

Yangtze River Four-Bridge Construction Project

“Hefei-Tongling Highway and Tongling Yangtze River Highway Bridge Construction Project (1) (2)”

“Huangshi Yangtze River Bridge Construction Project”

“Second Wuhan Yangtze River Bridge Construction Project” “Second Chongqing Yangtze River Bridge Construction Project”

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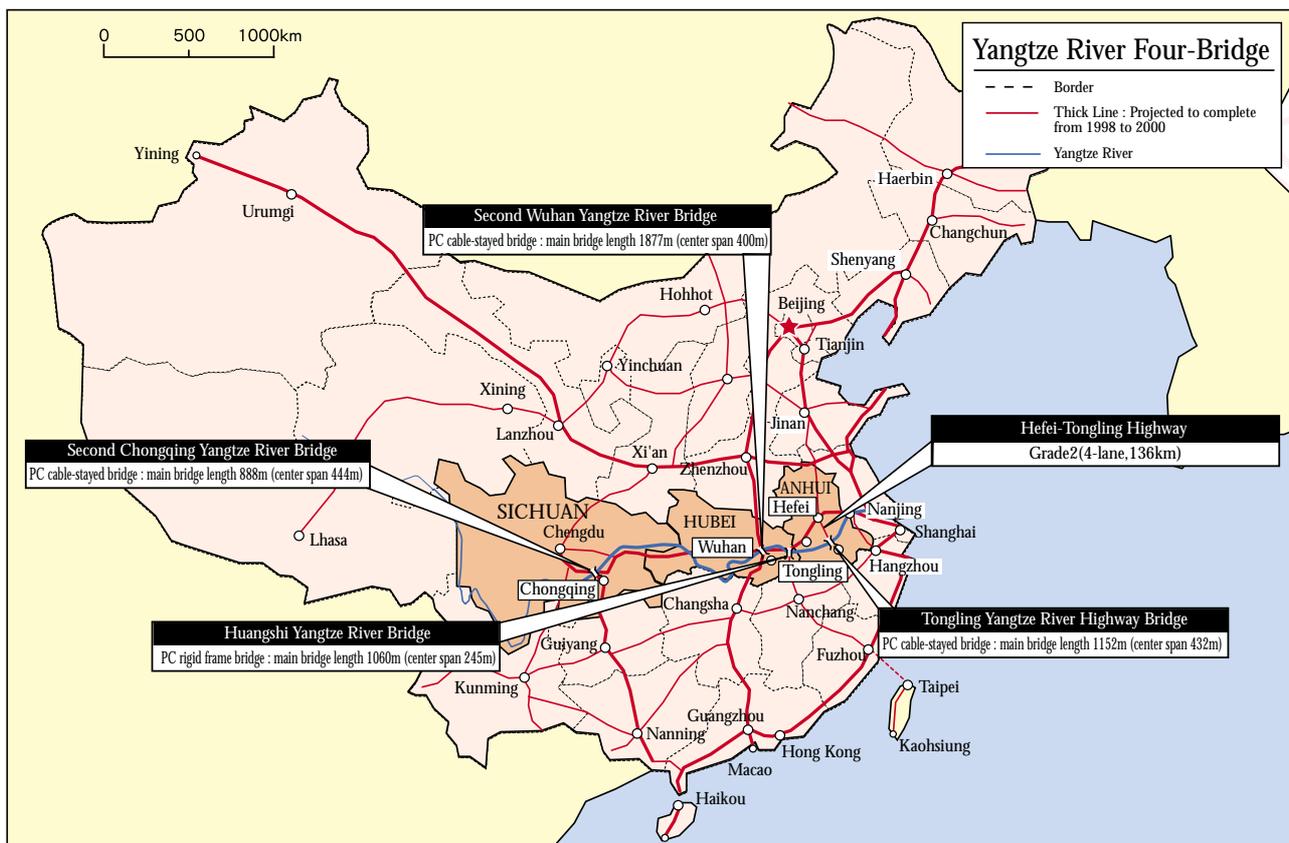
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1 Project Summary and Japan's ODA Loan

