

the subject project, is a section of Beijing-Zhuhai Route, which is one of 2 vertical routes among 12 trunk highways.

### 1.2 Objective

The objectives of the project are to enhance the transport effectiveness and improve the traffic conditions along the Xinxiang-Zhengzhou corridor, and to improve the transport efficiency with neighboring regions, by constructing a 80 km expressway between Xinxiang and Zhengzhou in Henan Province, a section between Beijing and Zhuhai, which is one of “the high priority 2 vertical-2 horizontal-3 routes” among NTHS in China, thereby contributing to improvement of the investment environment and promotion of the economic development along the corridor . The location of the project site is shown in Figure 1.



Figure 1 Location of Project Site

### 1.3 Borrower/Executing Agency

Government of the People’s Republic of China/Henan Provincial Government

### 1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	23.491 billion yen/20.630 billion yen
Exchange of Notes/Loan Agreement	March 2000/March 2000
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	2.2%, 30 years (10 years), General untied Consultant: 0.75%, 40 years (10 years), Bilateral tied
Date of (Disbursement) Completion	July 2006

Main Contractors (More than 1 billion yen only is stipulated)	China Geo-Engineering Group Company, 4th Engineering Co. Ltd. of No.18 Engineering Bureau of CREC, China 4th Metallurgy Construction Company, Henan Highway Engineering Bureau, 1st Engineering Co. of 1st Highway Engineering Bureau of China, China Railway & Bridge Bureau (Group) Co. Ltd. of CREC, 20th Engineering Bureau of CREC, Beijing Civil Construction Group Co. Ltd. Corp, No.4 Engineering Bureau of China Construction Group Corp, Second Highway Engineering Bureau of Road and Bridge Group, Beijing Urban Construction Group Co. Ltd, China Road and Bridge Corporation (all Chinese contractors)
Consultant Services (More than 100 million yen only is stipulated)	none
Feasibility Study (F/S)	F/S by Henan Provincial Communications Design Institute (February 1999)

## 2. Evaluation Results (Rating: A)

### 2.1 Relevance (Rating: a)

#### 2.1.1 Relevance at the time of appraisal

Under the China's Ninth Five-Year Plan (1996-2000), construction of the "5 vertical and 7 horizontal (five north-south and seven east-west)" highway network was proposed for further economic development in inland provinces. Among these 12 highways, "2 vertical, 2 horizontal, and 3 routes", or seven highways were planned to serve as main trunk lines traversing along the coast, and connecting between inland cities and main cities and ports along the coast. Three routes including "Beijing-Zhuhai", "Beijing-Shenyang", and "Beijing-Shanghai" were planned to be completed basically as an expressway by 2000. At the same time, the Chinese government intended to allocate budgets intensively to construction of roads in inland provinces to promote economic development in poor regions, and particularly had tried to promote road development in central and western regions<sup>2</sup>. Thus, the objective of the project is consistent with the government development policies/strategies.

From the development needs viewpoint, the average traffic volume of the existing National Highway 107 was about 16,000 vehicles/day, and 20,000 vehicles/day, particularly at the Yellow River crossing section, and urban areas were congested all day long. Moreover, the traffic volume was expected to increase by 6% per annum, and thus countermeasures to relieve the congestion were anticipated. The proposed expressway is the part of the Beijing-Zhengzhou-Wuhan-Zhuhai route, which is one of NTHS, and its construction was expected to commence by 2000 as an important route connecting inland regions with coastal cities and ports.

<sup>2</sup> From appraisal documents

### 2.1.2 Relevance at the time of evaluation

The national plan for constructing 35,000 km expressway network (“5 vertical and 7 horizontal” highways) by 2010 was implemented in advance, and by the end of 2005 a 41,000 km highway network, including XZE had been completed. In January 2005, the government announced the post “5 vertical and 7 horizontal” highway network with a total length of 85,000 km (7918 Plan), in which all regional major cities with a population of over 200 thousand would be connected in the next 30 years, and it is currently under the construction phase. The project section is included in the 7918 Plan and the project is relevant with development needs of the national development plan.

From the development needs viewpoint, the subject expressway (XZE) is part of the Beijing-Zhuhai route, which is the most important and essential route in China. By improving the transport efficiency and traffic condition, the project will contribute not only to improvement of the investment environment and promotion of the economic development along the Xinxiang-Zhengzhou corridor, but also to improvement of the economic development of whole China. XZE is one of the essential segments among highways which form the national trunk highway system.

