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Report No: 23517

IMPLEMENTATION COMPLETION REPORT
(CPL-39290)

ON A

LOAN

IN THE AMOUNT OF US\$260.0 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR

SHANGHAI-ZHEJIANG HIGHWAY PROJECT

March 21, 2002

**Transport Sector Unit
East Asia and Pacific Region**

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CURRENCY EQUIVALENTS

(Exchange Rate Effective December 31, 2001)

Currency Unit = Yuan (Y)
Y1.00 = US\$ 0.12032
US\$ 1.00 = Y 8.2768

FISCAL YEAR

January 1 - December 31

ABBREVIATIONS AND ACRONYMS

DF	-	Diversion Factor
E&M	-	Electrical & Mechanical
EA	-	Environmental Assessment
EAP	-	Environmental Action Plan
EIRR	-	Economic Internal Rate of Return
FIRR	-	Financial Internal Rate of Return
GOC	-	Government of China
ICB	-	International Competitive Bidding
MOC	-	Ministry of Communications
NCB	-	National Competitive Bidding
NPV	-	Net Present Value
NR	-	National Route
NTHS	-	National Trunk Highway System
PCU	-	Passenger Car Unit
RAP	-	Resettlement Action Plan
RSP	-	Road Safety Program
SHE	-	Shanghai-Hangzhou Expressway
SPC	-	State Planning Commission
VOC	-	Vehicle Operating Costs
YEZTS	-	Yangtze Economic Zone Transport Study
ZPG	-	Zhejiang Provincial Government
ZPTD	-	Zhejiang Provincial Transport Department

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CHINA SHANGHAI-ZHEJIANG HIGHWAY PROJECT

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<i>Project ID:</i> P003569	<i>Project Name:</i> SHANGHAI-ZHEJIANG HI
<i>Team Leader:</i> Yasuhiro Kawabata	<i>TL Unit:</i> EASTR
<i>ICR Type:</i> Core ICR	<i>Report Date:</i> March 21, 2002

1. Project Data

Name: SHANGHAI-ZHEJIANG HI *L/C/TF Number:* CPL-39290
Country/Department: CHINA *Region:* East Asia and Pacific Region
Sector/subsector: TH - Highways

KEY DATES

	<i>Original</i>	<i>Revised/Actual</i>
<i>PCD:</i> 02/09/93	<i>Effective:</i> 01/30/96	01/30/96
<i>Appraisal:</i> 10/22/93	<i>MTR:</i>	
<i>Approval:</i> 08/01/95	<i>Closing:</i> 06/30/2001	12/31/2001

Borrower/Implementing Agency: PEOPLE'S REPUBLIC OF CHINA/SHANGHAI MUNICIPALITY and ZHEJIANG PROVINCE

Other Partners:

STAFF	Current	At Appraisal
<i>Vice President:</i>	Jemal-ud-din Kassum	Russell J. Cheetam
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2. Principal Performance Ratings

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HL=Highly Likely, L=Likely, UN=Unlikely, HUN=Highly Unlikely, HU=Highly Unsatisfactory, H=High, SU=Substantial, M=Modest, N=Negligible)

Outcome: S

Sustainability: L

Institutional Development Impact: SU

Bank Performance: S

Borrower Performance: S

	QAG (if available)	ICR
<i>Quality at Entry:</i>		S
<i>Project at Risk at Any Time:</i>	No	

3. Assessment of Development Objective and Design, and of Quality at Entry

3.1 Original Objective:

Context. The objectives and design of the Shanghai-Zhejiang Highway project need to be assessed in the context of China's long-term commitment to: (i) develop the National Trunk Highway System (NTHS) and (ii)

reform its economy and transport sector. The main component of the Government strategy for the transport sector remains the development of the NTHS, comprising some 35,000 km of interprovincial highways for the exclusive use of motor vehicles. The need for high-speed highway links in the Shanghai-Hangzhou corridor was identified in the *Yangtze Economic Zone Transport Study (YEZTS, April 1992)*. The study recommended priority areas for transport investment, including a network of expressways linking the key regional cities of Shanghai, Nanjing, Hangzhou and Ningbo. The Shanghai-Hangzhou Expressway, a 130-km access-controlled four-lane divided highway financed under the project, forms an important segment of the coastal route of China's NTHS. It also links the most economically developed areas of Zhejiang Province with major regional ports and the commercial and communications center of Shanghai.

Objectives. The objectives of the project were: (i) to increase highway capacity in the Shanghai-Hangzhou corridor in order to relieve existing congestion and promote economic development; (ii) to improve road safety in northern Zhejiang, and (iii) to develop the highway sector institutional capability in Shanghai and Zhejiang.

The objectives of the project were clear and were accorded a very high priority by the Government as part of its long-term development target. The project objectives were also in line with the Bank's Strategy for Highway Lending, detailed in *Highway Development and Management: Issues, Options and Strategies* (No. 11819-CHA, February 1994). The Bank strategy supports continued institutional development and sectoral reforms aimed at modernizing the highway system and its management, as well as investment for high-priority links of the NTHS and the provincial road network that feeds into it.

The safety program was designed as a pilot for road safety-conscious engineering design and strengthening of road safety practices. At the time of the project launch, China's fatality accident rate was one of the highest in the world, with 43 deaths per 10,000 vehicles, which was about 20 times higher than those in USA, UK and Canada. The project also addressed institutional issues, including staff training and strengthening of institutional capacity through the provision of equipment.

3.2 Revised Objective:

Project objectives remained the same throughout project implementation. However, operations of the Zhejiang section of the Shanghai-Hangzhou Expressway (SHE) were handed over to Zhejiang Expressway Company Ltd, a shareholding state-owned enterprise established principally to engage in investing in, constructing and managing high-grade highways and other traffic infrastructure projects in Zhejiang Province. The securitization of the Zhejiang section of the SHE assets, together with those of the Hangzhou-Ningbo Expressway (which is approximately 145 km long), and the listing of the company on the Hong Kong H-share equity market were supported by the Bank in line with the Board of Directors guidance of December 1997 titled, "Securitization and other Capital Mobilization Transactions using Bank-IDA Financed Assets." The agreement was entered on March 27, 1997. Given the limited resources for financing the transport sector and the enormous demand for new transport infrastructure, the market financing of the high-volume expressway was a positive development. The approach has helped the Government to raise large sums of new capital from foreign investors, particularly in the Hong Kong, Shenzhen and Shanghai stock markets.

3.3 Original Components:

The following four components comprised the project:

- (a) Construction of the SHE (**US\$386.0 million**). The largest component of the project was the construction of a 130-km divided four-lane access-controlled highway. This component included the construction of service facilities, the supply and installation of the electrical, electronic and mechanical (E&M) equipment for tolling, traffic monitoring, telecommunications and lighting, and the upgrading and construction of 56 km of linking roads at interchanges in Zhejiang Province to improve access to the new expressway.

- (b) Construction Supervision of the SHE (**US\$10.9 million**).
- (c) Road Safety Program (**US\$17.2 million**). The road safety program was to be a pilot program in northern Zhejiang to improve safety on highways in the Shanghai-Hangzhou corridor after the opening of the new expressway. This program included: (i) upgrading of 86 km of the National Route (NR) 320 road sections and structures in Jiaxing Municipality, including construction supervision; and (ii) technical assistance, training, and equipment to support the institutional aspects of the Road Safety Program; and
- (d) Institutional strengthening of the highway agencies in Shanghai and Zhejiang (US\$13.3 million), comprising, (i) a staff training program, and (ii) strengthening of technical capacity through the addition of equipment.

The original IBRD loan to the People's Republic of China was for a total of US\$260.0 million, and the loan beneficiaries were Shanghai Municipality and Zhejiang Province.

3.4 Revised Components:

The part of the road safety program component of the project was revised. The first phase of the road safety program (segregation of motor vehicle traffic from bicycles and agricultural tractors) was declared misprocured, and a total of US\$7.75 million was canceled from the loan on July 12, 1996.

3.5 Quality at Entry:

Project quality at entry is rated overall as satisfactory. The assessment was based on: (i) the consistency of project objectives with the priorities of China for the sector; (ii) attention given during project preparation to lessons of experience, including the past performance of the implementing agencies, particularly the weak performance of Zhejiang Province in the implementation of ongoing Bank-financed projects, and to the sequencing of institutional reforms; (iii) the importance given to Bank policies, particularly those related to environmental, resettlement and road safety aspects; and (iv) technology transfer and quality assurance. It should be noted that even though the main project component was construction of a toll expressway, the financial analysis was not undertaken at appraisal.

4. Achievement of Objective and Outputs

4.1 Outcome/achievement of objective:

Despite some shortcomings during implementation (such as misprocurement of the road safety program), the Shanghai-Zhejiang Highway project objectives have been substantially met and achievement of the project objectives is assessed as satisfactory.

A. Congestion relieved and economic development promoted

The completion of the SHE in 1998, the main component of the project, has increased the corridor's highway capacity. The increased capacity has had a significant, positive impact on economic growth in the Yangtze Economic Zone. The gross domestic product increased by about 10 percent per annum between 1998 and 2000. The additional road capacity was able to accommodate growing traffic, substantially reducing congestion in the corridor. For example, a year after the opening of the expressway to traffic, travel speed on NR 320 has increased from 36.8 km per hour to 46.8 km per hour. Traffic on the roads parallel to the SHE dropped from 9,690 vehicles per day (1998) to 6,787 vehicles per day (1999). The diversion factor has increased from 35.0–61.0 percent in 1999 to 39.0–69.0 percent in 2000 (depending on the road section), which is slightly higher than the forecast for 2000 (35–60 percent). Traffic on the SHE grew between 19.0 percent and 22.0 percent in 1999–2000, depending on the road section. Traffic is projected to grow significantly over the next 20 years—between 6.4 percent and 7.0 percent, depending on the road section—but less than the estimate made at appraisal (10.9–11.1 percent).

B. Improved road safety in northern Zhejiang

Originally, key infrastructure improvements in two phases were included in the Road Safety Program: Phase I, the segregation of motor vehicle traffic from bicycles and agricultural tractors, and Phase II, the improvement of road junctions to ensure that minor road traffic can turn safely into and out of the main road. Phase I works were canceled from the project, but the physical works were completed with local funds following the misprocurement. Thus, the main purpose of physically segregating motor vehicle traffic from bicycles and agricultural tractors was achieved. Phase II works were financed with a reduced number of intersections (27 intersections compared to a planned 37). As a result of the Road Safety Program, for example, on NR320, traffic accidents involving fatalities declined from 2.4 to 2.2 per 10,000 vehicles in 1999. The successful completion of the road safety program has significantly improved road safety in the Shanghai-Hangzhou corridor.

C. Highway sector institutional capability developed

Capacity of highway sector institutions in Shanghai and Zhejiang has improved. Through overseas training, study tours and participation as a counterpart in the project implementation, the project staff has had satisfactory exposure to new concepts and forms of incentives needed in adopting new practices and technology. The technology transfer integrates the acquisition of modern equipment and operation helped to improve project staff skills in modern methods of highway construction and management.

4.2 Outputs by components:

A. Construction of Shanghai-Hangzhou Expressway (US\$386 million, SAR; US\$457.0 million, ICR)

Overall, this component is rated as satisfactory. The SHE was successfully completed and opened to traffic as planned in December 1998. Field inspection at completion showed that the quality of the expressway construction is above average—better than any other expressway in China. The Shanghai section of the SHE was rated among the ten best projects by the Shanghai Municipal Government in 1998. Finishing details, including landscaping and environmental improvement along the route, received adequate attention.

Although the SHE component was financed by the Bank as one project, the implementation experience in Shanghai and Zhejiang varies as discussed below.

Zhejiang Section

The Expressway and Interchanges. (US\$240.0 million, SAR; US\$281.3 million, ICR). The civil works for the Zhejiang section (102.66 km) was subdivided into two sections, Pengbu–Wengmei and Wengmei–Fengjing, and implemented through 10 contracts. The Pengbu–Wengmei section and the access road at the Wengmei interchange were opened to traffic on December 28, 1995. The Wengmei–Fengjing section was opened to traffic in December 1998, including its eight access roads. A management office and six tolling and service facilities were completed in April 1999.

Supply and Installation of Electrical and Mechanical Facilities. (US\$13.6 million, SAR; US\$7.8 million, ICR). The contract for these works was signed in January 2001. Installation of E&M facilities is expected to be completed by April 2002. The completion of supply and installation of E & M facilities was delayed due to the changes in the design concept of the expressway network operations in Zhejiang following the transfer of the expressway to the new expressway company.

Shanghai Section

The Expressway and Interchanges. (US\$129.0 million, SAR; US\$160.3 million, ICR). The civil works for the Shanghai section (27.6 km) commenced on January 20, 1996, and it opened to traffic in December 1998. Two interchanges (Shibudang and Xinbang) were added during implementation to provide access to the newly improved major connecting roads.

Supply and Installation of the Mechanical and Electrical Facilities. (US\$3.3 million, SAR; US\$7.6 million, ICR). In the Shanghai section, the supply and installation of the electrical and mechanical facilities were completed at the same time as the civil works. Changes in the supply and installation of E&M facilities were made to accommodate added interchanges at Xinbang and Shibudang. There were a few variations in the pipeline and manhole works for power and telecommunications.

B. Construction Supervision of SHE (US\$10.86 million, SAR; US\$10.0 million, ICR)

Supervision of the expressway construction was satisfactory. It was carried out by a joint supervision team of Shanghai Municipality and Zhejiang Province and international consulting engineers. The joint supervision team approach, with international consulting engineering firms playing catalytic role, proved to be effective in improving quality. This arrangement helped the local counterparts appreciate the importance of quality control and assurance. Overall performance of the supervisory team was satisfactory, as evidenced by the number of improvements made through the initiation of variation orders in improving quality of infrastructure.

C. Road Safety Program (Civil works US\$16.3 million, SAR; US\$5.3 million, ICR)

There were originally two civil works components: (i) segregation of the main carriageway from the parallel service roads and (ii) improvements of intersections. Despite the misprocurement of the civil works, this component was completed as planned (see paragraph 5.3). Although the quality of works of Phase I was not up to the Bank standards, the objective of improving safety was achieved. Under Phase II, the number of intersections improved was reduced. Intersections in townships were improved by each township. In general, the original objective was achieved, given that accident rate was reduced with improved travel speeds. The accident rate (in number of accidents with fatalities per 10,000 vehicles) was reduced from 3.28 in 1995 to 1.15 in 2000.

D. Institutional Strengthening of Highway Agencies in Shanghai and Zhejiang (US\$14.2 million, SAR and US\$11.1 million, ICR)

This component contributed to the strengthening of highway agencies by (i) supporting institutional staff training, and (ii) financing purchase of equipment for supporting transfer knowledge and for central laboratories, environmental management, research, and expressway operation and maintenance.

Staff training (US\$2.6 million, SAR; US\$2.6 million, ICR)

The training program proved very effective in transferring technology and management know-how, and gave staff exposure to new concepts and modern construction procedures. Forty-five overseas study tours and training groups (236.3 person-months) were organized by Shanghai, Zhejiang Province and the Ministry of Communications (MOC). The training covered a wide range of subjects related to high-grade highways operations, management and safety. Shanghai Municipality's training program was executed according to schedule. In Zhejiang Province, training program experienced some delay.