(1) Background

Since Third Plenary Session of the Eleventh Central Committee of the Chinese Communist Party adopted openness policies in December 1978, a succession of areas along the Eastern Seaboard have been designated as Special Economic Zones, Free Economic Zones and Free Coastal Zones. The Eastern Seaboard has been the center of rapid growth in foreign trade. In order to pursue balanced regional development, the Seventh Five-Year National Plan for Economic and Social Development (1986~1990, the "7-5 Plan") proposed regional economic development policies which emphasized creating close linkages between the Eastern Seaboard and the central and western regions. In particular, the central was seen as important for creating an organic link between the coastal and western regions and for gradually propagating coastal development inland. Within the central region, the land along the banks of the Yangtze River was expected to play a vital role as a belt joining the other two regions, and its development was promoted accordingly. The Eighth Five-Year Plan (1991~1995, the "8-5 Plan"), which followed on from the 7-5 Plan, also proposed directing the progress of development in ways which harmonized the coast and the interior. The 8-5 Plan added transport to the list of priority development sectors, alongside agriculture, energy and communications. Construction in the roads sector was to target trunk roads at the provincial level and roads at the district level, in addition to national routes and other trunk routes, expressways and automobile-only roads. Specifically, the priority roads for construction were:

(i) Those linking coastal cities with large cities in the hinterlands.



- (ii) Those linking ports to cities.
- (iii) Those linking provinces.
- (iv) Those linking industrial cities with economic cities.

The 8-5 Plan included the construction of approximately 90,000km of roads and the improvement of approximately 50,000km (comprising 10,000km of expressways and 42,000km of automobile-only) roads.

From the completion of the Wuhan Yangtze River Bridge in 1957 to the start of this project, the Yangtze was bridged in five more places, Nanjing, Zhicheng, Chongqing, Luzhou and Jiujiang, for a total of six bridges. This project bridged the Yangtze at four more places, Tongling, Huangshi, Wuhan (No.2) and Chongqing (No.2). All of these bridges were designated as key projects under the 8-5 Plan.

(2) Objectives

The purpose of Hefei-Tongling River Highway Bridge was to construct a road and bridge to link Hefei, the provincial capital, with Tongling, a mining city to the south, in order to promote the development of mining in Tongling and, by extension, contribute to the development of Anhui province as a whole.

The purpose of Huangshi River Bridge was to link Huangshi with the opposite bank of the river. There was no previous bridge in the city, and the ferry link was unable to cope with increasing demand for traffic across the river. The bridge was constructed to improve the situation, and to promote development on the Yishui district side of the river.

The purpose of Second Wuhan Yangtze River Bridge was to alleviate construction in the city caused by cross-river vehicular traffic exceeding the capacity of the First Wuhan Yangtze River Bridge, to make economic activity more efficient and to accommodate future increases in cross-river traffic demand.

The purpose of Second Chongqing Yangtze River Bridge was to create closer linkages within the city's traffic system, which is segmented by the Yangtze and Jialing Rivers, and to encourage economic development and traffic improvement in the southwest of the city. The construction of the bridge, which completed a ring road around the city, was also intended to reduce traffic pressure on the city center. By enhancing links with major national-level trunk roads, such as road No. 210, 212 and 319, the project was expected to contribute to economic progress in the area around Chongqing, and also, by extension, in southern China as a whole.

(3) Project Scope

Hefei - Tongling Highway and Tongling Yangtze River Highway Bridge Construction Project consisted of two projects, the construction of a new 123km-long grade two road between Hefei and Tongling and the construction of a PC cable-stayed bridge across the Yangtze (main bridge length 1,152m) to link the road with Tongling. The construction of a north-south trunk road within the province was to provide a base for the economic development of Anhui province by encouraging Tongling's mining industry.

Huangshi Yangtze River Bridge Construction Project was to build a PC rigid frame bridge (main bridge length 1,060m) over Yangtze, which flows through the city, between the West Bank (the Huangshi side) and the East Bank (the Yishui side). The project was intended to meet increased demand for crossings to the Yishui side and help to stimulate economic activity and development along the opposite bank.

Second Wuhan Yangtze River Bridge Project built Second Yangtze River Bridge (PC cable-stayed bridge, main bridge length 1,877m) in Wuhan, which is divided into the Hankou and Wuchang districts by the Yangtze River. It was intended to alleviate traffic congestion in the city and make economic development more efficient.

Second Chongqing Yangtze River Bridge Project built Second Yangtze River Bridge (PC cable-stayed bridge, main length 888m) in Chongqing, which is divided by two large rivers, the Yangtze and Jialing. The project was intended to create closer traffic links within the city, to promote economic development and a better traffic situation in the southwest of the city, and to reduce traffic pressure in the city center.