This project has been highly relevant with China’s national policies and development needs at the times of both appraisal and aex-post evaluation.

## 2.2 Efficiency (Rating: b)

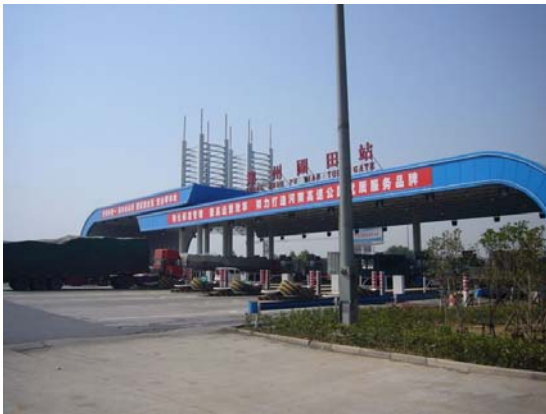
### 2.2.1 Outputs

The project scope and its outputs are shown in Table 1. The project scope and contents have been implemented almost as planned except extension of route length by 2 km due to change of location for Xinxiang Interchange and conversion of a service area to a parking area in Xinxiang.

Table 1: Project Scope and Output

Planned		Actual	Reasons for changes
Civil works :			
① Expressway:			
Length	79.8km	almost as planned. 81.8km	
Right of way	35m (6-lane section)	as planned	
	42.5m (8-lane section)	as planned	
Lanes	3-4 lanes for one direction	as planned	
Pavement	asphalt	as planned	
Type of highway	full access controlled, toll	as planned	
② Interchanges	4 sites	as planned	
③ Toll stations	3 sites	as planned	
④ Service areas	2 sites	1 site	Xinxiang Service Area, originally planned as a service area was

			converted to a parking area.
⑤ Bridges	Large: 6 sites with 5,616.5m  Yellow Rive large bridge 9,570m Medium: 18sites with 1,032m Small: 12 sites with 444m	Large: 6 sites with 5,301m. almost as planned Yellow River large bridge 9,848 m Medium: 17sites with 983m Small: 12 sites with 444m	
⑥ Management facilities	Toll stations, communications system, surveillance system, vehicles for maintenance and operations	as planned	
Consulting services :			
48M/M (only for bridges) for review of detailed designs, and assistance in construction supervision of bridge sections、 and 11M/M for overseas training		almost as planned 46.6M/M (only for bridges) + overseas training 11M/M	



Toll stations at Putian Interchange



Yellow Rive Large Bridge

### 2.2.2 Project period

The project implementation period planned at appraisal was from March 2000 (Loan Agreement signing) to December 2003 (construction completion) with a period of three years and 10 months (46 months). However, the actual period was from March 2000 to October 2004 (open to traffic) with a period of four years and 8 months (56 months). It was about 10 months delay against the planned (122% of the planned). The planned and actual period by item is shown in Table 2.

Table 2 Planned and Actual Implementation Schedule by Item

Item	Planned	Actual
Detailed designs	October 1999 - March 2000	March 2001 - August 2001
Land acquisition / resettlement	January 2000 - April 2000	July 2001- December 2001
Tendering for civil works	March 2000 – August 2000	January 2001 – March 2002
Civil works and Electrical/Mechanical works	October 2000 – December 2003	March 2002 – September 2004
Consulting services	July 2000 – September 2003	April 2002 – October 2004

Main reasons for delay are:

- ① It took more time to secure clearance for various items regarding the project implementation from relevant authorities. Thus, commencement of land acquisition activities was delayed by one year and 5 months.
- ② Since the number of people to be resettled was quite numerous, it took more time than expected to undertake the land acquisition and resettlement. The originally expected 3.5 months was extended to five months.
- ③ The originally expected tendering period was 5 months. However, the actual period needed was 14 months. The originally expected period of 5 months is considered to be unrealistic.

Due to the reasons mentioned above, commencement of civil works was delayed by 22 months against the planned schedule. However, the actual construction period was shortened by 8 months, and the project was completed (open to traffic) in October 2004 with one year delay.