Strengthening of Technical Capacity through the Addition of Equipment (US\$11.6 million, SAR; US\$8.5 million, ICR)

In Zhejiang, the procurement of equipment was satisfactorily executed. Delivery was made in three batches starting in February 2000. Due to procurement delays, the equipment list agreed to at appraisal was revised, after the Bank was consulted, to reflect the changed needs. There was no adverse impact of the delay on the operation of the SHE. In Shanghai, equipment for the central laboratory and research facility and pavement management was procured in early stages of the project. There were three packages for the procurement of highway operation equipment. The first package of equipment to be used for maintenance and operation of the expressway was procured and delivered by August 1999. The second package was procured by April 2001. The third package was signed in March 2001 and was delivered by November 2001, before the loan closing date. All the equipment purchased under the project have been fully utilized.

E. Safeguard Policy

Environmental Protection. During construction, mitigating measures were implemented for air pollution, noise, soil erosion and water quality, and soil pollution from lead emitted by motor vehicles. Measures also were taken to minimize social disruption during the haulage of construction materials, the disruption of communications and possible accidents. A survey undertaken in March 2000 (during the operation stage), confirmed that: (i) the noise levels in the residential areas were lower than the required standards both in daytime and at night; and (ii) the air quality had not worsened and met the required standards; and (iii) the expressway did not cause any significant negative impact on water quality in rivers along the expressway.

Land Acquisition and Resettlement. The land acquisition and resettlement activities were executed satisfactorily. The project underwent extensive preparation and all actions were implemented basically according to the resettlement action plan (RAP). Houses and enterprises were relocated as close as possible to their initial locations, the housing quality and size were maintained or improved, farmland was replaced through the readjustment within villages, and jobs in nearby enterprises were provided when farmland could not be replaced.

Some of the RAPs were executed before the Board presentation in anticipation of early project effectiveness (Pengbu-Wengmei section). The resettlement activities were evaluated by independent monitoring institutions: the Shanghai Academy of Social Sciences for the Shanghai section and the Municipal Plan and Design Institute of Hangzhou University for the Zhejiang section.

In the Shanghai section, a total of 2,406 people were affected: 1,593 people were assigned new jobs while 813 people were of retirement age. One hundred thirty-six households (509 persons) were displaced and were compensated with a total of Y144.5 million. Thirteen enterprises also were removed, affecting 884 people. The compensation for moving equipment, county/township property, and households, rebuilding, and providing allowances to enterprises for work stoppage totaled Y34.0 million. A total of 2,870.68 mu of land was acquired, about the same as estimated at appraisal.

In the Zhejiang section, a total of 6,559 people were resettled, about 134 more than planned. A total of 11,565.7 mu was acquired, compared to the appraisal estimate of 11,107.9 mu. A baseline of income levels and socioeconomic conditions was established during the project preparation. Overall, the RAPs were considered to be implemented satisfactorily. Independent monitoring of the project-affected persons indicates some improvement in their living standards.

4.3 Net Present Value/Economic rate of return:

Shanghai-Zhejiang Expressway

The Economic Internal Rate of Return (EIRR) of the SHE is estimated to be 22.7 percent, compared to the SAR estimate of 32.8 percent. The Net Present Value (NPV), at a discount rate of 12 percent (in constant December 2001 prices), is estimated to be Y5.0 billion, compared to the SAR estimate of Y16.2 billion. The EIRR and NPV are much lower than those estimated at appraisal, mainly because traffic on one of the three sections of the expressway is much lighter than estimated, whereas total project costs had increased. The detailed analysis is presented in Part I of Annex 3.

Road Safety Program

The EIRR for the Road Safety Program is estimated at 58.5 % versus the SAR estimate of 54.4%, and the NPV, at a discount rate of 12% (constant December 2001 prices), is estimated to be Y0.26 billion versus the SAR estimate of Y1.15 billion. The main reason for the higher EIRR is the reduced costs following the redesign of the component. The detailed analysis is in Part II of Annex 3.

EIRR and NPV for the total Project (SHE and Road Safety Program)

The EIRR for the total project is estimated to be 22.9 percent and the NPV is estimated at Y5.17 billion, compared with the 33.4 percent and Y15.91 billion, respectively, estimated in the SAR. The detailed analysis is in Part III of Annex 3.

4.4 Financial rate of return:

The results of the financial evaluation show that the Financial Internal Rate of Return (FIRR) for the SHE, which constitutes 99 percent of total project investment, is expected to be 5.5 percent. The NPV, at a discount rate of 4.9 percent (the weighted average financial cost of capital), would be Y284.6 million. The detailed analysis is in Part IV of Annex 3. No financial evaluation for the expressway component was undertaken during project preparation.

The entire SHE was open to traffic in December 1998. In March 1997, Zhejiang Provincial Government established Zhejiang Expressway Company Ltd to be responsible for the day-to-day management, operation and development of other highways. The company immediately took over the responsibility for operating the Zhejiang section of SHE. Zhejiang Expressway Company bears the financial obligations for its own operation and for repaying loans. Its main income source is the toll revenue from the users of the expressway, but the toll rate is controlled by the Zhejiang Provincial Government. Toll levels were set to take into consideration the traffic projections—a 15 percent increase every five years, or an average increase of 2.8 percent per year.

4.5 Institutional development impact:

Overall the institutional development impact was positive. Significant knowledge and technology transfer took place during project implementation. Significant numbers of staff have been trained through foreign and domestic studies and tours. Local experts, jointly with foreign experts, supervised the construction of the expressway. This implementation arrangement helped to raise the quality of the civil works and enabled the transfer of know-how. Experience with competitive bidding was enhanced through the use of contracting firms.

In the financial area, the securitization of project assets has led to the exploration of private alternatives for financing high-grade highways. The securitization experience would provide useful data in assessing the efficacy of private financing infrastructure development in the future.

5. Major Factors Affecting Implementation and Outcome

5.1 Factors outside the control of government or implementing agency:

Adverse climate conditions. A 50-year storm affected the region in 1996. As a result, the contractors for the Shanghai section claimed Y9.11 million (US\$1.1 million).

5.2 Factors generally subject to government control:

The shortening of the work day. A new labor law required the working days per week to be reduced from 6 days to 5 days. The contractors claimed about Y28.82 million (US\$3.5 million) in additional costs.

5.3 Factors generally subject to implementing agency control:

Misprocurement of the first phase of the Road Safety Program in Zhejiang Province. The Bank cancelled US\$7.75 million on July 12, 1996 and declared a misprocurement after its review of the Road Safety Program. The review found that: (i) the final design of the works was inadequate because designs were incomplete; (ii) completed works revealed design, construction, supervision and development problems; and (iii) the documentation and procedures revealed flaws in the overall sequencing of events.

Delays in procurement. Because of delays in equipment procurement, the equipment list that was prepared during project appraisal was revised to reflect current needs. To compensate for delays, the closing date was extended by six months from June 30, 2001, to December 31, 2001.

5.4 Costs and financing:

At appraisal, the total project cost was estimated at US\$729.16 million, of which US\$260 million equivalent was from the Bank loan. The total actual cost of the project is estimated at US\$614.02 million. The civil works for the SHE, including installation and E&M, were estimated to cost US\$385.98 million at appraisal, whereas the estimated actual cost is US\$456.99 million—an increase of about 18 percent. The cancellation of US\$7.75 million of the loan because of the misprocurement of the first phase of the Road Safety Program in Zhejiang Province contributed to the lowering of the total cost. Due to the timely implementation of the civil works and the rationalization in procuring equipment and training activities, the anticipated price contingency resource (US\$175 million estimated at appraisal) was not utilized.

6. Sustainability

6.1 Rationale for sustainability rating:

It is likely that the benefits generated and those expected to be generated are sustainable over the life of the project. Several factors contribute to the sustainability of the project benefits. All levels of government are committed to the development of the Yangtze Economic Zone, and the sustainability of the SHE is key to this development. The quality of the civil works of the SHE is satisfactory. The economic rate of return is high, *although not as high as anticipated at appraisal because the initial traffic-diversion rate is lower than expected.* The toll, although regulated, is set at a level adequate to generate revenue to cover total operating expenses, including depreciation and financial obligations. With a positive financial rate of return and a strong cash flow, not only the maintenance and operations expenses, but also the repayment of the loan are covered.

The Zhejiang section of the expressway was securitized by the granting of a concession to Zhejiang Expressway Company. The existence of the company is expected to ensure that the toll rates for the expressway are adjusted in a timely manner. Furthermore, the institutional capabilities in Shanghai and Zhejiang have improved through various training programs, including overseas training and study tours. The trained staff is well aware of the importance of maintenance. The implementing agencies also have acquired adequate equipment to plan and manage the maintenance of the corridor. The reconstruction of the intersections and the segregation of fast and slow modes in traffic (motor vehicles from bicycle and agricultural traffic) under the Road Safety Program have been completed successfully, and overall road safety along the corridor has improved. With reduced risks of accidents economic benefits will further increase in using the expressway than the existing highway, NR320.

6.2 Transition arrangement to regular operations:

The SHE has been open to traffic since December 1998. Shanghai and Zhejiang governments have set up companies in their respective jurisdictions to operate the expressway. These companies are responsible for the day-to-day operation, maintenance, and development of the highways, including the repayment of the loans. As noted above, resources—revenue, trained staff and equipment—are adequate to provide smooth operation and maintenance. The Zhejiang Expressway Company manages and operates the Zhejiang section of the SHE (approximately 102.6 km) and the Hangzhou-Ningbo expressway (145.0 km). The main performance measurement of the project benefits would be the projected income statements of the companies operating SHE, taking into consideration traffic volume, operating revenue and the return on shareholders' equity.

The securitization of the Zhejiang section indicates the potential for private financing. However, under the current market conditions and legal framework, private sector financing faces problems such as non-tariff barriers, rigid toll-rate control, and competition from parallel roads (toll free) and railways (low tariff), among other things, all of which affect the profitability of such operations.

7. Bank and Borrower Performance

Bank

7.1 Lending:

The identification phase of the project was satisfactory. As noted earlier, the project was a top Government priority in the transport sector. At the time of project identification, the Shanghai-Hangzhou corridor was experiencing rapid economic growth, and traffic was growing at 20 percent per year. Timely completion of the project was an immediate concern of the central government and the two provinces.

Bank assistance in project preparation was satisfactory. The Bank assigned a highly qualified team to the project with an appropriate skill mix of experts in civil works, environment, resettlement, road safety, procurement, institutional development, training, and other specializations (see Annex 4). The preparation of the project served to transfer technical knowledge to the Chinese counterparts. Bank staff, by raising the bar for excellence, motivated Chinese staff and they responded extremely well.

Appraisal was satisfactory. The assessment of the Government's commitment to the project and of the implementing agencies' capacity in the SAR and during negotiations was on the mark. The economic viability of the project expressway was high. The main risks were correctly identified, stemming from the implementation of the Road Safety Program, Bank safeguard policies, and measures to ensure adequate supervision resources. Because of the weak implementation experience of Zhejiang Province identified under the previous Bank-financed projects with respect to the quality of civil works, international experience was extensively introduced by foreign consultants.

7.2 Supervision:

Bank supervision performance during implementation was satisfactory. Supervision was carried out as planned with high-level staff and an adequate skill mix (Annex 4). For most of the project implementation period, the continuity of staff was maintained. Bank supervision staff was flexible with respect to design changes to accommodate needed interchanges identified after project preparation. Many variation orders were allowed to improve the quality of the infrastructure services.

The Bank raised concern over the nine contracts of the Road Safety Program which were issued and construction had advanced before Bank supervision staff was informed. After a thorough post-review, the first phase of the Road Safety Program was declared misprocured, and a total of US\$7.75 million was cancelled from the loan. This setback occurred in spite of forewarning. However, the original objective to segregate motor vehicle traffic from bicycles and agricultural tractors were achieved, and safety on the existing roads was enhanced.

7.3 Overall Bank performance:

Overall Bank performance was satisfactory. Supervision team paid adequate attention to the compliance of Bank policies on resettlement and environment. The project was considered to be one of the ten best projects in Shanghai City. This recognition was largely due to the high quality of staff, skill mix, continuity of staff, and the partnership that the Bank team established with its Chinese counterpart. The flexibility of Bank supervision staff helped to enrich the quality of the project by allowing variations as needed.

Borrower

7.4 Preparation:

Borrower preparation was satisfactory. Both the central government and the implementing agencies were highly committed to the project from the start. Despite complexity of the project, their commitment was evidenced in their well-documented preparation work. The project staff reflected past experience in the design to meet changing needs and technological progress. Key contributory factors to the success of the project were the sound strategy behind the national trunk highway system, including the phasing of its development, and the associated development framework.

7.5 Government implementation performance:

The central government was very supportive of the project throughout its implementation. MOC helped implement capacity building measures by coordinating training activities, particularly overseas studies and tours. It also paired local staff and foreign experts to optimize the transfer of knowledge. MOC oversaw the coordination of interprovincial activities, resulting in the coordinated operation of the expressway upon its completion. The proactive role played by the Chinese project staff added significant value to the quality and timeliness of the civil works of the expressway and the orderly execution of resettlement measures.

7.6 Implementing Agency:

Overall, the performance of the implementing agencies was satisfactory, and the performance of Shanghai Municipality was highly satisfactory. The handling of the Road Safety Program by Zhejiang province was an unfortunate incident. Their desire to complete ahead of schedule led to the sacrifice of quality and incurred additional costs in correcting the design errors.

7.7 Overall Borrower performance:

Overall, the borrower performance is rated as satisfactory. Both beneficiaries and the central government have shown commitment and have followed through with the successful implementation and operation of the project. One shortcoming was the misprocurement of the road safety component. Throughout the implementation phase, they have been proactive and flexible. They have adapted to the challenges presented during the design and implementation phases. The concession of the Zhejiang section of the expressway to Zhejiang Expressway Company is yet another indication of a strong desire to experiment and to ensure the financial viability and sustainability of the project.

8. Lessons Learned

- (a) **Dynamic and Proactive Implementation Partnership.** The successful outcome of the project can be attributed to the stable partnership in the transport sector between Bank staff and the Borrower. The project team—the Chinese, Bank staff and other experts—were well committed and proactive in dealing with all implementation issues.
- (b) **Misprocurement.** Bank procurement policy is an important instrument of quality assurance and good governance. The Bank uses its procurement procedures and its supervision as vehicles for ensuring the highest possible quality of construction, thereby reducing maintenance costs. The Bank was forced to declare a misprocurement for the first phase of the Road Safety Program and cancel that part of the loan. The ensuing dialogue between the Bank and its development partners demonstrated the Bank's concerns about quality, and these concerns appear to have been well received.
- (c) **Traffic Diversion.** The growth of the traffic diversion rate has been slower than anticipated at appraisal. This pattern has been observed in other Bank-financed expressways: Zhejiang Hangzhou-Ningbo Expressway and Anyang-Zhengzhou Expressway. Although traffic in this transportation corridor generally has grown as fast as forecasted or faster, the diversion of traffic from the existing roads to the new has lagged behind the forecast. In the past decade China's transport demand has been shaped more by market demand and less by government directive. Several factors are known to affect the diversion of traffic to the new road. The factors affecting traffic flow patterns must be determined by a thorough study of the experience of the completed expressways. The results of such a study would provide strong basis for predicting traffic diversion rates. Such a study would be critical to improve the assessments of the economic and financial viability of new projects at appraisal.