The content of the projects consisted of bridge and road construction, land acquisition and technical assistance. The technical assistance only concerned the cable-stayed bridges. The ODA loan covered the entire foreign currency portion of the cost of buying materials (cement, timber, asphalt and steel etc.), construction machinery and technical assistance necessary for the construction of the roads and bridges listed above. The procurement of materials and equipment covered by foreign currency portion was arranged by international competitive tender through the Chinese Mechanical Equipment Import Export Corporation (a procurement agency).

(4) Borrower/Executing Agency

Ministry of Foreign Trade and Economic Cooperation, People's Republic of China/

Ministry of Communications (Hefei-Tongling Highway and Tongling Yangtze River Highway Bridge, Huangshi Yangtze River Bridge)

Ministry of Construction (Second Wuhan Yangtze River Bridge, Second Chongqing Yangtze River Bridge)

(5) Outline of Loan Agreement

	Hefei-Tongling Highway and Tongling Yangtze River Highway Bridge	Huangshi Yangtze River Bridge	Second Wuhan Yangtze River Bridge	Second Chongqing Yangtze River Bridge
Loan Amount	¥8,603 million	¥3,700 million	¥4,760 million	¥4,764 million
Loan Disbursed Amount	¥8,505 million	¥3,674 million	¥4,757 million	¥4,660 million
Loan Conditions				
Interest Rate	2.6%	2.5%	2.5%	2.6%
Repayment Period (Grace Period)	30 years (10 years)	30 years (10 years)	30 years (10 years)	30 years (10 years)
Final Disbursement Date	November 1997	December 1995	May 1995	November 1996

2 Analysis and Evaluation

(1) Project Scope

Within Hefei Tongling Yangtze River Highway Bridge Construction Project, the route of the road portion was partially revised at the construction stage, shortening it to 123km from the planned 136km. The river bridge portion of the project was carried out as planned, with no alterations.

Huangshi River Bridge was altered as follows. Due to geological conditions, the main bridge was moved 27m towards the North Bank, in the direction of the bridge's axis, but the structure of the bridge itself was unchanged. The approach road was altered from 5km of grade two road to 1.5km of grade one road, which was an appropriate alteration due to a change in the route to the connection point.

For Second Wuhan Yangtze River Bridge, the span sub-divisions and their lengths were altered on the approach bridge on the Wuchang side, and the interchange overpass was lengthened on the Hankou side. These were both appropriate alterations. The specification of the main bridge was not altered.

For Second Chongqing Yangtze River Bridge, the approach road on the Lijiatuo side was partially rerouted due to site conditions, increasing its length from the initial 4,130m to 4,411m. The specification of the main bridge was not altered.

Therefore the main bridge sections of the four bridges were built as planned, without alterations to their structures or specifications. Three of the bridges had alterations in the specification of the approach roads and approach bridges, but all the changes were minor and appropriate to the content of the project. All projects achieved their objectives.

(2) Implementation Schedule

Work on Hefei Tongling Yangtze River Highway Bridge began and was completed as scheduled. The road was completed in December 1994 and the river bridge in December 1995.

The start of construction work on the Huangshi River Bridge was delayed for six months due to loan procedures after Tiananmen Incident and other factors, including design changes. Flooding after the completion of the bridge construction caused a further delay of seven months, meaning the project was completed 13 months later than planned, in December 1995.

The start of work on Second Wuhan Yangtze River Bridge was delayed for 13 months for similar reasons to Huangshi River Bridge, but measures taken to accelerate the construction works were successful, and the bridge was finished only six months late in May 1995.

Work on Second Chongqing Bridge began as planned, but the lack of budgetary allocation to cover the local currency cost overrun slowed its progress and it was not completed until December 1996, a year late.

Of the three bridges which were completed late, in Huangshi, Wuhan and Chongqing, Chongqing Bridge was set back by budget allocation delays and the others were due to acts of God and other unavoidable circumstances beyond the responsibility of the executing agencies. In general, major projects in China are named in honor of events such as the foundation of the Republic, and there is a strong desire to finish on time. The construction of Wuhan Bridge was an example of this approach, as the delay in beginning construction was covered by efforts to accelerate progress. Completion was delayed, but the delay was kept to a minimum, and it is reasonable to say that performance in connection with implementation schedules was good.