### 2.2.3 Project cost

The total project cost estimated at appraisal was 58.126 billion yen, among which the Japanese ODA loan was 23.491 billion yen. The actual project cost was 57.752 billion yen, among which the Japanese ODA loan disbursed was 20.630 billion yen, and thus it was lower than planned (0.6% reduction) for the total project cost. The cost paid by local currency was slightly higher than planned. Reasons for higher cost are: 1) in the soft ground area, additional pile foundation works were needed; 2) the location for Xinxiang interchange was moved; 3) lighting facilities were installed along the roadway between Yellow River and Putian; and 4) planting and landscaping works were added. The Japanese ODA loan disbursed was lower than planned (about 12% reduction). Reasons for reduction are: 1) by the time when the foundation work and bridges were completed, the loan closing date has come. Thus, costs needed for remaining works were financed by local funds; and 2) Henan Provincial Communications Department (HPCD) decided that a firm/entity undertaking construction works and a firm/entity to be responsible for operations and maintenance must be separate from each other. Thus, equipment/materials needed for operations and maintenance, which was originally to be conducted by force

account (HPCD) were not procured under this project. Reduction of the total project cost is due to reduction of the Japanese ODA loan portion that exceeded the increased amount of local currency portion.

The planned and actual project costs by item are shown in Table 2.

Table2 Project costs by Item (Planned and Actual)

Item	Planned			Actual		
	Foreign currency (million yen)	Local currency (million yuan)	Total (million yen)	Foreign currency (million yen)	Local currency (million yuan)	Total (million yen)
Civil Works	13,127	858	25,997	14,212	1,268	32,875
Base Course	5,264	345	10,439			
Pavement	4,002	261	7,917			
Interchange	2,786	182	5,516			
Traffic engineering	1,075	70	2,125			
Bridges	7,168	465	14,143	6,254	520	14,156
Facilities	1,317	100	2,817		48	729
Land acquisition / resettlement	0	239	3,585		318	4,827
Administration cost	0	17	255		10	152
Taxes	0	81	1,215		97	1,473
Research & development	0	70	1,050		69	1,048
Interest during construction	0	137	2,055		155	2,354
Consulting services	233	82	1,463	138		138
Price escalation	538	154	2,848			
Contingencies	1,108	106	2,698			
<b>Total</b>	<b>23,491</b>	<b>2,309</b>	<b>58,126</b>	<b>20,609</b>	<b>2,485</b>	<b>57,752</b>

Note 1: Exchange rates: US\$1=120 yen, US\$1=8 yuan, 1 yuan=15yen  
 Price increase: foreign currency 1.2%/year, Local currency 3.3%/year  
 Contingencies: foreign/local currencies 5%  
 Base year for cost estimation: November 1999

Note 2: Exchange rate: 1 yuan=15.19 yen

Although the project period slightly exceeded the plan, project cost was lower than planned; therefore the evaluation for efficiency is moderate.

## 2.3 Effectiveness (Rating: a)

### 2.3.1 Traffic volume on XZE

The annual average daily traffic of XZE is shown in Table 3.

Table 3 Annual Average Daily Traffic of XZE

(Unit: passenger car unit veh/day)

Section	2005	2006	2007	2008
Xinxiang-Zhengzhou	39,400 (40,745)	33,850 (43,600)	34,000 (46,500)	35,000 (49,400)
Actual against planned	97%	78%	73%	71%

Note: Numbers in ( ) are estimated

The traffic volume on XZE decreased in 2006 and since then the volume has remained unchanged. The reason for non-increasing is that since in 2006/2007 two expressways (Dalian – Guangzhou Expressway<sup>3</sup> and Erenhot – Guangzhou Expressway<sup>4</sup>) parallel to XZE were completed, traffic travelling north-south direction was distributed to three expressways including XZE. Traffic volume as of 2008 on Dalian-Guangzhou Expressway and Erenhot-Guangzhou Expressway (in the section parallel to Xinxiang-Zhengzhou section) was both about 20,000 vehicles/day. Should the half of the traffic volume on these expressways use XZE, the traffic volume of XZE will be more than 55,000 vehicles/day, which is more than the expected at the appraisal stage.