- (d) **Private Sector Participation.** Since Guangdong Province first used a Bank-financed expressway as part of the capital of an expressway company that issued shares on the Shenzhen stock market, several other provinces have followed suite. The establishment of the Zhejiang Expressway Co, Ltd. to mobilize private capital through asset securitization (i.e., the sale of highway equity through initial public offerings and private placement as a substitute for long-term debt financing) is an innovation in infrastructure financing. The Bank should explore such innovations further to reach its objective of greater private sector participation in infrastructure operations.

9. Partner Comments

(a) *Borrower/implementing agency:*

Zhejiang Province

A. General

1. This report summarizes the implementation experience of the Zhejiang section for the Shanghai-Hangzhou Expressway, the second highway project financed partly by an IBRD loan. All information provided in this report is based on the implementation of finished works covered in the SAR and Loan Agreement except Contract No. 11, E&M engineering works, which has not yet been completed.

B. Project Description

2. Project Objectives:
- (a) Build a high standard highway between Shanghai-Hangzhou to relieve the traffic congestion that was restraining economic growth in the Shanghai-Hangzhou corridor, and promote development in the corridor;
 - (b) Carry out a testing program in north Zhejiang province to enhance road safety; and
 - (c) Develop capabilities, skills and maintenance through training and provision of updated equipment.
3. The Project components of the Zhejiang section:
- (a) Construction of a 102.66-km, four-lane, divided access-controlled expressway, including service facilities and the supply and installation of electrical, electronic and mechanical (E&M) equipment for tolling, traffic monitoring, telecommunications and lighting;
 - (b) Improve and construct access roads of a 56-km section near interchanges to enhance the capabilities of entering and exiting the expressway;
 - (c) Construction supervision of Shanghai-Hangzhou Expressway;
 - (d) Road Safety Program;
 - (e) Staff training; and
 - (f) Equipment procurement.

C. Achievement of the Objectives

4. The project has attained all major objectives through successful implementation of the project components as follows:
 - (a) A full-graded highway of 102.66 km with four lanes, including toll station, service facilities, and supply and installation of E&M equipment.
 - (b) Improved and constructed 54 km of access-road interchanges, enhancing the capabilities of entering and exiting the expressway;
 - (c) Completed the construction supervision of Shanghai-Hangzhou Expressway;
 - (d) Completed Road Safety Program including improvement of 26 junctions and technical assistance;
 - (e) Completed staff training; and
 - (f) Completed equipment procurement.

D. Project Formulation and Preparation

5. In November 1992, the World Bank mission visited the Shanghai-Zhejiang corridor. A project identification was made based on discussions for seeking financing from the Bank for Shanghai-Hangzhou Highway Project.
6. In February 1993, the World Bank mission visited Zhejiang again for project preparation. Site visits were made for sections of Shanghai-Hangzhou Expressway, and its city entrance and exit information. The condition of road safety of the Shanghai-Hangzhou corridor in Jiaxing Municipality also was reviewed and investigated with bilateral discussions. A full copy of the engineering feasibility study for SHE was provided by Zhejiang.
7. The project proposal was approved by the State Planning Commission (SPC) in February 1993.
8. The engineering design and bidding documents were reviewed by the experts from the HASKONIN company, Netherlands, employed by the World Bank in June 1993.
9. The Bank pre-evaluation mission in July 1993 discussed the project formation, contract section, procurement, procurement program, supervision, staff training, equipment procurement, environmental protection, land acquisition and resettlement and the road safety program of the Shanghai-Zhejiang Highway Project. The document for contractor qualification was reviewed and it was agreed to carry out retrospective financing for advanced implementation of LCB for the Pengbu-Wenmei section of the project.
10. A formal appraisal was made by the World Bank mission in November 1993 for the Shanghai-Zhejiang Highway Project. Thorough discussions were made for specific design issues and an agreement was reached. Satisfaction was shown by the World Bank mission for the condition and comprehensiveness of design. The timetable for supplying and reviewing the qualification and bidding documents was discussed and agreed. Detailed discussion and confirmation regarding project implementation, construction supervision, cost estimation, equipment procurement, staff training, land acquisition and resettlement, environmental protection action plan, road safety program and construction schedule were made and agreed.
11. An additional appraisal mission was sent by the Bank to Zhejiang in May 1994. Components and ratios of foreign and local financing were discussed. It was decided that the loan for the Zhejiang part would be US\$200 million based on the proposal of project cost estimation and investment scale.
12. The Engineering feasibility study was approved by the SPC in February 1995.
13. The Preliminary design was approved by the MOC in March 1995.

14. Project negotiations were made in Washington between the World Bank and MOF of China, Shanghai Municipality and Zhejiang Province, with the decision on the loan for Zhejiang being US\$200 million (US\$190 million for Shanghai-Hangzhou Expressway and US\$10 million for Road Safety Program) in June 1995.

15. The loan agreement was signed in November 1995 and became effective January 31, 1996.

E. Project Implementation

16. The total length of the SHE Zhejiang section is 102.66 km. The section between Hangzhou and Yuhang (13.17 km) commenced in advance in 1994 and was completed and operated at the same time as the Hangzhou-Ningbo Expressway in December 1995 in order to relieve traffic congestion on both sides of the Qiantangjiang River. The remaining section commenced in September 1995 and became operational from December 12, 1998. There are 11 ICB contracts for expressway main route and traffic engineering for the project in accordance with the agreement with the World Bank, 4 access roads contracts and 7 building works contracts. All parts have been finished except Contract No. 11, which is under condition of installation and testing.

17. **Civil Works.** ICB was used for the implementation of Contract Nos. 6–10 for the main expressway route and Contract No. 11 for E&M. China Technical Import & Export Cooperation was authorized as the tendering agent. Bidding was processed in accordance with the procurement guidelines of the Bank, with bidding documents being reviewed and approved by the Bank. LCB was used for the remaining contracts. Optimized designing was carried out for the assurance of project quality with local conditions taken into consideration during project implementation. A number of feasible and practical means were taken to avoid bridge-approach bumping. A positive effect has been observed since operation.

18. **Supply and Installation of E&M (Contract No. 11).** The Spanish INDRA company was responsible for project implementation, and the installation of E&M has been completed. The lump sum amount for this part in Staff Appraisal Report was US\$20.2 million, and the actual amount was 2.3182 million Euro and ¥32.947 million respectively in a signed contract.

19. **Road Safety Program.** There were three work items in the program (civil works, technical assistance and equipment procurement).

- (a) Civil works: The civil works for phase 1 were cancelled, and work items in phase 2 of the civil works included the improvement of 37 major junctions. However, some junction improvement was no longer possible due to rapid road side development and fast urbanization in some townships, and 11 junctions were cancelled. All remaining 26 junctions were improved by September 1999.
- (b) The technical assistance items are as follows: developing the software package for accident processing and analysis, compilation for road safety manual and safety review manual; development of Zhejiang Provincial Geographic Information System (GIS) (additional item); local training and overseas study tours. The French BCEOM was selected for the technical consultancy based on an international shopping process. The road safety manual and safety review manual were completed in June 1999, and the final report of technical assistance was completed in January 2000. The GIS for Zhejiang Province has been completed.

20. **Consulting Services for Construction Supervision and Staff Training.** The American company Wilbur Smith Associates was responsible for the supervision consultancy for Contract Nos. 5–11. A two-layer supervision organization was set up for SHE supervision, namely a supervision department and site engineers. There were a chief engineer, engineer representatives and three deputy representatives (one sent by American WSA Company), and some other supervision engineers. Site engineers were responsible for site work groups, and they were all independent consultant companies selected based on LCB procedures. The sum for this part was US\$11.2 million in the SAR, including the Road Safety Program of US\$0.8 million. The phase 1 Road Safety Program civil works were canceled, and the corresponding supervision services were cancelled as well. The actual payment for civil works supervision was US\$5.33 million (including the fees for supervision training of US\$1.89 million). The total

payment for foreign supervision of Contract No. 11 was US\$0.39 million, and thus the grand total for supervision was US\$5.72 million.

21. Equipment Procurement

(a) Equipment procurement for Shanghai -Hangzhou Expressway

The list of equipment procurement changed slightly for the enhancement of Chinese national technical standards and equipment functions. Three packages of equipment were procured with the amount of US\$4.528 million: Package 1—8 sets of 5 kinds equipment for maintenance and operation; Package 2—16 sets of 9 kinds of equipment for maintenance and operation; Package 3—4 sets of 4 instruments through local shopping. All procurement has been completed. The allocated sum for this part in the SAR was US\$11.2 million. Actually US\$2.097 million and DM3.362 million were paid.

(b) Equipment procurement for Road Safety Program

Local shopping was used for the procurement of traffic-counting equipment and computer. It was completed and became operational in April 1997. The sum for this part in the SAR was US\$0.3 million, and US\$0.18 million was actually paid.

22. Staff Training

(a) Staff training for Shanghai-Hangzhou Expressway: the training program in accordance with the SAR included: overseas study tours (40 people/0.75 month) and overseas training (46 people/18 months), and the estimated cost was US\$980,200 or Y8,527,900. Domestic training involved 18 people/1.5 month with an estimated cost of US\$320,200 or Y2,785,900. All training and study tours have been completed. The total cost for domestic and overseas training and study tours was US\$982,000.

(b) The domestic part of the additional training of Road Safety Program was completed in December 1999, and the overseas training and investigation planned for 2000 was completed. The final cost was US\$299,000.

23. Environmental Protection and Monitoring. All works related to environmental protection were carried out strictly in accordance with the requirements specified in the Environmental Action Plan for the SHE (Zhejiang section) during the construction of the expressway. The executive committee invited contractors, supervision and operation authorities to the environmental protection training from the initial phase of construction. About 220 people were trained. Effective means were used. The environment was protected and improved during the construction stage such as sending staff for site supervision. The air, noise and water quality in two rivers has been monitored in two monitoring stations quarterly by the highway administration after operation. The requirement of environmental protection has been met.

24. Land Acquisition and Resettlement. Internal and external monitoring for land acquisition and resettlement was made in accordance with the World Bank requirement. The Municipal Plan and Design Institute of Hangzhou University was responsible for carrying out the external monitoring, and the internal monitoring was carried out by ZEPEC and Zhejiang Provincial Land Administration Bureau. All the expected objectives were met, illustrated by a fairly good implementation outcome. All the affected people were satisfied with the improved living standard. So the World Bank expert made positive comments towards the land acquisition and resettlement. The planned and actual land acquired was 11,107.9 mu and 11,565.7 mu respectively. The planned and actual resettled house areas were some 323,848 square meters and 328,658 square meters, respectively. The planned and actual compensation for resettlement was Y293.6 million and Y292.2 million, respectively. The planned and actual resettled numbers of labor was 6,425 and 6,559 respectively.

F. Operation

25. The operation of the expressway and the associated components are satisfactory with obvious social and economical benefits. The problem of traffic bottlenecks was basically solved after the completion of Contract Nos. 1–4 sections by the end of 1995. The condition of traffic congestion of the Hangzhou-Shanghai corridor has been greatly relieved after the completion of Contract Nos. 5–10 by the end of 1998. The number of traffic accidents has also decreased due to the reduction in traffic mileage and travel time. The 26 junctions along National Road 320 have been improved under the Road Safety Program. The traffic condition has greatly improved, with a decreased number of traffic accidents. The Zhejiang Expressway Limited Company is responsible for the operation and maintenance of the expressway. The operational revenues and expenses of the expressway from 1997 to 2000 are as follows:

1997: Operation revenue of Y83 million with operation expenses of Y23 million
1998: Operation revenue of Y117 million with operation expenses of Y25 million
1999: Operation revenue of Y428 million with operation expenses of Y114 million
2000: Operation revenue of Y522 million with operation expenses of Y107 million

26. The traffic volume of the SHE has increased dramatically since its opening. The traffic volume on the Pengbu–Yuhang section increased from 12,400 car-equivalents in 1996 to 49,900 car-equivalents in 2000, with an increasing rate of 60.1% annually. The traffic volume on the Yuhang–Fengjing section increased from 14,400 car-equivalents in 1998 to 21,900 car-equivalents in 1999, and to 27,000 car-equivalents in 2000, with an increasing rate of 29.2% annually.

G. Works by Contractors and Consultants

27. Constructors for the SHE were selected through competitive bidding, and the whole project was divided into 11 ICB contracts, 4 other access road contracts and 7 building works contracts. All works are civil works except No.11, an E&M contract. Main work quantities: Earth works of 9,795,700 cubic meters, 3 super-long bridges of a total of 1,799.4 m, 8 long bridges of a total of 1,435.3 m, 81 medium bridges of a total of 4,250.6 m, 28 small bridges of a total of 860.3m, 6 interchanges, 20 grade separations, and 544,200 square meters of asphalt pavement. There are six toll stations, one service area provided for the whole route (with plantation), separation fencing, guard rails, road making and traffic signs. The operation of SHE started in December 1998.

28. **Works of Consultant.** Training for construction supervision was carried out by three engineers of Wilbur Smith Associates in accordance with the service scope and responsibilities specified in the contract for "Supervision Consultant and Training Service." Their services were satisfactory.

29. **Works of Engineer.** The Sino-foreign joint supervision was implemented for the project under the leadership of a chief engineer. A two-level supervision setup was used as the organizational structure, namely the engineer's office and a local engineer's office. There were one engineer representative and three deputies (one foreign), with other specialized engineers in different technical fields (one foreign). LCB was used for selecting the local engineers as an independent agency. The project quality, working program and payment were controlled by the engineer in accordance with the provision of FIDIC, construction contracts and supervision procedures and methods. All works were asked to be redone without any payment if shown unqualified. The project quality and investment were effectively controlled.

30. **Working Experience.** All the experience obtained through the implementation of the SHE are as follows: (1) Setting up a strict supervision program is an effective method to reinforce the construction supervision in order to ensure the project quality, progress, investment, and satisfactory construction working capability. (2) Good progress with better quality standards can be achieved by helping the contractor improve its capability prior to any work item in accordance with contract provision and technical specifications. (3) The site administration should be reinforced, namely the site engineer on site should monitor the total process of construction. Inspection by the engineer can ensure better quality meeting the requirements. (4) It is an effective method that inspection is

done before any consequent work items are carried out. (5) The employer is an implementation organization center by coordinating relevant parties to control the quality, progress and investment. (6) Compliance with World Bank instructions and positive cooperation are key elements for smooth implementation.

H. Works Implementation.

31. **Project Preparation.** Sufficient preparation works were done by the Zhejiang Provincial Communications Department for the implementation of the SHE. The Project Proposal of Shanghai-Hangzhou Expressway Project was submitted to the SPC and MOC in November 1989 and August 1992 respectively, and approved by the SPC in February 1993. The Project Feasibility Study for Shanghai-Hangzhou Expressway was submitted to SPC and MOC in February 1993, and a feasibility study was approved by SPC in February 1995. Preliminary designs were approved by MOC in March 1995. The project identification, pre-appraisal, appraisal, and negotiations were smoothly done since November 1992. The loan agreement with the World Bank was signed in November 1995.

32. **Project Design.** The whole route was designed by the Zhejiang Provincial Design Institute of Communications. The traffic engineering component was designed by the Highway Scientific Research Institute of MOC.