(3) Project Cost

The ratios of planned to actual project costs in the foreign currency portions were 97.2% for Hefei-Tongling Highway, 99.5% for Tongling River Bridge, 99.3% for Huangshi River Bridge, 99.9% for Second Wuhan River Bridge and 97.8% for Second Chongqing River Bridge. Thus the foreign currency portions were largely as anticipated.

The local currency portions all overran by large margins. The overruns, relative to the planned costs, were 32% for Hefei-

Tongling Highway, 60% for Tongling River Bridge, 310% for Huangshi River Bridge, 310% for Second Wuhan River Bridge and 60% for Second Chongqing River Bridge. The planned values for the projects were based on 1992 prices for Hefei Tongling Yangtze River Highway Bridge, 1989 prices for Huangshi and Wuhan Bridges and 1990 prices for Chongqing Bridge. The main reason for the cost overruns was price rises triggered by the introduction of market economic. At the time of appraisal, a local currency inflation rate of 12% per year was anticipated, but the prices of major construction-related items leapt up by 2~3 times over the four years between 1990 and 1993.

(4) Project Implementation Scheme

Executing agency for Hefei Tongling Yangtze River Highway Bridge and Huangshi River Bridge was the Ministry of Communications. It is a central ministry which carries out policy determination and plan formulation tasks, such as overall planning, plan coordination and selection of projects for application of loan funds. Its remit covers roads and other areas of transport infrastructure. The implementation, operation and maintenance of individual projects are delegated to the provincial level (Department of Communications) and municipalities from the feasibility study stage.

Ministry of Construction was the executing agency for Second Wuhan River Bridge and Second Chongqing River Bridge. Ministry of Construction is another central ministry which carries out policy determination and plan formulation tasks, such as overall planning, plan coordination and selection of projects for application of loan funds. Its remit covers water supply, gas, roads and other infrastructure in 600 cities throughout China. The implementation, operation and maintenance of individual projects are delegated to the provincial level (Construction Committee) and city governments from the feasibility study stage.

All four bridges constructed under this project were built by approved contractors (those with superior qualifications) chosen for each part of the project by competitive tender. The best applicants were selected and the construction works were monitored appropriately by a third-party organization. Thus we can judge that there were no problems with the implementation scheme.

(5) Operations and Maintenance

Systems for direct management by the provinces or cities concerned were set up for Hefei Tongling Yangtze River Highway Bridge and Huangshi River Bridge, which were Ministry of Communications projects. For Second Wuhan River Bridge and Second Chongqing River Bridge, which were Ministry of Construction projects, limited-liability corporations were set up under the jurisdictions of the cities to handle operations and maintenance (O&M). Both organizational systems were meant to operate on the basis of independent profitability.

Past policy on the setting of tolls by public-interest corporations in China emphasized the public interest, with profitability viewed as an irrelevance. With the shift to market economics, the central government's policy has changed and the idea of placing the burden on the beneficiaries has been taking root. The management offices for each river bridge are asked to operate them on the basis of independent profitability, but the toll settings are finally approved by Pricing Office and the People's Government after comparison of tolls with those of other transport agencies and other provinces. The table below shows average tolls per vehicle, as calculated from traffic volume and charge income for 1998.

Comparison of Crossing Toll per Vehicle						
						(Unit: Yuan/vehicle)
		Hefei-Tongling Highway and Tongling Yangtze River Highway Bridge	Tongling River Bridge	Huangshi Yangtze River Bridge	Second Wuhan Yangtze River Bridge	Second Chongqing Yangtze River Bridge
Toll system	Small car	25 (Below 2.5t)	20 (1.5 ~ 4t)	20 (Below 2t)	2 ~ 10 (Below 2t)	3 ~ 10 (Below 5t)
	Medium car	50 (2.5 ~ 7t)	50 (2 ~ 10t)	40 ~ 50 (4 ~ 8t)	20 ~ 30 (2 ~ 8t)	15 (5 ~ 8t)
	Large car	75 (7t or more)	80 (8t or more)	60 (10t or more)	50 (8t or more)	20 (8t or more)
Average toll per vehicle (Actual results in 1998)		23.8	24.5	27.5	5.0	3.6