### 2.3.2 Traffic volume on National Highway 107 (Xinxiang-Zhengzhou)

Traffic volume on the existing National Highway 107 between Xinxiang and Zhengzhou is shown in Table 4. At the appraisal stage, other expressways parallel to XZE were not planned and thus, it was assumed that the traffic volume on National Highway 107 would also gradually increase. However, as regional economy has developed, hesitation to pay toll was reduced and diversion to an expressway was accelerated more than expected. As a result, the traffic volume on National Highway 107 has been decreasing and traffic congestion has been relieved.

Table 4 Annual Average Daily Traffic on National Highway 107 (Xinxiang-Zhengzhou)

(Unit: passenger car unit veh/day)

Section	2005	2006	2007	2008
Xinxiang-Zhengzhou	20,000 (17,063)	18,000 (18,200)	16,000 (18,300)	14,000 (19,400)
Actual against planned	117%	99%	87%	72%

Note 1: Numbers in ( ) are estimated

Note 2: National Highway 107 traverses parallel to the expressway.

### 2.3.3 Traffic accident rate on National Highway 107

The accident rate (number of accidents) on the existing National Highway 107 is shown in Table 5. After the expressway was open to traffic, traffic congestion has been relieved and traffic accidents on National Highway 107 have been decreasing.

<sup>3</sup> parallel to XZE with 40 km apart

<sup>4</sup> parallel to XZE with 75 km apart



Table 5 Traffic accident rate on National Highway 107

(Unit: accidents/year)

Section	2005	2006	2007	2008	2009
Xinxiang -Zhengzhou	820	790	720	650	580
Number of accidents against previous year		96%	91%	90%	89%

#### 2.3.4 Internal rate of return

Based on cost and benefit items assumed at the appraisal stage, using the actual cost with respect to construction costs, and actual costs for four years upon completion and projected costs afterward during the remaining project life period with respect to operation and maintenance costs and toll revenue, the financial internal rate of return (FIRR) was recalculated. FIRR at post evaluation is 13.3% and the financial viability is high. The reason for higher FIRR at post evaluation is that toll charges estimated at appraisal (e.g. 0.28 yuan/km for a passenger car) were doubled (0.55 yuan/km) and the toll revenue was increased. Based on the same assumptions and condition (costs include construction costs, and operation and maintenance costs, and benefits include savings of vehicle operating costs, reduction of travel distance, reduction of traffic congestion, reduction of travel time, reduction of traffic accidents and increase of generated traffic), the economic internal rate of return (EIRR) was recalculated. EIRR at post evaluation is 12.7%. Since the actual traffic volume is lower than expected by 30%, EIRR is also lowered. However, since it is more than 12%, which is the target for an expressway project finance by international aid agencies, the project is considered viable.

Table 6 Internal rate of return

IRR	At appraisal	At post evaluation
FIRR	9.6%	13.3%
EIRR	14.9%	12.7%

#### 2.3.5 Qualitative effects

The qualitative impacts expected at appraisal were: i) enhancement of transport capacity along the Beijing-Zhuhai corridor and strengthening transport efficiency with neighboring regions; ii) acceleration of economic development along the corridor and iii) generation of travel demands. These impacts were confirmed by results of beneficiary surveys conducted under this post evaluation (please refer to the succeeding page, on the

results of surveys).

Since two expressways, which were not planned at the appraisal stage, have been constructed parallel to XZE, certain volume of traffic (about half) which was expected to use XZE diverted to those expressways, and thus the traffic volume on XZE is less than planned. However, the total traffic volume along the corridor is much more than originally planned. The traffic volume on the existing National Highway 107 parallel to XZE has been decreasing since XZE was completed, and this proves that traffic has diverted to efficient expressways. Moreover, the traffic accidents on the existing National Highway 107 have been decreasing with reduction of traffic volume. From these data, it proves that the effective transport by XZE has been achieved, that traffic congestion along the corridor has been relieved and that the transport efficiency with neighboring regions has been enhanced.

Therefore, this project has largely achieved its objectives, and its effectiveness is high.

## 2.4 Impact

### 2.4.1 Improvement of investment environment and promotion of economic development

#### (1) Improvement of investment environment and economic development

With completion of an expressway, which has enough highway capacity (3-4 lanes for each direction) and provides substantial reduction of travel time (reduced to 1/3 of the original travel time), accessibility to markets has been enhanced and thus, the investment environment has been improved. As shown in the table 7, the average income of Zhengzhou city was increased by 68% and that of Xinxiang city by 85% in 2008 upon completion of the project. The economic growth rate of both cities for the past three years was more than 20% /annum.