33. **Environmental Impact Appraisal.** The environmental impact appraisal of the Zhejiang section of SHE was carried out by the Zhejiang Provincial Environmental Protection Science Research Institute. The environmental impact appraisal report of the project was completed in October 1992, and was reviewed by experts organized by MOC in October 1992. The letter No. 423 (1993) for approving the environmental impact appraisal report was issued by the National Environmental Protection Bureau in January 1993. An environmental protection implementation report was completed in November 2000 after the expressway completion. Supervision activities were organized by the National Environmental Protection Supervision Center for the project with a report completed. The final acceptance for environmental protection facilities of the project was made jointly by the National Environmental Protection Bureau and MOC in January 2001.

34. **Project Implementation.** The Zhejiang Provincial Expressway Executive Commission was primarily responsible for the project guidance, coordination, supervision and services according to requirements of Chinese central government and the World Bank. Local municipalities (county) were also involved in project construction in accordance with the decision made by the Zhejiang Provincial Government.

35. **Experience from Construction of the SHE.** The construction and project administration capacity of Zhejiang Province has been greatly advanced based on the successful implementation of the SHE. The World Bank loan will be paid back by toll fees from highway users. Experience in highway administration, maintenance and repair has also been accumulated. The teams for design, supervision and construction were trained and strengthened through the implementation of the project.

I. Work of World Bank

36. **Project Preparation.** The project identification mission of the World Bank visited Zhejiang Province in November 1992. The project scope was based on the close cooperation among World Bank mission, SPC, MOC, Shanghai Municipality and Zhejiang Province. Missions were sent by the World Bank for discussions on technical, organizational and economic issues since 1993 for project investigation and appraisal.

37. **Project Implementation.** Missions from the World Bank visited Zhejiang Province during project implementation with an interval of twice a year. A lot of practical and feasible comments were given by the Bank mission regarding the project quality, resettlement, environmental protection, financing, administration and organization structure. The World Bank helped a joint supervision team (Chinese and foreign engineers) carry out the supervision of civil works and E&M project properly so that the construction quality and the local staff capability improved.

38. **Cooperation Between the Implementation Agencies and the World Bank.** It was deemed that the fairly good cooperation existed between the World Bank and implementation agencies. The working staff of the World Bank fully understood the urgent requirements to develop the transport infrastructure and full support was given for Contract Nos. 1-4 of SHE and the Road Safety Program. Zhejiang Provincial Government and the Zhejiang Provincial Transport Department would like to convey their sincere appreciation for the cooperation and support of the World Bank.

39. **Experience.** The main achievements are the experience in highway construction in Zhejiang based on the implementation of competitive bidding procedures, provision of FIDIC and supervision systems, and involvement of working staff in training programs in the highway design, plan, construction and administration, financial administration, highway maintenance and traffic engineering. These helped their capability improve in their works.

J. Planning

40. The traffic congestion along the Shanghai-Hangzhou corridor has been basically relieved after the construction of SHE, but cannot fully meet the requirements of the dramatically developed local economy. The traffic volume on the SHE increased by 30% annually from 1998 to 2000. It is certainly true that more traffic will be generated with the completion and improvement of Zhejiang provincial highway network, and that the service level of the highway will decrease. The decision of speeding up the expansion of the existing Shanghai-Hangzhou-Ningbo expressway has been made by the government, and the expansion of the Hangzhou-Ningbo expressway has already started.

Shanghai Municipality

A. General

1. This report summarizes the implementation experience of the Shanghai section of the SHE, the first highway project partly financed by an IBRD Loan.

B. Project Description

2. Project Objectives:

- (a) Build a high-standard highway between Shanghai and Hangzhou to relieve the traffic congestion that was restraining economic growth in the Shanghai-Hangzhou corridor, and promote agricultural and industrial development in the corridor;
- (b) Develop institutional capabilities, skills and maintenance through training and provision of up-to-date equipment; and
- (c) Gain new experience in project management by adopting the World Bank Loan and carrying out bidding and contract management process, as well as through a supervision system for construction and design.

3. The project components of the Shanghai section:

- (a) Construction of a 27.6-km expressway, four lanes initially, and reserve another two lanes in the median for future expansion, with all embankment and bridges built as six lanes at once, including one highway/railway overpass; six extra-large and large bridges; 18 medium and small bridges; four interchanges; six grade separations; and afforestation.
- (b) Ancillary works cover five overpasses, one underpass and a pump station, four toll gates and one service area;

- (c) E&M engineering covers safety facilities, traffic surveillance system, telecommunications system, tolling system and power supplying and lighting system for the whole route;
- (d) Local and international consultant services for supervision work and training;
- (e) Staff training (local and overseas)
- (f) Environmental training and monitoring; and
- (g) Provision of equipment for road test, pavement management, road maintenance and highway operation.

C. Achievement of the Objectives

4. The project has attained all major objectives through successful implementation of the project components:

- (a) The 27.6-km Fengjiang-Songjiang Expressway, its ancillary works and E&M works were satisfactorily completed. After opening to public, both traffic and revenue increased. The actual traffic volume for the year 2000 was 18,800 PCU compared to SAR estimate of 25,800 PCU and the toll income was Y117.94 million compared to the SAR estimate of Y88.95 million for the year. Thus, the project has basically reached expected targets. In the course of implementation, it has introduced and adopted FIDIC, which was popular in the world, for future project management. This mode of management has been extended and adopted for other highway projects and reform in Shanghai. It established the groundwork for highway construction in Shanghai to be internationalized.
- (b) The international construction supervision services totaled 52.2 person-months and local supervision services totaled 1,944 person-months. By inviting a foreign consulting company to review preliminary designs and bidding documents, local designers' sight was widened, and the quality of specifications and drawings was improved, which met the international standards.
- (c) A total of 18 overseas study tours and training model totaling 80.1 person-months were implemented. Through overseas study/training, the local managerial and technical staff gained experience in expressway planning, design, construction, financing, financial auditing and maintenance management in foreign countries.
- (d) Environmental monitoring was undertaken eight times during the construction period and 11 times during the operation period. The local environmental check for completion of the project has been rated satisfactory by National General Environmental Bureau, Shanghai Municipal Environmental Bureau, Environmental Protection Office of Ministry of Communications and World Bank experts.
- (e) The purchase of 11 pieces of equipment for a central laboratory and three for a pavement management system by international shopping, and ICB for 17 pieces of equipment for maintenance and operation was successfully completed. Through the procurement of some maintenance equipment, the mechanized maintenance of expressways has been improved.

D. Project Formulation and Preparation

5. Project formulation and preparation was a genuine collaborative effort. Many state agencies participated in the formulation and preparation of the project since commencement in the mid-1980s.

6. A pre-feasibility study for the Shanghai-Hangzhou section was carried out by Shanghai Municipal Engineering Administration Bureau and Shanghai Planning Bureau as early as 1983. The connecting location between Shanghai section and Zhejiang section was coordinated at that time. The project was divided into two stages and the Xinzhuang-Songjiang section, totaling 20.5 km, was commenced in May 1985 and opened to the public on December 21, 1990.

7. In order to speed up the economical development of the Yangtze River Delta, the State Planning Commission organized comprehensive research on a development strategy for traffic and economy in the Yangtze River Delta Area. In April 1990, the Central Party and the State Council made a decision to develop Pudong. The Shanghai Municipal Government recognized that transport infrastructure is basic to develop Pudong and invigorate Shanghai, and that it was essential to construct the Songjiang-Hangzhou Expressway, totaling 131 km, to bring the new Xinzhuang-Songjiang Expressway into full play.

8. Between 1989 and 1993, Shanghai and Zhejiang carried out a feasibility study and evaluation work together for the Songjiang-Hangzhou Expressway. The alignment and connecting location at the boundary was decided at that time. On February 5, 1993, the SPC approved the project proposal and the Ministry of Finance listed the expressway project in the rolling plan to use the World Bank loan for 1993–1995 financial years. In April 1995, MOC approved the preliminary design for the expressway.

9. Starting with the Bank's identification mission in November 1993, the World Bank was involved in providing preparation assistance to the Government project team. In February/March 1993, the World Bank preparation mission reviewed the prepared Feasibility Study Report, Environmental Evaluation Report, City Entrance and Exit Information, and Regional Traffic and Economical Information. In July 1993, the Bank's pre-appraisal mission reviewed the Staff Training Plan, Equipment Procurement Plan, Land Acquisition and Resettlement Plan, Environmental Action Plan, Supervision and Training Plan, Contract Division for Civil Works and Qualification Evaluation Document.

10. The Bank appraisal mission, in November 1993, further discussed documents provided during the pre-appraisal mission. Also, specialists funded by the Dutch Consultant Trust Fund were invited to assist in the review of the design and bidding documents. Information on the design scale and engineering cost analysis and monitoring of the implementation of the Land Acquisition and Resettlement Plan were reviewed. In May 1994, a World Bank mission reviewed the information on project costs, construction supervision, land acquisition and resettlement, project implementation, staff training, equipment procurement and bidding documents. This mission also reviewed the Environmental Action Plan and Resettlement Action Plan carefully prior to project effectiveness.

11. Shanghai and Zhejiang worked together to select a consulting company for construction supervision. On the basis of ICB procedures, one consulting company out of the 17 that competed was selected.

12. In June 1995, the loan was negotiated in Washington. The Loan Agreement for the Shanghai-Zhejiang Highway Project for US\$260 million was signed. Also project agreements for the two sections with US\$60.0 million for Shanghai and US\$200 million for Zhejiang were signed.

E. Project Implementation

13. The loan became effective on January 31, 1996, and the project commenced on March 27, 1996. The experience gained during the implementation of the Shanghai section is summarized below by component.

14. **Expressway and Ancillary Works.** The construction of the 27.6-km expressway was implemented using three ICB civil works contracts: HH01 for construction of 8.379 km; HH02 for 8.746 km and HH03 for 10.45 km. Contracts were signed on November 2, 1995, and the project was completed on schedule and opened to traffic on December 12, 1998. During the construction, the employer paid much attention to important nodes and quality control. The employer, together with the designer and foreign and local engineers, supervised and urged the contractors to observe the embankment settlement speed periodically. New specifications issued by MOC were

adopted for the embankment quality control. Two targets (CBR for the upper road bed, and density for the embankment) were used to control quality. Eight major variation orders, such as for the treatment of saturated soil and the upper road bed, optimizing of road base material grading, and changing of advanced expansion joints were issued to ensure the engineering quality. Further, to reduce the hidden trouble of bumping at bridge approaches, design was optimized by adjusting the road net and water system. Eight small bridges and 38 culverts (across the road) were reduced. In addition, through variation orders, two interchanges were added, and eight ancillary works covering grade separations, bridges, service area and toll stations were combined into three civil works contracts.

15. **Equipment Procurement.** Based on the revised Equipment Procurement Plan, in 1995, the Executive Commission procured 11 pieces of equipment for a central laboratory and three for a pavement management system to serve for civil works and supervision works. Along with the adjustment of the general plan for the Shanghai Expressway Network, (650 km of expressways will be constructed by 2010), the Executive Commission requested to adjust and supplement highway operation equipment. In 1998, five pieces of equipment were procured under contract HH06, seven pieces of equipment under HH07, and five pieces of equipment under HH08 in 2000.

16. **Tolling System and the Power Supply System.** Unification of the tolling system and the power supply system of the new 27.6-km expressway with the Xingzhuang-Songjiang Expressway was successfully undertaken. A total of 27 variations took place. The main variations included: rebuilding a tolling and surveillance center; cable laying at main routes and interchanges; new building of four tolling subcenters and lanes at Dagang, Xinbang, Shihudang and Fengjing; and rebuilding three old tolling subcenters, tolling lanes and power supply equipment at Xingzhuang, Xinqiao and Songjiang.

17. The contract for E&M became effective on February 25, 1998. The tolling system passed the final check in December 1999, and was accepted in December 2000 after a one-year defect liability period. The other three systems passed the final check in March 1999 and were accepted in March 2000 after a one-year defect liability period. The equipment has operated well since the defect liability period.

18. **Consulting Services for Construction Supervision and Training.** The consultant was responsible for the construction supervision for civil works contracts and E&M contracts, and training work. A 52.2 person-month consultant service was provided, including four groups of overseas training for 20 trainee-months; foreign experts trained local engineers in China with 2.8 person-months. The World Bank also agreed to finance local consulting services for construction supervision. The contract price approved was ¥19.96 million, while the actual payment was ¥16.67 million (equivalent to US\$2.002 million). The payment was mainly for resident supervision services for three civil works contracts. The service duration was from January 1996 to January 1999, with a total of 1,944 person-months.

19. **Staff Training.** A total 18 overseas study tours and training models for 80.1 person-months were organized by Shanghai Municipality or MOC. The total cost was US\$664,256.23. The main training contents covered embankment and soft foundation treatment of high-class highways, design and construction management; expressway network plan; investment management mode; financial management; environmental management; safety management; operation and maintenance management, etc. The training enriched staff with modern management knowledge on design, construction, operation and maintenance for high-class highways.

20. **Environmental Training and Monitoring.** Environmental protection was considered important to expressways. Around 30 trainees from the employer, contractors, supervisors and operation management authorities received three weeks of training under the project. The employer entrusted Shanghai Research Institute for Environmental Protection to carry out environmental monitoring each quarter. A total of eight times during the construction period and 11 times during the operation period, monitoring was undertaken. The World Bank also sent a specialist to supervise the environmental conditions and monitoring report during the construction period.

21. The National General Environmental Bureau organized an acceptance check group combining staff from MOC, Shanghai Municipal Environmental Bureau, Shanghai Municipal Engineering Administration Bureau, Shanghai Environmental Monitoring Center, Shanghai Research Institute for Environmental Protection, and Shanghai Municipal Engineering Design Institute to examine on-site and review relevant documents on October 21, 2000. The results were considered satisfactory with relevant environmental standards and passed the check.

22. **Land Acquisition and Resettlement.** Land acquisition and resettlement was executed satisfactorily. In accordance with the Bank requirements, external monitoring activities were carried out by Shanghai Academy of Social Sciences. The Resettlement Action Plan (RAP) was implemented smoothly. The living conditions of the affected people was improved and income increased with the contribution they got under the project. Experts from the World Bank who inspected the site and monitored reports confirmed that implementation was satisfactory. For the SHE as a whole, a total of 2,743.19 mu were acquired for highway construction. Some 2,406 persons were directly affected, of whom 813 were old-age persons. The balance, 1,593 persons, were resettled with new jobs. The total compensation for land acquisition and labor resettlement was Y144.4774 million. An additional 136 affected households with 609 people were removed. The compensation was Y15.5026 million. Thirteen enterprises with a total of 884 affected persons were removed. The compensation for rebuilding and removal of equipment was Y15.5266 million. The compensation for removal of county/township collective property was Y7.6023 million. The household removal allowance, enterprise non-stop work allowance, and living allowance prior to labor resettlement were in total Y10.8459 million. The total actual payment for land acquisition and resettlement was Y316.17 million, a Y143.21 million increase from the estimated amount of Y172.96 million in April 1995.

F. Operation of the SHE, Shanghai Section

23. **Shanghai-Hangzhou Expressway Project.** The operation of the expressway is satisfactory. All 61 tolling lanes, tolling stations, tolling centers, monitoring centers are in good condition and safe transportation on the expressway is secured. The increase in traffic volume is obvious. Since opening to the public, the average traffic volume on the Songjiang-Fengjing Expressway, which had 10,806 vehicles per day on December 12, 1998, increased to the 15,800 PCU equivalent in 1999 and 18,800 PCU equivalent in 2000, indicating that the expressway is producing high social and economic benefit. Also, the revenue collected from tolls is more than expenditures in each of last two years. The revenue from the SHE, Shanghai section (48 km), was Y99.89 million in 1999, while the expenditures was Y86.07 million (including depreciation amounting to Y53.65 million). The revenue for 2000 was Y118.00 million, and the expenditures was Y98.23 million (including depreciation amounting to Y53.61 million).