As the table below shows, the actual traffic volumes on each of the Ministry of Communications projects (Hefei - Tongling Highway, Tongling River Bridge and Huangshi River Bridge) were lower than those predicted at the time of appraisal. On Chongqing River Bridge, traffic volume reached 85% of the predicted volume. In Wuhan, the actual traffic exceeded the predicted volume. In general, traffic volume is thought to vary in line with the toll for crossing the bridge, but for Tongling and Huangshi bridges the level of crossing tolls does not seem to have much impact. In Tongling, the ferry crossing was closed, leaving the bridge as the only way of making the crossing, and meaning that there is little price elasticity. In Huangshi

the ferry fare is five Yuan per ton, and accordingly the average toll of six Yuan per ton for crossing the bridge does not seem particularly high in comparison. Therefore, the likely reasons for the gap between predicted and actual include the following:

- 1) Wuhan and Chongqing are large cities and they are growing extremely rapidly, but the pace of growth in regional cities such as Tongling and Huangshi is relatively slow.
- 2) After the bridges were opened, there was little change in the volumes of traffic using ferries in outlying areas, which indicates that the volume of traffic transferring from ferries in outlying areas was small.
- 3) The building of peripheral roads in Huangshi and Tongling is overdue.

After the bridges opened, the growth rates in traffic crossing Tongling and Huangshi bridges were large (around 20% and 40% per year, respectively) and there is potential for greater growth as progress is made in the development of peripheral roads.

Comparison of Traffic Volumes						(Unit: Vehicles/day)
	Hefei-Tongling Highway and Tongling Yangtze River Highway Bridge	Tongling River Bridge	Huangshi Yangtze River Bridge	Second Wuhan Yangtze River Bridge	Second Chongqing Yangtze River Bridge	
Predicted traffic volumes (at the time of appraisal)	6,677 ¹⁾	8,649 ²⁾	7,795 ³⁾	77,420	14,737	
Actual traffic volumes (1998)	2,249 ¹⁾	2,425 ²⁾	3,534 ³⁾	116,863 (47,151)	12,572	
Notes	Figures for the time of the appraisal, and the recorded figures, are averages over the three zones. 1) is estimated from traffic volumes in 1995 and 2000	2) is estimated from traffic volumes in 1995 and 2000	3) is estimated from traffic volumes in 1995 and 2000	Figures for the time of the appraisal, and the recorded figures, are for traffic crossing the Yangtze (including First Bridge). Figures in () are for the Second River Bridge		

(6) Environmental Impact

Traffic on Hefei - Tongling Highway and Tongling River Bridge is low and there are no problems with noise or atmospheric pollution. Huangshi River Bridge exceeds environmental standards for NO_x (nitrogen oxides) and TSP (Total Suspended Particulates), but only by a small margin in each case, and the situation does not appear to have worsened significantly, relative to other measurement stations. At monitoring stations near the heavily-trafficked Second Wuhan and Second Chongqing River Bridges, some measurement results for air pollution and noise pollution exceed environmental standards. In both cities the background environment is very bad, and the river bridges are not the sole causes. According to the bridge maintenance offices in the two cities, the construction of the bridges has actually improved overall air quality by alleviating traffic congestion in the city centers. At present, moves are under way to implement city-wide measures, such as the prohibition of leaded gasoline.

Continuing attention will have to be paid to the air pollution situation around Huangshi River Bridge, Second Wuhan River Bridge and Second Chongqing River Bridge.

3 Project Effects and Impacts

(1) Direct Impact

In terms of EIRR, the values recalculated on the basis of this survey were lower than those calculated for the appraisal for all the projects. The rate of EIRR shortfall relative to the appraisal value was relatively low in Ministry of Construction projects (Second Wuhan and Second Chongqing River Bridges) and much higher in the other three projects. The shortfall is closely related to the actual traffic volumes using the projects, compared to the volumes predicted for the appraisal. Ministry of Communications projects (Hefei - Tongling Highway, Tongling river Bridge and Huangshi River Bridge) have less than half the traffic predicted at the time of the appraisal, while the volumes of traffic on Ministry of Construction projects exceed the forecast or are only slightly below.

The local currency portion of the construction cost overran in every project, which also drove the EIRR values down. The

local currency portion overrun was particularly large on Second Wuhan River Bridge, but the overrun was offset by the traffic volume, which is 50% higher than forecast for the appraisal. Overall the EIRR for this project was only slightly less than expected.