The increase of average income in both Zhengzhou and Xinxiang within the project area is shown in Table 7.

Table 7 Average income (per person)

Unit: yuan

City	2004	2005	2006	2007	2008
Zhengzhou	9,364	10,639	11,822	13,692	15,715
		(114%)	(111%)	(116%)	(115%)
Xinxiang	7,146	9,312	9,544	11,236	13,218
		(130%)	(102%)	(118%)	(118%)

Note 1: Open to traffic in October 2004

Note 2: Numbers in ( ) are ratio against the previous year

Table 8 Economic growth rates

City	2004	2005	2006	2007	2008
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Zhengzhou	112	119	119	120	
Xinxiang	118	124	125	125	

Note: Base year is 2000

## (2) Results of beneficiary surveys

At the post evaluation stage, beneficiary surveys by interviews were conducted in three cities (Xinxiang, Yuangyan, and Zhengzhou) along the XZE corridor. The number of respondents was 150 in total with 13% of female and 87%<sup>5</sup> of male respondents. Main findings and results are shown below.

- 1) Contribution to promotion of regional economic activities and expansion of business chances<sup>6</sup>: 93% evaluate
- 2) Contribution to relieve traffic congestion between Xinxiang and Zhengzhou: 98% evaluate
- 3) Impact to increase of household income: 62% perceive
- 4) Amount of agricultural products transported to the market: 80% evaluate
- 5) Improvement of accessibility to public services such as market, school, hospital and government offices: 100% evaluate
- 6) Reduction of travel/commuting time<sup>7</sup>: 91% evaluate
- 7) Reduction of transport costs: 33% of respondents admit reduction by 10% and 27% by 30%.
- 8) Improvement of traffic safety and reduction of traffic accidents: 97% admit its contribution.
- 9) Among 150 respondents, 27 people (18%) happened to be somehow affected (land, houses, plants/trees) by the project. However, they reported that they were properly compensated.
- 10) Regarding the environmental issues, some of the residents along the corridor, who moved after XZE has been completed, reported that they are suffered from traffic noise during the night time. Some residents complain that the length of installed noise barrier is insufficient.

In summary, regarding improvement of transport capacity and efficiency, 98% of respondents of beneficiary surveys evaluate the project's contribution to relief of traffic congestion along the XZE corridor and 80% evaluate to transport of industrial and agricultural products to the markets. With respect to promotion of economic development, 93% of respondents evaluate the project's contribution to promotion of regional economic activities and expansion of business chances and 62% perceive project's impact to the increase of household income. Regarding generation of travel demands, all the

<sup>5</sup> The reason for higher ratio of male respondents is that most of questions are more appropriate to ask male respondents because of nature of the project (expressway).

<sup>6</sup> The following comments were obtained: Due to improvement of accessibility from Yuanyan to other cities, a few firms including Sanyuan Milk Group, one of the biggest manufacturers in China, and Diyi Rice Company constructed large factories and they are contributing to the city's economic development and increase of employment opportunities. According to the statistics of Yuangyan County Traffic Administration, the cargo handling volume in 2003 before the project was 1,720,000 tons and this was doubled to 3,420,000 tons in 2008 after the expressway was open to traffic.

<sup>7</sup> The following comment was obtained: Before the expressway was completed, it took one and half hours from Yuanyan to Zhengzhou. It takes only 40 minutes now.

respondents evaluate its contribution to improvement of accessibility to public services and 91% reduction of travel/commuting time.

#### 2.4.2 Environmental and social impact

##### (1) Impact to environment

Any issues on the impact to the environment have not been observed. During the project implementation, an environmental monitoring plan was prepared and the monitoring has been conducted by the Henan Provincial Environmental Bureau after the XZE got open to traffic.

*Ecological condition:* During the expressway construction, 62 borrow pits (with a total area of 331 ha) were selected. Upon completion, 40% of excavated area was converted to cultivated lands and 60% to either fish ponds or reservoirs. To protect slope erosion, protection works and planting were undertaken. During the construction, asphalt/concrete plants were installed at 11 locations. Upon completion, these sites were restored to the original condition and planting work was conducted. From the above mentioned facts, it was confirmed that the environmental protection was conducted properly.