24. **Traffic Surveillance, Telecommunications and Tolling System.** This contract covered the reconstruction of facilities for the Xinzhuang-Songjiang Expressway (equipment installation and debugging) as well. After one year of operation, it passed the completion inspection organized by Shanghai Municipal Highway Quality Supervision Station on December 29, 1999, and was delivered to Shanghai Hu-Hang Industrial Co. Ltd for operation management.

G. Works by Contractors and Consultants

25. **Civil Works.** The SSHE, Shanghai section was divided into three civil works contracts and procured through ICB procedures. The contractors followed the contracts, specifications and design/construction drawings. They self-inspected various parts and sections according to specifications and quality standards to ensure the engineering was of good quality. They also carried out additional works ordered by the employer/engineer. The final quantity of works were: 21.16 km of roads, 6.44 km of structures along the alignment (including highway/railway overpass: 1 set/1,570 m, extra bridge; 6 sets/3,000 m medium/small bridges; 18 sets/690 m interchanges; 4 sets/980 m; grade separation: 6 sets/200 m; 5 places of rural roads over-crossing the expressway, 1 separated tractor hole, 4 separated manholes, 7 box culverts (4 mx5 m), 6 pipe culverts of 1,400 mm diameter, 3 pipe culverts of 2,000 mm diameter, 803,200 m² of planting, 4 tolling stations, 1 service area and expressway facilities covering safety fences, barriers, traffic lines and markings.

26. **Electrical and Mechanical Facilities.** A total of 32 variation orders were approved. The system for the existing expressway and the new one had been debugged and operated together. After 1 year of trial operation, this system passed the completion inspection organized by the Shanghai Municipal Highway Quality Supervision Station on December 29, 1999, and was considered stable. Data accuracy satisfactorily met design requirements. It was put into operation together with the civil works.

27. Through the efforts of the employer, engineer and contractors, this project was completed on time and met the requirements of Shanghai municipal government. It was awarded as one of the top ten Municipal Engineering projects.

28. **Consultant Service.** The consulting firm fielded one civil works engineer (37.7 man/months) and one E&M engineer (10.67 man/months) worked together with local engineers and contractors. They inspected the site frequently to ensure quality and progress, reviewed payment invoices and variation orders, and prepared supervision monthly reports. The firm also conducted 2.8 man-months of local training and one man-month of overseas training.

29. **Works by Supervision Engineers.** Two levels of Sino-foreign supervision structures were adopted for the SHE Shanghai section. Under the leadership of the engineer (local), and deputy engineer (foreign), a project supervision department and site supervision groups for each contract were set up, with a total of 80 supervision engineers. All these supervision engineers carried out all-round management and control for quality, progress, measurement and payment based on FIDIC conditions, contracts and supervision outlines. They paid special attention to material test, embankment/pavement/bridge/culvert and E&M system. They issued rectification notices to disqualified engineering. The payment was made only after rectification works were made satisfactorily. Their management works for quality, investment and progress were valuable.

H. Works by Implementation Agency

30. **Project Preparation and Implementation Arrangement.** Shanghai Municipal Government set up an Expressway Construction Leading Group under the Vice Mayor to ensure that the project was completed smoothly. After approval by the municipal government, Shanghai-Hangzhou Expressway Engineering Construction Executive Commission was set up with staff from the Shanghai Highway Management Department, leaders of Shanghai Construction Commission, Municipal Engineering Bureau and Highway Management Department. The Commission established a Chief Engineer Office, Pre-period Department, Finance Department and Administration Office. The Commission was responsible for land acquisition and resettlement, bidding process, review of major variations and claims, payment based on measurement confirmed by the Supervision Department, reports to the World Bank and negotiation for major matters such as variations and loan allocations, supervision of works of contractors and supervision engineers, control of progress, and investment as well as quality. This arrangement helped the employer complete the project in good quality and open on time.

31. **Design.** The SHE Shanghai section was designed by Shanghai Municipal Engineering Design Institute. The E&M and building engineering were designed by Shanghai Tie Dao University Survey and Design Institute. During implementation of the engineering, design representatives were sent to the site to deal with drawing clarification and variations.

32. **Environmental Impact Assessment.** The EIS for the SHE Shanghai section was conducted by Shanghai Research Institute for Environmental Protection, according to national environmental evaluation regulations and environmental protection management methods that require environmental protection to be carried out during design, construction and operation periods. In April 1993, the Environment Impact Assessment Report was prepared, and the Environmental Action Plan was sent to the World Bank. In January 1994, the World Bank confirmed the EAP. The employer took environmental protection into consideration during the design stage, covering alignment, crossing passage, culverts, navigation, embankment slope, and the afforestation layout. The planting area was 803,200 m². The contractors were urged to protect the environment for the construction period, to borrow land for replanting and to carry out environmental monitoring during the construction period and

operation period. At present, the interchanges of SHE are managed and maintained by Shanghai-Hangzhou Expressway Industry Co., Ltd according to highway laws and expressway management laws. After the completion of the project, a national-class environmental facility check for design, construction and production was applied to National General Environmental Bureau.

I. Main Factors Affecting the Project

33. **Soil Condition and Higher Cost.** A soft foundation was one of the main problems affecting and restricting the construction of the engineering, especially in Contract HH03. The thickness of the soft soil layer was more than 30 m, and the settlement for this section was around 1.6 m. An intergradation pavement (8 cm of coarse bituminous concrete plus 4 cm of anti-skid layer) was approved by MOC. After 2 years of operation, maintenance is needed for the pavement.

34. The total embankment filling was 3.3 million cubic meters. Shanghai belongs to a plain area. The shortage of earth was restricting progress. After approval by the World Bank, the employer treated saturated soil, and thus the cost increased accordingly.

35. **Adverse Climate.** The rainfall in 1996 was much more than seen in meteorological history. The heavy rainfall and its long duration caused difficulties in embankment construction. The contractors devoted more labor, materials and machines on non-rainy days to ensure that important nodes were completed on time and that there was sufficient time reserved for resettlement. The claims for adverse climate applied for by contractors were approved by the employer.

36. **Trade-off Between Shortening Construction Period and Engineering Quality.** The construction period approved by MOC was 4 years, but it was decided to cut it down to 3 years. This caused conflicts between the construction period and engineering quality. After an earnest study, the employer arranged the schedule to ensure completion on time, and requested that the settlement rate of the embankment for 3 continuous months must be less than 8 mm before unloading and notching roadbed.

37. **Procurement.** According to the procurement guidelines of the World Bank, the lowest bidder won the bids. It was considered not as suitable as expected to the situation of China. Some contractors lowered prices in their bids to win projects but suffered from shortage of funds during construction.

38. The E&M contract was procured by ICB procedures. The winner was a joint venture. The actual construction period exceeded the contract period by 6 months due to the insufficient survey of existing equipment during the joint design stage, especially for the aged power pipeline in the old Xinsong station and inconsiderable reforming design of tolling system and prolonging of debug time.

J. Works by the World Bank

39. **Project Preparation.** As noted earlier, the Bank, from November 1992 to January 1995, fielded five missions to Songjiang-Fengjing-Hangzhou Expressway to assist in project identification, pre-appraisal and preparation of evaluation. In July 1995, the Staff Appraisal Report (Report No. 14034-CHA) was issued. This report analyzed background information provided by Shanghai and Zhejiang covering traffic transportation, development of industrial and agricultural economies, the existing highway road network and its plan, increase in traffic volume, vehicle quantity and recent highway development, and clarified reasons to distribute the loan to the project. The World Bank reviewed a Resettlement Action Plan and an Environmental Action Plan, preliminary designs and bidding documents, provided procurement guidelines and model bidding documents to the Borrower, reviewed the Qualification Evaluation Report and bidding documents, published civil works bidding advertisement, and reviewed and confirmed outlines and bidding documents for goods procurement, supervision consulting services, overseas training, environmental monitoring and training.

40. **Project Implementation.** After the loan agreement became effective, the World Bank sent two missions each year to the project to follow up the work of employer, Project Supervision Department and contractors, and to know engineering progress, quality, contract implementation, finances, auditing, environmental protection and resettlement, and was satisfied with the works.

41. **Cooperation of Implementation Agency with the World Bank.** The World Bank cooperated well with the implementation agency. The World Bank assisted and helped the employer to deal with variation orders and claims (including civil works and E&M works). The World Bank agreed to add two interchanges and eight ancillary works to the loan and add maintenance equipment, and confirmed a revised contract addendum and the final loan allocation. Under the concern and direction of World Bank officers and the Beijing Mission, the project was completed smoothly and satisfied the World Bank.

K. Planning

42. Under the leadership of Shanghai Municipal Government, a new wave of Shanghai General Urban Plan has been worked out. A fast, efficient, unobstructed highway transportation network framed by high-level highways and trunk highways, together with county/township roads will be constructed to connect Jiangsu and Zhejiang provinces and radiate to the whole Yangtze Delta. By the year 2010, the length of operated expressway in Shanghai will reach 650 km, among which 343 km of expressway will be newly built, while another 220 km will be reconstructed. After the expressway network is completed, a target of "153060" will be accomplished, i.e., 15 minutes of transportation is needed from any place in an important industrial area, important towns, vital communication hub, or main passenger (cargo) distribution center to the expressway network; 30 minutes of transportation is allowed between central cities and new towns (including county towns) or between central cities and municipal boundaries; 60 minutes of transportation is needed between any two points in the expressway road network.

43. SHE is a tourist highway in Shanghai. Trees will be planted in a 30-50 m strip along both sides of the expressway to improve the environment and to beautify the city according to relevant notices issued by the State Council.

44. By 2015, depending on the actual traffic volume, SHE will be expanded by 2 lanes on the reserved land.

(b) Cofinanciers:

No cofinancier.

(c) Other partners (NGOs/private sector):

N/A

10. Additional Information

Annex 1. Key Performance Indicators/Log Frame Matrix

Outcome / Impact Indicators:

Indicator/Matrix	Projected in last SAR Year 2000	Actual/Latest Estimate Year 2000
Increased Highway Capacity		
Reduced traffic congestion on roads parallel to the proposed road: traffic volume (PCU):		
Zhejiang Section	32,400	35,100
Shanghai Section	27,900	39,470
Expressway: traffic (PCU):		
Zhejiang Section	28,700	27,000
Shanghai Section	33,500	18,800
Increased average speed (km/hr) on:		
Zhejiang Section	60.0	66.8
Shanghai Section	46.8	47.0
Promote economic development in the S-Z corridor (GDP in Y billion):		
Zhejiang Section	604	604.0
Shanghai Section	444	455.1
Utilization of equipment for institutional strengthening (usage rate percent):		
Zhejiang Section	100%	100%
Shanghai Section	100%	90%
Reduced number of traffic accidents involving fatalities on NR 320 (number of accidents with fatalities per 10,000 vehicles):		
Zhejiang Section	1.16	1.15
Shanghai Section	1.90	1.80

Output Indicators:

Indicator/Matrix	Projected in last PSR Year 2000	Actual/Latest Estimate Year 2000
Civil works (SHE) completed:		
Zhejiang Section (102.66 km)	100%	100%
Shanghai Section (27.6 km)	100%	100%
Number of person-months of completed training:		
Zhejiang Section	156.2	156.2
Shanghai Section	76.6	80.1

Indicators of traffic volume are mentioned in the SAR. Other indicators were established during the project implementation.

Annex 2. Project Costs and Financing

Annex 2a. Project Cost by Component (in US\$ million equivalent)

Project Cost By Component	Appraisal Estimate US\$ million	Actual/Latest Estimate US\$ million	Percentage of Appraisal
A. Construction of Shanghai-Hangzhou Expressway:			
A.1. Shanghai-Hangzhou Expressway	369.09	441.61	119.65
A.2. E&M Supply and Installation	16.89	15.38	91.06
A.3. Road Safety Program	16.26	5.25	32.29
B. Equipment (operation & maintenance, laboratory, environment research)	11.55	8.52	73.77
C. Technical Assistance:			
C.1. Construction Supervision of SHE:			
Shanghai Section	4.00	4.28	107
Zhejiang Section	6.86	5.72	83.38
C.2. Institutional Development	1.94	1.88	96.91
C.3. Road Safety	0.69	0.76	110.14
Total Baseline Cost	427.28	483.30	
Physical Contingencies	41.33		0
Price Contingencies	175.36		0
Total Project Costs	643.97	483.30	
Land Acquisition/Resettlement and Tax	85.19	130.62	
Total Financing Required	729.16	614.02	

Exclude interests during construction.

Annex 2b-1 Project Costs by Procurement Arrangements (Appraisal Estimate) (US\$ million equivalent)

Expenditure Category	ICB	Procurement NCB	Method¹ Other²	N.B.F.	Total Cost
1. Works	483.40 (174.00)	96.70 (38.40)	0.00 (0.00)	25.40 (0.00)	605.50 (212.40)
2. E&M Supply and Installation	24.00 (17.10)	0.00 (0.00)	0.00 (0.00)	1.80 (0.00)	25.80 (17.10)
3. Goods	11.80 (8.50)	1.80 (1.30)	0.80 (0.50)	4.80 (0.00)	19.20 (10.30)
4. Consultant services: Construction supervision	0.00 (0.00)	0.00 (0.00)	17.10 (17.10)	0.00 (0.00)	17.10 (17.10)
5. TA & Training	0.00 (0.00)	0.00 (0.00)	3.00 (3.00)	0.00 (0.00)	3.00 (3.00)
6. Land acquisition & other expenses	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	58.60 (0.00)	58.60 (0.00)
Total	519.20 (199.60)	98.50 (39.70)	20.90 (20.60)	90.60 (0.00)	729.20 (259.90)

Annex 2b-2. Project Costs by Procurement Arrangements (Actual/Latest Estimate) (US\$ million equivalent)

Expenditure Category	ICB	Procurement NCB	Method¹ Other²	N.B.F.	Total Cost
1. Works	335.88 (135.11)	60.81 (25.73)	17.40 (6.09)	32.77 (0.00)	446.86 (166.93)
2. E&M Supply and Installation	12.68 (9.65)	0.00 (0.00)	0.96 (0.76)	1.74 (0.00)	15.38 (10.41)
3. Goods	7.09 (7.09)	1.23 (1.23)	0.20 (0.20)	0.00 (0.00)	8.52 (8.52)
4. Consultant services: Construction supervision	0.00 (0.00)	0.00 (0.00)	10.00 (9.62)	0.00 (0.00)	10.00 (9.62)
5. TA & Training	0.00 (0.00)	0.00 (0.00)	2.64 (1.88)	0.00 (0.00)	2.64 (1.88)
6. Land acquisition & other expenses	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	130.62 (0.00)	130.62 (0.00)
Total	355.65 (151.85)	62.04 (26.96)	31.20 (18.55)	165.13 (0.00)	614.02 (197.36)

^{1/} Figures in parenthesis are the amounts to be financed by the Bank Loan. All costs include contingencies.

^{2/} Includes civil works and goods to be procured through international and national shopping, and consulting services.