For all projects other than Huangshi River Bridge, the values of FIRR recalculated for this project were lower than those calculated for the appraisal. The reasons include the following:

- (i) The increased local currency portion of construction.
- (ii) Changes in the exchange rates for the foreign currency portion of the construction cost.
- (iii) Increased operation and maintenance costs.

Furthermore, in the case of Tongling River Bridge, the actual traffic volume is only around 30% of that forecast for the appraisal, which is one factor behind the large drop in FIRR, even after future growth in traffic volume is included in the calculation. On Second Chongqing River Bridge, charges are only collected in one crossing direction. This arrangement reduces the average charge per vehicle and is one factor reducing FIRR.

Huangshi River Bridge has only half the traffic volume predicted for the appraisal, and the local currency portion of its construction cost tripled, but its FIRR was unchanged because the charge was set at 3.7 times more than was anticipated at the time of the appraisal.

Comparison of EIRR and FIRR

(Unit: %)

		Hefei-Tongling Highway and Tongling Yangtze River Highway Bridge	Tongling River Bridge	Huangshi Yangtze River Bridge	Second Wuhan Yangtze River Bridge	Second Chongqing Yangtze River Bridge
At the time of appraisal	EIRR	16.8	8.7	11.6	9.4	19.5
	FIRR	7.9	11.1	11.1	4.0	2.7
At the time of evaluation (recalculated value)	EIRR	6.4	3.7	5.6	8.0	16.6
	FIRR	2.3	0.8	11.1	3.6	0.4

(2) Ripple Effects

The ripple effects of transport infrastructure such as roads and bridges are manifested as increased private-sector building of facilities and increased freight movement due to improved transport conditions in the project area. They extend to the stimulation of production activity in the area. In this case we examined two ripple effects: "impact on transport condition in the surrounding area" and "regional development effects". These two effects are summarized below.

Summary of Ripple Effects

		Hefei-Tongling Highway and Tongling Yangtze River Highway Bridge	Huangshi Yangtze River Bridge	Second Wuhan Yangtze River Bridge	Second Chongqing Yangtze River Bridge
Impact on transport in the area	Alleviation of traffic congestion in the cities	- No particular changes in Hefei or Tongling.	- Cars waiting for ferries, which caused congestion in Huangshi city center, disappeared, solving the congestion problem.	- The opening of the Second River Bridge completed the city's ring road. - Cross-river traffic, which had been concentrated on one bridge, was split between two, making transport within the city smoother. - Growth in cross-river traffic is rapid and the area around the First River Bridge is still congested.	- The Second River Bridge takes a share of the through traffic which previously passed through the center and caused congestion. - Growth in cross-river traffic is rapid, and the areas around the First River Bridge and the city center are still congested.
	Impact on inter-regional transport	- The project contributed to smoother north-south travel in Anhui province.	- The project formed a part of China's East - West expressway. - Travel to Yishui district, on the opposite bank from Huangshi, was stimulated.	- Travel time for through traffic is reduced because it no longer has to pass through the busy streets around the First River Bridge.	- Travel time for through traffic is reduced because it no longer has to pass through the busy streets around the center of Chongqing.