*Noise protection:* Noise barriers were installed at 21 sites with a total length of 4,670 m along the expressway and the noise level was lowered by 3.6-4.8 db. The noise level actually measured at sensitive locations such as school zones meets the class 2 standard (national standard GB3096-2008). The noise level in other locations also meets national class 4 standard.

*Water treatment:* Water treatment facilities were installed at all the service areas, toll stations and parking areas. According to the results recently measured, treated water quality at these sites meets the class 2 standard (national standard GB3096-2008).

As a result, it was confirmed that the environmental protection has been well taken care of during construction and operation stages. According to the interview surveys conducted along the expressway, 90% of respondents also report that they are satisfied with the environmental protection taken and its outcome. From these points, the environmental protection taken (for traffic noise and exhausted gas) is considered to be satisfactory.

##### (2) Land acquisition and resettlement

At appraisal, land acquisition of 870 ha and resettlement of about 7,000 inhabitants

were planned. The land area actually acquired was 720 ha and the number of resettled people was approximately 890. The total area of resettled houses was 55,158 m<sup>2</sup> including 197 houses and 13 factories. The amount paid for land acquisition and compensation was about 318 million yuan, which is about 1.3 times of the originally estimated. The right consciousness of citizens has been recently increased in Henan as well and thus reasonable support/compensation for land acquisition and resettlement is required. In the area where an agreement on the compensation amount was not obtained, an alignment was partly shifted. It hints that the dissemination to the public on the compensation policy might not be sufficient and that the process for concurrence formation with the public might not be appropriate. One of the reasons for delay of project implementation is that it took more time than originally expected to acquire the land. The originally planned period (3.5 months) was extended to 6 months.

## 2.5 Sustainability (Rating: a)

### 2.5.1 Operation and maintenance system

Since the part of XZE is a section of an important route connecting with Zhengzhou Airport, the Xinxiang-Zhengzhou Administration Bureau for Beijing- Zhuhai Expressway under HPCD has been directly managing the expressway. The Xinxiang-Zhengzhou Administration Bureau is responsible for operation and maintenance of four routes with a total length of 159 km including XZE. The Bureau consisted of 11 divisions and is staffed with 50 professionals at its headquarters and 415 professionals and employees at field offices (toll stations and service areas). All the professional staff has qualified educational background (graduates of professional schools and college and universities, and among which 16 professionals have senior level qualifications and 30 medium level qualifications.

### 2.5.2 Technical capacity in operation and maintenance

In addition to the operation and maintenance manuals for each operation and maintenance work prepared by HPCD, manuals and regulation books particularly applicable to XZE have been prepared and distributed to all the staff and employees concerned. Some of the manuals include: a toll collection operational manual, a technical manual for repair of variable message sign board, a manual for patrol operations, and related documents on maintenance (issued in December 2007). Each staff in charge is obliged to participate in training programs in the related sector at least once a year. Each participant takes an examination after attending the program and the level of understanding of the training program is checked. Staff, who failed to pass the examination is requested to quit the job in some cases. Depending on training programs, reference books for training and sample examination papers are prepared. With these well established training programs, the technical level of staff has been kept high.

### 2.5.3 Financial status on operation and maintenance

#### (1) Financial status of XZE

Table 8 Financial status of XZE

Unit: million yuan

Year	Income	Operation expenses	Profit
2005	729.64	161.78	567.86
2006	847.03	182.06	664.97
2007	918.88	185.51	733.37
2008	813.44	277.39	436.05
2009 <sup>8</sup>	427.71	176.01	251.7

Income and profit have been increasing every year. Reasons for reduction of income and profit in 2008 are: i) XZE was closed for a few weeks due to heavy snow in winter (January and February); and ii) all the vehicles which were used for removal of snow and emergency purposes (including those used for the Sichuan Earthquake Disaster Reconstruction program) were allowed to pass free so that tolls were not collected. The reason for cost increase is that some repair and maintenance works were needed in 4 years after opening to traffic. The works included renewal of traffic signs, change of expansion joints, additional landscaping/planting work, and new construction of approaching ramps to Yuangyan Service Area.

#### (2) Breakdown of operation and maintenance expenses (2008)

The breakdown of operation and maintenance expenses is shown in Table 9.