Annex 2c. Project Financing by Component (in US\$ million equivalent)

Component	Appraisal Estimate			Actual/Latest Estimate			Percentage of Appraisal		
	Bank	Govt.	CoF.	Bank	Govt.	CoF.	Bank	Govt.	CoF.
Civil Works (SHE)	203.60	376.00		165.00	276.50		81.0	73.5	
E&M Supply and Installation	17.10	8.70		10.40	4.97		60.8	57.1	
Road Safety Program	8.80	17.10		1.84	3.41		20.9	19.9	
Equipment	10.40	8.70		8.52	0.00		81.9	0.0	
Technical Assistance:	20.10	0.00		11.50	1.14		57.2	0.0	
- Project Implementation & Institutional Strengthening									
- Land acquisition & other expenses	0.00	58.60		0.00	130.62		0.0	222.9	
Total Cost including contingencies	260.00	469.10		197.36	416.66		75.9	88.8	

Annex 3. Economic Costs and Benefits

ECONOMIC AND FINANCIAL EVALUATIONS

Preface

1. The economic evaluation of the project covers the following two components:
 - (a) construction of the SHE, including the 27.6-km Songjiang–Fengjing Expressway (SFE) in Shanghai city and the 102.6-km Fengjing–Pengbu Expressway (FPE) in Hangzhou city, Zhejiang province; and
 - (b) the Road Safety Program, a pilot program in northern Zhejiang to improve safety on highways in the Shanghai–Hangzhou corridor after the opening of the new expressway.
2. The economic analysis is based on the re-evaluation of data on traffic, operational performance, and costs and benefits of project components. The methodology used was similar to that employed by the SAR and is summarized as follows:
 - (a) capital investment and maintenance costs were revised to reflect December 2001 prices and are included in the cost stream;
 - (b) the benefits stream, also reflected in December 2001 prices, were included and consist of savings in vehicle operating costs (VOC), ship operation costs, reduced traffic congestion on existing routes, and enhanced road safety; and
 - (c) a project life of 20 years has been assumed and the capital investment period for all components was from 1994 to 2000, depending on the construction phases.
3. During the project's implementation, approved by the Bank, some project components were modified. The economic analysis reflects the final implementation of the project.
4. This annex is comprised of four parts. **Part I** is the economic evaluations of SHE; **Part II** is the economic evaluations of the Road Safety Program; **Part III** is the overall economic evaluation of the project, including the probabilistic risk analysis; and **Part IV** is the financial evaluation of the project.

PART I: SHANGHAI-HANGZHOU EXPRESSWAY

5. As in the SAR, the highway was divided into three sections for economic evaluation.

		Length of the Old Road (km)	Length of the New Expressway (km)
FPE:	Section 1: Pengbu – Yuhang	31.0	14.5
	Section 2: Yuhang – Fengjiang	93.0	88.1
SFE:	Section 3: Fengjiang – Songjiang	41.0	27.6
	Total	165.0	130.2

Highway Corridor Traffic

6. The expressway was partially opened for trial operation in early 1998 and fully opened in December 1998. The highway corridor traffic for 1999 and its distribution between the existing and the new expressway are presented in the following table, indicating the SAR forecast and actual traffic census data:

NUMBER OF MOTORIZED VEHICLES PER DAY (1998-2000)

	Existing Road		Expressway		Total Traffic		Diversion Factor (DF) (4) = (2) / (3)
	Total AADT	PCU (1)	Total AADT	PCU (2)	Total AADT	PCU (3)	
1998 SAR							
Pengbu – Yuhang	--	37,110	--	--	-	37,110	--
ICR							
Pengbu – Yuhang	17,126	28,901	16,079	25,264	33,205	54,16546	.6%
Ratios (ICR/SAR)							
Pengbu – Yuhang	--	-22.1%	--	--	--	46.0%	--
1999 SAR							
Pengbu – Yuhang	--	38,959	--	28,957	-	67,916	42.6%
Yuhang – Fengjing--	--	31,240	--	27,672	-	58,912	47.0%
Fengjing – Songjiang	--	27,387	--	32,884	-	60,271	54.6%
ICR							
Pengbu – Yuhang	14,721	25,178	25,328	39,130	40,049	64,308	60.8%
Yuhang – Fengjing	22,936	40,496	14,176	21,504	37,112	62,000	34.7%
Fengjing – Songjiang	9,474	14,278	12,290	15,810	21,764	30,088	52.5%
Ratios (ICR/SAR)							
Pengbu – Yuhang	--	-35.4%	--	35.1%	--	-5.3%	--
Yuhang – Fengjing--	--	29.6%	--	-22.3%	--	5.2%	--
Fengjing – Songjiang	--	-47.9%	--	-51.9%	--	-50.1%	--
2000 SAR							
Pengbu – Yuhang	--	40,900	--	30,400-		71,3004	2.6%
Yuhang – Fengjing--	--	32,400	--	28,700-		61,10047	.0%
Fengjing – Songjiang	--	27,900	--	33,500-		61,40054	.6%
ICR							
Pengbu – Yuhang	13,609	21,675	30,560	48,016	44,169	69,691	68.9%
Yuhang – Fengjing	24,136	40,214	16,869	25,590	41,005	65,804	38.9%
Fengjing – Songjiang	9,041	15,123	15,055	18,832	24,096	33,955	55.5%
Ratios (ICR/SAR)							
Pengbu – Yuhang	--	-47.0%	--	57.9%	--	-2.3%	--
Yuhang – Fengjing	--	24.1%	--	-10.8%	--	7.7%	--
Fengjing – Songjiang	--	-45.8%	--	-43.8%	--	-44.7%	--

Sources: SAR and the Bank staff report.

7. As shown above, the 1999 total highway corridor traffic counts (i.e., the sum of traffic on the parallel sections of the existing road and the new expressway), except for the Fengjing–Songjiang section, were about equivalent to the SAR’s forecast, within plus or minus 5 percent. The traffic distribution of the corridor (i.e., between the existing road and the new highway), indicates that road users with longer trips chose to travel on the existing road the first full opening year. The traffic diversion factors (DF), however, show that diversion from the existing road to a new expressway took place more than anticipated in the SAR in urban areas.

8. In December 1995, the Pengbu–Yuhang section opened for a trial operation. The DF ratio for this section in 1998 was about 46.6 percent. In 1999, this increased to 60.8 percent. In 2000, the DF ratios for all three sections improved further to 68.9 percent, 38.9 percent and 55.5 percent, respectively. The trend of the DF ratio clearly reveals that more and more road users on this highway corridor choose the new expressway as traffic volume increases.

Traffic Projection

9. Normally, the buildup of traffic on a new expressway, particularly when it is operated as a toll facility, is gradual in the early years, and then the diversion of traffic accelerates. The traffic growth rate on the expressway in 1999-2000 was in the range of 19-22 percent. Despite the currently increasing DF ratio and fast traffic growth rate, the long-term traffic growth rate on the new expressway was estimated to be lower than the SAR’s forecast. The traffic projections by section are summarized as follows:

TRAFFIC FORECAST COMPARISON FOR THE NEW EXPRESSWAY BY SECTION

	Pengbu – Yuhang		Yuhang - Fengjing		Fengjing – Songjiang	
	Total AADT	PCU	Total AADT	PCU	Total AADT	PCU
SAR						
1999	--	28,957	--	27,672	--	32,884
2000	--	30,400	--	28,700	--	33,500
2005	--	52,190	--	49,304	--	49,304
2008	--	72,181	--	68,216	--	79,582
2018	--	212,743	--	201,319	--	234,707
Average growth p.a.						
1999-2018	--	11.1%	--	11.0%	--	10.9%
ICR						
1999	25,328	39,130	14,176	21,504	12,290	15,810
2000	30,560	48,016	16,869	25,590	15,055	18,832
2005	42,141	65,502	23,480	35,152	21,534	26,589
2008	51,149	78,973	28,662	42,564	26,715	32,736
2018	85,126	128,337	48,651	70,240	47,831	57,180
Average growth p.a.						
1999-2018	6.6%	6.5%	6.7%	6.4%	7.4%	7.0%

Sources: SAR and the Bank staff reports

10. From the actual traffic data in 1999-2000 the following growth rates were assumed for subsequent years:
- The normal traffic growth rates for the new expressway were assumed to be within a range of 5 to 8 percent between 2000-2008, depending on the type of vehicle and the section. Between 2008 and 2018, the growth rates were assumed to be in the range of 3.5 to 6.5 percent;
 - It was assumed that there would be no generated traffic.

Economic Costs

11. Financial construction costs were converted to economic costs by shadow pricing for each of the input items. Comparing the total economic cost of the expressway between SAR and ICR costs (at constant December 2001 prices), the ICR cost is 25.0 percent higher than the SAR cost. Of that, ICR costs of SFE and FPE are 40.1 percent and 17.1 percent higher than the SAR costs, respectively.

Expressway Economic Cost Comparison (million Yuan)					
		SAR		ICR	ICR/ SAR
		(Jan. 1995)	(Dec. 2001)	(Dec. 2001)	(in %)
Shanghai Section	(FSE)	1,436.00	1,438.55	2,014.18	40.0
Zhejiang Section	(PFE)	2,735.00	2,739.86	3,209.23	17.1
	Total	4,171.00	4,178.41	5,223.41	25.0

Source: SAR and the Bank staff reports

The 1995 prices have been up dated to 2001 prices by multiplying by a factor of 1.0018

Economic Benefits

12. Benefits used for the economic analysis include those derived from (a) VOC savings, (b) time savings through relieved congestion on the existing road, and (c) lower accident costs. The VOC savings include the net VOC savings of vehicles using the expressway. The time savings include the benefits resulting from the lower level of congestion on the existing road and the expressway, including the value of passenger time savings which was estimated at Y1.0 per passenger-hour, updating the value estimated in the report on Feasibility Study Methodology for the Highway in China (Rust PPK, Australia Feasibility Study Methodology Report, March 1996). The same source was used for vehicle accident rates on different classes of road.

Economic Vehicle Operating Cost
(Yuan per 1,000 veh.-km)

	Car	Medium bus	Large bus	Small Truck	Medium truck	Large truck	Trailer/ container
The Existing Road:							
Fuel	377	510	1,200	750	928	1,056	1,216
Tires	18	30	47	39	74	315	726
Maintenance	339	459	1,080	675	835	950	1,094
Crew	32	54	78	35	60	86	97
Depreciation	45	200	500	79	124	285	858
Subtotal	<u>811</u>	<u>1,253</u>	<u>2,905</u>	<u>1,478</u>	<u>2,021</u>	<u>2,692</u>	<u>3,991</u>
Time value of passengers	50	182	800				
Total	<u>861</u>	<u>1,435</u>	<u>3,705</u>	<u>1,478</u>	<u>2,021</u>	<u>2,692</u>	<u>3,991</u>
The New Expressway:							
Fuel	319	450	1,024	600	800	928	1,024
Tires	18	25	47	33	65	285	660
Maintenance	305	413	972	608	752	855	985
Crew	19	33	49	26	41	59	62
Depreciation	41	180	450	71	111	257	772
Subtotal	<u>702</u>	<u>1,101</u>	<u>2,542</u>	<u>1,338</u>	<u>1,769</u>	<u>2,384</u>	<u>3,503</u>
Time value of passengers	30	111	500				
Total	<u>732</u>	<u>1,212</u>	<u>3,042</u>	<u>1,338</u>	<u>1,769</u>	<u>2,384</u>	<u>3,503</u>

Sources: PCD and the Bank staff.

Economic Evaluation and Sensitivity Analysis

13. Economic Internal Rate of Return (EIRR) for the expressway was estimated at 22.7 percent, which is much lower than EIRR estimated in the SAR (32.5 percent). The lower EIRR is primarily due to (a) lower traffic (see paragraph 6), particularly for the Shanghai section, and (b) project cost overruns (see paragraph 11). The EIRR and the Net Present Value (NPV) for SHE are presented as follows:

EIRR (in %) and NPV (12%, million Yuan)		
	SAR	ICR
EIRR	32.8	22.7
NPV (12% million Yuan)	16,186	5,022

NPV has been updated to 2001 prices by multiplying by a factor of 1.0018.

14. The distribution of the estimated benefits indicates that: (a) the main beneficiary is the road user on this highway corridor; (b) the traffic that uses the expressway constitutes the majority of the road user's benefits (98.3 percent); and (c) trucks receive 52.1 percent of the project benefits and cars receive 31.2 percent. The breakdown of the benefits is summarized as follows:

Distribution of the Project Benefits (NPV, 12%, million RMB)					
	Road user		Road agency	Society	
Total benefits	8,683.0		(3,660.9)	5,022.1	
Of which: Road user:					
a. By traffic:					
<u>Expressway traffic</u>	<u>Generated traffic</u>	<u>Existing road traffic</u>	<u>Road safety</u>	<u>Total</u>	
8,531.5	0.0	113.3	38.2	8,683.0	
98.3%	0.0%	1.3%	0.4%	100.0%	
b. By vehicles:					
<u>Cars</u>	<u>Buses</u>	<u>Trucks</u>	<u>Trailers</u>	<u>Total</u>	
2,707.8	908.6	4,521.3	545.3	8,683.0	
31.2%	10.5%	52.1%	6.3%	100.0%	

15. Besides the normal traffic growth scenario, two other traffic growth scenarios were also considered: a lower traffic growth projection (25 percent lower than the normal traffic) and a higher traffic growth projection (25

percent higher than the normal traffic growth). The traffic growth and annual average growth rates under these two scenarios are as follows:

EXPRESSWAY TRAFFIC FORECAST SCENARIOS (AADT)		
	High Growth	Low Growth
2000	15,055 ~ 30,560	15,055 ~ 30,560
2008	30,961 ~ 59,342	22,987 ~ 43,960
2018	66,819 ~ 119,200	34,024 ~ 60,399
Average growth per year (2000-2018):	8.5% ~ 9.3%	4.7% ~ 5.5%

16. The overall EIRR for the two traffic-growth scenarios are summarized in the following table. It indicates that even with the lower traffic projection, the overall EIRR is estimated at 21.2 percent.

	EIRR
The high traffic growth scenario	24.4%
The low traffic growth scenario	21.2%

Sensitivity Analysis

17. EIRRs indicate that the effects of possible changes in assumptions in the evaluation could alter the yield on the investment. Because the operation and maintenance costs of SHE make up a relatively small investment cost, any variation in these costs would have a minimum discernible impact on the EIRR. The impact due to changes in traffic volumes was studied under traffic growth scenarios (discussed in paragraphs 15 and 16 of this annex). The results of the sensitivity test show that the reduction of total benefits by 15 percent has the greatest impact on the EIRR, and the reduction of road congestion has the least impact.

SENSITIVITY ANALYSIS		
	EIRR (in %)	NPV(12%, Y million)
VOC savings reduced by 15%	20.4	3,725.4
Passenger time savings reduced to zero	20.9	4,036.8
Congestion savings reduced to zero	22.4	4,908.7
Total benefits reduced by 15%	20.4	3,719.6

PART II: ROAD SAFETY PROGRAM

Background and Traffic

18. In the project appraisal, the Road Safety Program was designed to upgrade a 86-km National Route (NR) 320 road section. NR320 is the principal and direct route connecting Shanghai and Hangzhou. The main purpose of the Road Safety Program was to promote road safety on NR 320 by segregating motor vehicle traffic from bicycles and agricultural tractors. The other purpose of the Road Safety Program was to improve road junctions to ensure that minor road traffic could turn safely into roads out of the main road. However, because of misprocurement, the first component (traffic segregation) was canceled from the project, but was completed with local funds.