Regional development impact	Industry location and expansion of business scale	<ul style="list-style-type: none"> - Businesses have been established along the Hefei - Tongling road, including plastics factories, pharmaceuticals factories and sawmills. - Existing industries along the route of the road have been encouraged to expand. 	<ul style="list-style-type: none"> - Cement factories using the bridge to ship their products have expanded their operations. - A Sino-Japanese joint venture textile factory has been established. It uses the bridge to ship its products to Shanghai. 	<ul style="list-style-type: none"> - A fresh fruit wholesale market has been established to take advantage of the improved accessibility afforded by the construction of the Second River Bridge. 	<ul style="list-style-type: none"> - Industries using local capital, such as factories for motor cycles, cement and ceramics have opened since the Second River Bridge opened.
	Establishment of economic development zones	<ul style="list-style-type: none"> - Eight economic development zones have been established along the road. - Plans are under way for an agricultural development zone on the south side of the bridge. 	<ul style="list-style-type: none"> - A new economic development zone with an area of 680,000km² has been established in Sanhua Zhen. 	-	<ul style="list-style-type: none"> - The new Huaxi economic and technical development zone has been established on the south side of the bridge.
	House construction	<ul style="list-style-type: none"> - Small-scale housing construction is going on along the road. 	<ul style="list-style-type: none"> - Houses are being built for people who work in the development zone in Yishang and for those who commute to Huangshi. 	<ul style="list-style-type: none"> - Construction of housing estates is proceeding rapidly in the Heinihu and Shahu residential zones and elsewhere on both banks. 	<ul style="list-style-type: none"> - Residential zones have been set at one point on the south bank and four points at the north bank. Rapid residential construction can be anticipated.
	Impact on the regional economy	<ul style="list-style-type: none"> - The project has had a favorable economic effect on the cities of Hefei and Tongling at the ends of the road, and development is proceeding in regions along the road. 	<ul style="list-style-type: none"> - The project contributes to the economic development of Huangshi. - The development of Yishang district, where the new economic development zone has been established, is not making much progress. 	<ul style="list-style-type: none"> - Development of the Second River Bridge, which was overdue. - Traffic and population were concentrated around the First River Bridge, but now they can be more dispersed, contributing to city development. 	<ul style="list-style-type: none"> - The project made a great contribution to development on both sides of the river, particularly in the Banan zone on the south bank.

4 Lessons Learned

Based on the evaluation findings, we can raise the following points which should be used as feedback for future operations.

(1) Local currency cost overrun

The final local currency cost of each of the four projects was far higher than the planned amount. The main reason for the cost overruns was that domestic prices rose more than expected due to the introduction of market economics. In a transition economy such as China's, it should be remembered that the introduction of market economics can cause domestic price increases which lead to major local currency cost overruns.

In the case of Second Chongqing River Bridge, the budgetary allocations to cover the extra costs were delayed, which caused further delays in the construction. Attention must be paid to the local currency budget allocation situation during implementation.

(2) The importance of preparation for weak ground and groundwater countermeasures in cuttings

The construction of Hefei - Tongling Highway did not include adequate preparation of weak ground or countermeasures against groundwater in cuttings. Even though the project area is damp, with high rainfall, which makes the road surface vulnerable to damage, not enough attention was given to drainage facilities. Therefore the road has already suffered surface cracking and subsidence in many areas only four years after completion, necessitating repair works. This problem may be related to change of the road route and the fixed-price order placed for the road. It is important to enhance checking performance by consultants during construction by putting more specialist staff on site for longer.

If road construction projects require treatment for weak ground and countermeasures against groundwater in cuttings, experts in those fields should be placed on site, and special attention should be paid to the design conditions employed at the design stage, and to supervision at the construction stage to avoid problems of the kind seen in this project. The executing agency

should be advised to take such steps.

(3) Close examination of traffic predictions

Both Hefei - Tongling Highway and Tongling Yangtze River Bridge have actual traffic volumes considerably lower than those predicted at the time of the appraisal. At the planning stage there were many unknown variables, such as improvements to nearby road networks and traffic transfer from ferries, which made it difficult to produce a more precise prediction, but as traffic volume is an important factor which affects EIRR and FIRR, it would be desirable to give more careful consideration to demand prediction.

(4) Confirmation of toll collection methods

At the time of appraisal for Second Wuhan River Bridge, the predicted traffic volume (return crossings) was multiplied by the crossing toll per vehicle to calculate future revenue from crossing tolls. However, in practice tolls are only collected for one crossing direction. This arrangement does not pose an obstacle to loan repayment, bridge repair or other needs, and the bridge is delivering its effects as a bridge construction project, but the matter of toll collection should have been checked more carefully, as far as possible, at the appraisal stage.

(5) Confirmation of the role of second river bridges

At the time of appraisal for Second Chongqing River Bridge, the necessity of the second bridge was argued based on the projection that the demand for traffic across the Yangtze would exceed the capacity of the First River Bridge and the ferry. However, most of the traffic on the First River Bridge was for journeys within the city, while the Second River Bridge was mainly used for intercity traffic. Thus the natures of the two bridges were very different. From the point of view of the Second River Bridge, there is a problem with handling cross-river traffic as a single homogenous volume. It should have been considered in more detail to confirm the role of the second bridge.



A General View of Tongling Yangtze River Bridge



A General View of Huangshi Yangtze River Bridge



A General View of Second Wuhan Yangtze River Bridge



A General View of Second Chongqing Yangtze River Bridge