Table 9 Operating Expenses

Unit: million yuan

Item	Amount
Personnel (salaries)	13.05
Operating expenses	1.16
Equipment and Materials	7.52
Maintenance works	35.42
Other expenses	6.68
Installation of surveillance cameras	1.88
Expansion of a service area	5.32
Approach ramps to Yuanyang service area	15.92

<sup>8</sup> Data for 2009 covers only the period from January to July 2009.

Interest	190.39
Total	277.39

Since the financial status is sound, budget is well allocated to the maintenance works as well.

#### 2.5.4 Status of operation and maintenance

During the field inspection, no crack/pothole on the asphalt pavement, nor settlement at the connection of bridge structure and earth work section including at the approach section to Yellow River Bridge were observed. This proves that maintenance has been properly undertaken. Enterprises, which would be responsible for routine maintenance (cleaning ditches, removal of obstacles on the roadway, trimming trees and others) are selected/recruited through National Competitive Bidding (NCB) procedures. Currently, the Xixiang-Zhengzhou Administration Bureau for Beijing- Zhuhai Expressway under HPCD entrusts civil works to three firms and landscaping/planning works to three firms as well. Contractors needed for periodic maintenance work (repair of lighting, traffic signs, guardrail, etc.) and major reconstruction works (overlay, etc.) are recruited through NCB procedures depending on the type and work.

No major problem has been observed in the capacity of the executing agency, nor its operation and maintenance system; therefore, sustainability of the project is high.

### 3. Conclusion, Lessons Learned, Recommendations

#### 3.1 Conclusion

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

#### 3.2 Lessons Learned

1) There is substantial difference between the planned and actual with respect to the number of people resettled, land area acquired, and the amount of compensation paid. Due to unsatisfactory negotiations on land acquisition, an alignment was partly revised. Thus, it is suggested that during the project preparation, reasonable time for discussions be spent with attended people, and that a resettlement action plan, which incorporates the results of discussions and negotiations be prepared, and it should be monitored during the project implementation.

#### 3.3 Recommendations

None.

### Comparison between planned and actual

Component	Planned	Actual
Civil works:	<p>① Expressway:</p> <p style="padding-left: 40px;">Length            79.8km</p> <p style="padding-left: 40px;">Right of way    35m (6-lane section) 42.5m (8-lane section)</p> <p style="padding-left: 40px;">Lanes             3-4 lanes for one direction</p> <p style="padding-left: 40px;">Pavement        asphalt</p> <p style="padding-left: 40px;">Type of highway full access controlled, toll</p> <p>② Interchanges    4 sites</p> <p>③ Toll stations     3 sites</p> <p>④ Service areas    2 sites</p> <p>⑤ Bridges</p> <p style="padding-left: 40px;">Large: 6 sites with 5,616.5m</p> <p style="padding-left: 40px;">Yellow River large bridge 9,570m</p> <p style="padding-left: 40px;">Medium: 18sites with 1,032m</p> <p style="padding-left: 40px;">Small: 12 sites with 444m</p> <p>⑥ Management facilities    Toll stations, communications system, surveillance system, vehicles for maintenance and operations</p>	<p>almost as planned.81.8km</p> <p>as planned</p> <p>as planned</p> <p>1 site</p> <p>Large' 6 sites with 5,301m almost as planned</p> <p>Yellow River large bridge 9,848 m</p> <p>Medium: 17 sites with 983m</p> <p>Small: 12 sites with 444 m</p> <p>Almost as planned</p>
Consulting services:	48M/M (only for bridges) for review of detailed designs, and assistance in construction supervision of bridge sections, and 11M/M for overseas training	almost as planned 46.6M/M (only for bridges) + overseas training 11M/M
Period	March 2000 (L/A) – December 2003 (Project completion) 3 years and 9 months (45 months)	March 2000 (L/A) – October 2004 (open to traffic) 4 years and 7 months (55 months)
Cost (Total Project Cost)		
Foreign currency	23.491 billion yen	20.690 billion yen
Local currency	34.635 billion yen (2.309 billion yuan)	37.143 billion yen (2.485 billion yuan)
Total	58.126 billion yuan	57.752 billion yen
Japanese ODA loan	23.491 billion yen	20.69 billion yen
Exchange rates	1 yuan = 15 yen (as of 1999)	1 yuan = 15.19 yen (March 2001 – August 2003)