19. Because NR320 is located on the same highway corridor, the economic development and traffic pattern are quite similar to those of SHE. By segregating motor vehicles from bicycles and tractors, it was estimated that the VOC of the traffic would be reduced by at least 2 percent.

Economic Costs

20. Financial construction costs were converted to economic costs. As for the expressway, all input data were evaluated in constant December 2001 economic costs. The overall average shadow price is 1.03 and the financial cost is 97.2 percent of the economic cost.

21. The total economic cost of the Road Safety Program at December 2001 constant price is only about 29.7 percent of the SAR's estimate.

ROAD SAFETY PROGRAM PROJECT COST COMPARISON (million Yuan)

	The SAR (Yuan million)		The ICR (Yuan million)		(B)/(A) (in %)
	January 1995 economic prices	Dec. 2001 economic prices (A)	Financial (current) cost	Dec. 2001 economic prices (B)	
Total	180.0	180.32 /_a	52.06	53.55	29.7

/_a: Economic cost (1995 constant prices), has been updated to 2001 constant prices by multiplying with a factor of 1.0018

Economic Benefits

22. The economic analysis was similar to the methodology used for the SAR and primarily focused on the benefits derived from VOC savings, travel time savings, and traffic accident savings.

23. Through improvement in traffic operation conditions, the congestion level was reduced and considerable benefits were attributed. It was assumed that there would be no generated traffic. The less congested road increased vehicle speed and reduced fuel consumption.

Economic Evaluation

24. The EIRR for the Road Safety Program was estimated at 58.5 percent, compared to 54.4 percent estimated in the SAR.

EIRR AND NPV OF THE ROAD SAFETY PROGRAM

	EIRR (in %)		NPV (12%, million Yuan)	
	SAR	ICR	SAR ¹	ICR
Total	54.4	58.5	1,153.1	262.2

1: NPV was at 1995 prices and updated to 2001 prices by multiplying by a factor of 1.0018.

PART III: THE OVERALL ECONOMIC EVALUATION OF THE PROJECT

Overall Economic Internal Rate of Return (EIRR)

25. The overall EIRR of the project (for both SHE and the Road Safety Program) is 22.7 percent and the NPV (at 12 percent) is about Y5.17 billion. In the SAR, the overall EIRR of the project was estimated at 33.4 percent and the NPV (at 12 percent) about Y17.0 billion.

EIRR (in %) and NPV (12%, million Yuan)

	SAR		ICR	
	EIRR	NPV	EIRR	NPV
Expressway	32.5	15.88	22.7	5.02
Road Safety Program	54.4	1.15	58.8	0.26
Total project	32.5	15.9	22.9	5.17

Project Risks

26. Although the overall EIRR of the project is economically justifiable, and the Road Safety Program also showed robust results, the EIRR for the expressway was less than expected because of cost overruns and lower traffic volume on one section. It is suggested that more accurate estimates on traffic O/Ds and construction costs could have been made in the feasibility study stage.

Probabilistic Risk Analysis

27. To determine the degree of project uncertainty, a probabilistic risk analysis using Monte Carlo techniques was carried out. In a Monte Carlo analysis, each uncertainty factor is allowed to vary at random between set limits, and all uncertainty factors are allowed to change simultaneously. The Monte Carlo simulation provides probability distributions of the potential outcomes of decisions. By analyzing these distributions, the risk associated with making various decisions can be assessed (probabilistic risk analysis). The outcome of the analysis can be used to judge the possible range of a decision variable, and the likelihood of each value within this range.

28. The probabilistic risk analysis focused on the SHE and Road Safety Program as well as the total project. The factors with the most uncertainty associated with the economic evaluation were identified as the traffic growth rate and the value of VOCs. The results of the probabilistic risk analysis for the project indicate that the EIRR for the most likely scenario is 21.8 percent, the EIRR for the worst-case scenario of the analysis is 17.3 percent, and for the best case scenario, 27.2 percent. The standard error of the mean is 0.3 percent. Results of the Monte Carlo test and probabilistic analyses (Appendix 1) are summarized as follows:

Summary of Probabilistic Risk Analysis			
	Range of EIRR	Most likely EIRR	Standard error of the mean
The expressway	17.1% ~ 26.9%	21.5%	0.3%
Road safety program	67.3% ~ 78.2%	73.1%	0.3%
Total project	17.3% ~ 27.2%	21.8%	0.3%

PART IV: FINANCIAL EVALUATION

Preface

29. Because the expressway is a toll road and the cost of the expressway constitutes about 99 percent of total project costs, the financial evaluation of the project focused on expressway operations. The expressway is owned and operated by two independent entities (Shanghai City and Zhejiang Province). The financial evaluation also was composed of two independent analyses for two administrative jurisdictions. The financial capital cost is based on the weighted average cost of the various sources of funds. The weighted average of the total project was 4.9 percent (31.9 percent from the Bank loan at 5 percent, 66.7 percent from an MOC grant at 5 percent, and 1.4 percent from a local bank at 3.2 percent). There was no financial evaluation in the SAR.

Highway Companies and Tolls

30. Shanghai and Zhejiang governments have set up companies in their jurisdictions to operate expressways. These companies are responsible for the day-to-day management, operation, maintenance, and development of the highways, including the repayment of the loans. Toll rates were strictly controlled by the government. Toll rates were assumed to increase once, by 15 percent, every five years (or an average of 2.8 percent per annum).

Financial Forecast

31. **Tolls:** The toll is charged on the basis of vehicle size (seven categories) and distance traveled. Current toll rates are as follows:

	Toll Charges						
	Small car	Medium bus	Large bus	Small truck	Medium truck	Large truck	Tractor-trailer
Shanghai (SFE):							
Basic fee (Y/ vehicle)	5.0	10.0	15.0	5.0	10.0	15.0	20.0
Toll (Y/Veh.-km)	0.60	0.55	0.60	0.60	0.55	0.60	0.60
Zhejiang (PFE):							
Basic fee (Y/ vehicle)	5.0	10.0	15.0	5.0	10.0	15.0	20.0
Toll (Y/ Veh.-km)	0.45	0.80	0.20	0.45	0.80	1.20	1.60

32. **Operations:** Total revenues generated from the toll expressway can meet the need for operating expenses, including the depreciation and financial obligations (Table 1.1, Table 2.1). Strong internal cash generation (mainly from the operations and depreciation) produces a strong cash inflow. The result indicates a sound debt service coverage ratio (the loan repayment capacity) (Table 1.2, Table 2.2). Except for the period in the early construction and operating years (1998 and 1999), both sections enjoy a healthy current ratio (liquidity of the company). The large government grants to the expressway have caused a higher portion of equity. Both the debt/capital ratio and the debt/equity ratio (financial leverage) have maintained a very sound range during implementation and after the completion of the project (Table 1.3, Table 2.3).

33. **Cash flow.** The total revenue is sufficient to cover the daily operating costs of the expressway. Capital requirements for the loan repayment and major maintenance works, however, would generate cash pressure on the expressway, particularly for the Shanghai section. This potential deficit could be filled by transferring the reserve funds from the previous years. It is expected that the expressway will not need any external cash injection over the life of the loan.

34. **Profitability:** Because of the strict control of toll rates by the government and less traffic on the Shanghai section, the profit margin is not expected to be high. This may not affect the daily operation of the expressway, but added to the project cost overrun, the low profit margin will have a large impact on the Financial Internal Rate of Return (FIRR).

35. **FIRR.** The FIRR and NPV (4.9 percent for the weighted average financial cost of capital) for the entire expressway is expected to be 5.5 percent and Y284.6 million, respectively. The FIRR for the Shanghai section would be -2.6 percent. The FIRR for the Zhejiang section would be 8.9 percent.

	FIRR and NPV	
	FIRR (in %)	NPV(4.9%, Y million)
Shanghai (SFE)	-2.6	(1,043.5)
Zhejiang (PFE)	8.9	1,276.6
Total expressway	5.5	284.6

36. **Financial Probabilistic Risk Analysis:** The three most uncertain factors that may affect the financial evaluation were identified: (a) traffic growth, (b) increase in toll rates, and (c) increase in total operating costs. The results of the financial probabilistic analysis reveal that the most likely FIRR would be -2.6 percent for the Shanghai section, 8.8 percent for the Zhejiang section and 5.4 percent for the total project. The details on the worst and the best FIRR and NPV are summarized as follows (and in Appendix 2):

Summary of Financial Probabilistic Risk Analysis

	Range of FIRR & NPV		Most Likely		Standard EIRR of The Mean	
	FIRR (in %)	FIRR (Y B.)	FIRR (in %)	NPV (Y B.)	FIRR (in %)	NPV (Y B.)
Shanghai (SFE)	-2.7 ~ -2.5	-1.05 ~ -1.03	-2.6	-1.04	0.0	0.000
Zhejiang (FPE)	8.2 ~ 9.3	1.03 ~ 1.48	8.8	1.25	0.0	0.014
Total	5.0 ~ 5.9	0.04 ~ 0.50	5.4	0.26	0.0	0.014

Private Financing Alternatives

37. Under the current market conditions and legal framework, the chance of private participation in financing Chinese expressway construction is very slim, particularly for this project, for the following reasons:

- (a) Non-transport distortion barriers, such as foreign exchange freedom and local banking services, impede foreign investment, while domestic capital markets of private funds have yet to be formed.
- (b) Profitability: The rigid government toll control has ruled out the possibility of private investors in the highway sector who would be in search of the higher FIRR.
- (c) Competition: Even without the toll control, the competition between the highways and other transport modes (such as railway) has also limited the possibility of toll increases for the expressway. Currently, there are four well-maintained highways between Shanghai and Hangzhou. Increasing the expressway toll will divert traffic to the other three highways. The railway is also one of the main transport means in this corridor, and it has a unit tariff that is much lower than the highway tariff.
- (d) Capital structure: The high proportion of government grants to the project (about 67 percent of costs) is one reason that the expressway can be operated under the current toll charge. The high portion of the grant fund generates a large stack of equity and strong financial leverage for the companies. If a large portion of capital were to come from loans and/or bonds, the expressway could suffer a problem of solvency.

**Table 1.1: Shanghai- Zhejiang Highway (Shanghai Section)
Income Statement
(million Yuan, year ending December 31)**

	1999	2000	2001	2002	2003	2004
Traffic (million Veh.-km)	123.80	151.65	216.92	223.71	230.72	237.93
Operating Revenue						
Tolls	99.89	118.00	136.00	140.26	144.65	149.17
Others	-	-	-	-	-	-
Total	<u>99.89</u>	<u>118.00</u>	<u>136.00</u>	<u>140.26</u>	<u>144.65</u>	<u>149.17</u>
Operating Taxes						
Business tax	-	-	-	7.01	7.23	7.46
City tax	-	-	-	0.51	0.52	0.62
Education levy	-	-	-	0.21	0.22	0.22
Total	-	-	-	<u>7.71</u>	<u>7.96</u>	<u>8.20</u>
Net Revenue	<u>99.89</u>	<u>118.00</u>	<u>136.00</u>	<u>132.55</u>	<u>136.69</u>	<u>140.97</u>
Operating Costs						
Wages and benefits	4.82	4.94	5.30	5.84	6.14	6.44
Maintenance	11.30	36.01	36.50	40.24	42.25	44.37
Fuel and materials	1.59	0.67	0.70	0.77	0.81	0.85
Administration	3.01	2.52	2.60	2.87	3.01	3.16
Others	11.70	0.48	0.50	0.55	0.58	0.61
Total working costs	<u>32.42</u>	<u>44.62</u>	<u>45.60</u>	<u>50.27</u>	<u>52.79</u>	<u>55.43</u>
Depreciation	53.65	53.61	53.61	52.27	52.28	52.29
Total operating costs	<u>86.07</u>	<u>98.23</u>	<u>99.21</u>	<u>102.54</u>	<u>105.07</u>	<u>107.72</u>
Operating Profit	<u>13.82</u>	<u>19.77</u>	<u>36.79</u>	<u>30.01</u>	<u>31.6</u>	<u>33.25</u>
Interests: IBRD loan	-	-	20.59	23.55	22.32	21.03
Local loan	4.97	4.78	4.41	4.04	3.66	3.29
Other income (expenses)	-	-	-	-	-	(3.44)
Profit Before Taxes	<u>13.82</u>	<u>19.77</u>	<u>16.20</u>	<u>6.46</u>	<u>9.30</u>	<u>8.78</u>
Income tax	-	0.08	0.05	2.13	3.07	2.90
Net Profit After Taxes	<u>13.82</u>	<u>19.69</u>	<u>16.15</u>	<u>4.33</u>	<u>6.23</u>	<u>5.88</u>

/_1: Assume operating taxes will start in 2002.

**Table 1.2: Shanghai- Zhejiang Highway (Shanghai Section)
Sources and Applications of Funds
(million Yuan, year ending December 31)**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sources:													
Net profits	-	-	-	-	-	-	13.82	19.69	16.15	4.33	6.23	5.88	21.29
Depreciation	-	-	-	-	-	-	53.65	53.61	53.61	52.27	52.28	52.29	52.69
State contribution	0.77	3.87	9.12	59.78	38.86	40.08	3.32	-	-	4.20	-	-	-
Provincial contribution	6.23	31.13	73.30	480.22	312.14	321.92	26.68	-	-	33.66	-	-	-
Borrowing:													
IBRD	-	-	-	82.72	122.88	117.33	65.66	32.87	75.35	-	-	-	-
Local	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	7.00	35.00	82.42	622.72	473.88	479.33	163.13	106.17	145.11	94.46	58.51	58.17	73.98
Applications:													
Capital expenditure	7.00	35.00	82.42	622.72	473.88	479.33	95.66	32.87	2.90	3.05	3.20	3.36	140.90
Other expenditure	-	-	-	-	-	-	-	-	-	-	-	-	-
Loan repayment:													
IBRD	-	-	-	-	-	-	-	-	23.07	24.23	25.46	26.75	28.10
Local	-	-	-	-	-	-	-	-	-	-	-	-	-
Change w/ capital	-	-	-	-	-	-	59.00	(4.12)	(4.07)	(0.97)	(0.99)	(1.04)	(6.27)
Total	7.00	35.00	82.42	622.72	473.88	479.33	154.66	28.75	21.90	26.31	27.67	29.07	162.73
Net Funds Flow	=	=	=	=	=	=	8.47	77.42	123.21	68.15	30.84	29.10	(88.75)
Open balance							-	8.47	85.89	209.10	277.25	308.09	337.19
Closing balance							8.47	85.89	209.10	277.25	308.09	337.19	248.45
D/S Cover									3.02	2.34	2.30	2.17	2.63

**Table 1.3: Shanghai- Zhejiang Highway (Shanghai Section)
Balance Sheet
(million Yuan, year ending December 31)**

	1999	2000	2001	2002	2003	2004
Assets:						
Fixed Assets						
At cost	1960.54	1828.88	1829.17	1829.48	1829.80	1830.14
Less: Depreciation	53.65	107.26	160.87	213.14	265.42	317.71
Net fixed assets	<u>1906.89</u>	<u>1721.62</u>	<u>1668.30</u>	<u>1616.34</u>	<u>1564.38</u>	<u>1512.43</u>
Current Assets						
Inventory	0.08	0.10	0.14	0.14	0.15	0.15
Accounts receivable	6.26	7.39	8.52	8.79	9.07	9.35
Cash	8.47	85.89	209.10	277.25	308.09	337.19
Subtotal	<u>14.81</u>	<u>93.38</u>	<u>217.76</u>	<u>286.18</u>	<u>317.31</u>	<u>346.69</u>
Other assets	9.01	9.46	9.93	10.43	10.95	11.50
Total Assets	<u>1930.71</u>	<u>1824.46</u>	<u>1895.99</u>	<u>1912.95</u>	<u>1892.64</u>	<u>1870.62</u>
Liabilities & Equity						
State funds- Equity	1516.83	1372.44	1382.66	1422.61	1426.48	1429.89
L/T loans: IBRD	388.59	421.46	473.74	449.51	424.05	397.30
Local	-	-	-	-	-	-
	<u>388.59</u>	<u>421.46</u>	<u>473.74</u>	<u>449.51</u>	<u>424.05</u>	<u>397.30</u>
Current Liabilities	29.08	34.35	39.59	40.83	42.11	43.43
Other Liabilities	(3.79)	(3.79)	-	-	-	-
Total Liabilities & Equity	<u>1930.71</u>	<u>1824.46</u>	<u>1895.99</u>	<u>1912.95</u>	<u>1892.64</u>	<u>1870.62</u>
Debt: Capital ratio	20.4	23.5	25.5	24.0	22.9	21.7
Debt / Equity ratio	22/78	25/75	27/73	26/74	25/75	24/76
Current ratio	0.5	2.7	5.5	7.0	7.5	8.0

Table 2.1: Shanghai - Zhejiang Highway (Zhejiang Section)
Income Statement
(million Yuan, year ending December 31)

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Traffic (million Veh.-km)	212.36	265.46	704.18	978.07	1006.11	1034.89	1064.60	1095.14	1126.58
Operating Revenue									
Tolls	83.00	117.00	428.00	522.00	503.06	517.45	532.30	547.57	653.42
Others	-	-	-	-	-	-	-	-	-
Total	<u>83.00</u>	<u>117.00</u>	<u>428.00</u>	<u>522.00</u>	<u>503.06</u>	<u>517.45</u>	<u>532.30</u>	<u>547.57</u>	<u>653.42</u>
Operating Taxes									
Business tax	3.64	4.55	20.00	26.37	25.15	25.87	26.62	27.38	32.67
City tax	0.25	0.32	1.40	1.85	1.76	1.81	1.86	1.92	2.29
Education levy	0.11	0.13	0.60	0.78	0.75	0.78	0.80	0.82	0.98
Total	<u>4.00</u>	<u>5.00</u>	<u>22.00</u>	<u>29.00</u>	<u>27.66</u>	<u>28.46</u>	<u>29.28</u>	<u>30.12</u>	<u>35.94</u>
Net Revenue	<u>79.00</u>	<u>112.00</u>	<u>406.00</u>	<u>493.00</u>	<u>475.40</u>	<u>488.99</u>	<u>503.02</u>	<u>517.45</u>	<u>617.48</u>
Operating Costs									
Wages and benefits	3.72	3.91	17.81	13.63	9.48	9.96	10.45	10.98	11.52
Maintenance	8.71	9.17	41.71	31.92	22.21	23.32	24.48	25.71	26.99
Fuel & materials	2.45	2.58	11.73	8.98	6.25	6.56	6.89	7.23	7.59
Administration	2.32	2.44	11.10	8.50	5.91	6.21	6.52	6.84	7.19
Others	1.80	1.90	8.65	6.60	4.60	4.83	5.07	5.32	5.59
Total working costs	<u>19.00</u>	<u>20.00</u>	<u>91.00</u>	<u>69.63</u>	<u>48.45</u>	<u>50.87</u>	<u>53.41</u>	<u>56.08</u>	<u>58.89</u>
Depreciation	-	-	-	30.37	36.31	42.25	48.20	54.14	60.08
Total operating costs	<u>19.00</u>	<u>20.00</u>	<u>91.00</u>	<u>100.00</u>	<u>84.76</u>	<u>93.12</u>	<u>101.61</u>	<u>110.22</u>	<u>118.97</u>
Operating Profit	<u>60.00</u>	<u>92.00</u>	<u>315.00</u>	<u>393.00</u>	<u>390.64</u>	<u>395.87</u>	<u>401.4</u>	<u>407.23</u>	<u>498.51</u>
Interests: IBRD	8.00	6.00	58.00	47.93	55.85	53.21	50.44	47.53	44.47
Local	-	-	-	2.07	1.82	1.53	1.22	0.87	0.49
Other income (expenses)	-	18.00	3.00	13.00	2.47	2.11	1.74	9.17	9.14
Profit Before Taxes	<u>52.00</u>	<u>104.00</u>	<u>260.00</u>	<u>356.00</u>	<u>335.44</u>	<u>343.24</u>	<u>351.49</u>	<u>368.00</u>	<u>462.69</u>
Income tax	6.00	23.00	36.00	96.00	110.70	113.27	115.99	121.44	152.69
Other taxes	-	-	-	-	-	-	-	-	-
Net Profit After Taxes	<u>46.00</u>	<u>81.00</u>	<u>224.00</u>	<u>260.00</u>	<u>224.74</u>	<u>229.97</u>	<u>235.50</u>	<u>246.56</u>	<u>310.00</u>

**Table 2.2: Shanghai - Zhejiang Highway (Zhejiang Section)
Sources and Applications of Funds
(million Yuan, year ending December 31)**

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sources:													
Net profits	-	-	-	-	46.00	81.00	224.0	260.0	224.74	229.97	235.5	246.56	310.00
Depreciation	-	-	-	-	-	-	-	30.37	36.31	42.25	48.20	54.14	60.08
State contribution	5.78	45.10	41.18	56.72	185.58	79.91	48.39	23.28	8.06	-	-	-	-
Provincial contribution	16.74	130.51	119.17	164.15	537.03	231.23	140.02	67.36	23.32	-	-	-	-
Borrowing:													
IBRD	12.95	100.99	92.21	127.01	415.54	178.93	108.35	52.12	18.05	-	-	-	-
Local	0.85	6.63	6.05	8.34	27.27	11.74	7.11	3.42	1.18	-	-	-	-
Others	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	<u>36.32</u>	<u>283.23</u>	<u>258.61</u>	<u>356.22</u>	<u>1211.42</u>	<u>582.81</u>	<u>527.87</u>	<u>436.55</u>	<u>311.66</u>	<u>272.22</u>	<u>283.7</u>	<u>300.70</u>	<u>370.08</u>
Applications:													
Capital expenditure	36.32	283.23	258.61	356.22	1165.42	701.81	274.87	243.55	36.63	38.46	40.38	42.40	44.52
Other payment	-	-	-	-	-	-	-	-	-	-	-	-	-
Loan repayment:													
IBRD	-	-	-	-	-	-	-	-	52.12	54.76	57.53	60.44	63.50
Local	-	-	-	-	-	-	-	7.00	8.00	9.00	10.00	11.00	12.00
Change w/ capital	-	-	-	-	-	(178.00)	312.00	74.00	(76.91)	0.43	0.44	0.47	3.17
Total	<u>36.32</u>	<u>283.23</u>	<u>258.61</u>	<u>356.22</u>	<u>1165.42</u>	<u>523.81</u>	<u>586.87</u>	<u>324.55</u>	<u>19.84</u>	<u>102.65</u>	<u>108.35</u>	<u>114.31</u>	<u>123.19</u>
Net Funds Flow	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>46.00</u>	<u>59.00</u>	<u>(59.00)</u>	<u>112.00</u>	<u>291.82</u>	<u>169.57</u>	<u>175.35</u>	<u>186.39</u>	<u>246.89</u>
Open balance					114.00	160.00	219.00	160.00	272.00	563.82	733.39	908.74	1095.13
Closing balance					160.00	219.00	160.00	272.00	563.82	733.39	908.74	1095.13	1342.02
D/S Cover					-	-	-	41.48	4.34	4.27	4.20	4.21	4.90

Table 2.3: Shanghai - Zhejiang Highway (Zhejiang Section)
Balance Sheet
(million Yuan, year ending 31, December)

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Assets:									
Fixed Assets									
At cost	1907.00	2843.00	2910.00	2910.37	3055.32	3059.17	3063.21	3067.45	3071.90
Less: Depreciation	-	-	-	30.37	66.68	108.93	157.13	211.27	271.35
Net fixed assets	<u>1907.00</u>	<u>2843.00</u>	<u>2910.00</u>	<u>2880.00</u>	<u>2988.64</u>	<u>2950.24</u>	<u>2906.08</u>	<u>2856.18</u>	<u>2800.55</u>
Long term investment	6.00	6.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00
Current Assets									
Inventory	-	-	-	-	-	-	-	-	-
Account receivable	294.00	30.00	251.00	262.00	291.77	300.12	308.73	317.59	378.98
Cash	160.00	219.00	160.00	272.00	563.82	733.39	908.74	1095.13	1342.02
Subtotal	<u>454.00</u>	<u>249.00</u>	<u>411.00</u>	<u>534.00</u>	<u>855.59</u>	<u>1033.51</u>	<u>1217.47</u>	<u>1412.72</u>	<u>1721.00</u>
Other assets	362.00	412.00	395.00	354.00	366.64	367.10	367.59	368.09	368.63
Total Assets	<u>2729.00</u>	<u>3510.00</u>	<u>3720.00</u>	<u>3771.00</u>	<u>4213.87</u>	<u>4353.85</u>	<u>4494.14</u>	<u>4639.99</u>	<u>4893.18</u>
Liabilities & Equity									
State funds- Equity	1521.16	2197.49	2383.03	2448.49	2844.80	3040.62	3240.27	3449.17	3719.64
L/T loans: IBRD	748.70	927.63	1035.98	1088.10	1035.98	981.22	923.69	863.25	799.75
Local	49.14	60.88	67.99	64.41	56.41	47.41	37.41	26.41	14.41
Subtotal	<u>797.84</u>	<u>988.51</u>	<u>1103.97</u>	<u>1152.51</u>	<u>1092.39</u>	<u>1028.63</u>	<u>961.10</u>	<u>889.66</u>	<u>814.16</u>
Current Liabilities	410.00	324.00	233.00	170.00	276.68	284.60	292.77	301.16	359.38
Total Liabilities & Equity	<u>2729.00</u>	<u>3510.00</u>	<u>3720.00</u>	<u>3771.00</u>	<u>4213.87</u>	<u>4353.85</u>	<u>4494.14</u>	<u>4639.99</u>	<u>4893.18</u>
Debt: Capital ratio	34.4	31.0	31.7	32.0	27.7	25.3	22.9	20.5	18.0
Debt / Equity ratio	44/56	37/63	36/64	35/65	32/68	30/70	28/72	26/74	24/76
Current ratio	1.1	0.8	1.8	3.1	3.1	3.6	4.2	4.7	4.8

**Table 2.4: Shanghai - Zhejiang Highway (Zhejiang Section)
Financial Assumptions**

1. Traffic:

	Small Car	Medium Bus	Large Bus	Small Truck	Medium Truck	Large Truck	Tractor-Trailer	Total
Section 1: Pengbu – Yuhang								
1998	4,992	1,133	2,649	2,175	3,898	1,185	47	16,079
1999	8,823	2,003	3,608	3,843	5,525	1,467	59	25,328
2000	9,489	2,154	5,033	4,135	7,408	2,252	89	30,560
2005	13,942	2,883	6,735	5,534	9,914	3,014	119	42,141
2008	17,563	3,434	8,021	6,591	11,808	3,590	142	51,149
2018	32,968	5,333	12,456	10,236	18,337	5,575	221	85,126
Section 2: Yuhang – Fengjing								
1998	-	-	-	-	-	-	-	-
1999	5,798	1,316	1,558	2,526	2,163	784	31	14,176
2000	6,899	1,565	1,854	3,006	2,574	933	38	16,869
2005	10,137	2,094	2,481	4,023	3,445	1,249	51	23,480
2008	12,770	2,494	2,955	4,791	4,103	1,488	61	28,662
2018	23,971	3,873	4,589	7,440	6,372	2,311	95	48,651

2. Operating Taxes:

- a. Business tax 5% of total revenue.
- b. City tax 7% of business taxes.
- c. Education levy 3% of business taxes.

3. Operating Costs:

- Increase 5 % pa.
- a. Wages and benefits 0.0881 million Yuan per km
- b. Maintenance 0.2062 million Yuan per km
- c. Fuel & materials 0.0580 million Yuan per km
- d. Administration 0.0549 million Yuan per km
- e. Others 0.0427 million Yuan per km
- f. Depreciation 30 years average annual traffic density method.

4. Income Tax Rate:

33% of profit before tax

5. Capital maintenance:
(million Yuan/km)

Routine (annual)	Medium (/5 years)	Major (/10 years)
0.34	4.000	8.000

6. Loans:

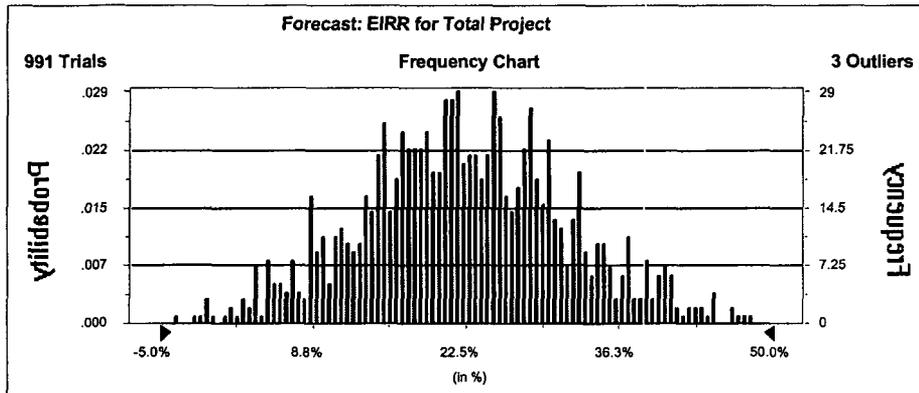
- IBRD 5.0% 20 year maturates, LIBOR US\$-based single
Currency, including 5-year grace period.
- Domestic 3.15% overall average

EIRR Simulation and Probabilistic Risk Analysis
(Total Project)

Summary:

Display Range is from -5.0% to 50.0% (in %)
 Entire Range is from -6.3% to 63.5% (in %)
 After 991 Trials, the Std. Error of the Mean is 0.3%

Statistics:		Value	Percentiles:	
Trials		991		
Mean		22.2%	<u>Percentile</u>	<u>(in %)</u>
Median		21.8%	0%	-6.3%
Mode		---	10%	10.0%
Standard Deviation		9.4%	Low Scenario	20%
Variance		0.9%	→	30%
Skewness		0.15	Most Likely	40%
Kurtosis		3.20	→	50%
Coeff. of Variability		0.42	High Scenario	60%
Range Minimum		-6.3%	→	70%
Range Maximum		63.5%	→	80%
Range Width		69.8%	→	90%
Mean Std. Error		0.30%	→	100%
				63.5%



Assumptions

Traffic Growth Rate

Normal distribution with parameters:
 Mean 100.0%
 Standard Dev. 10.0%
 Selected range is from -Infinity to +Infinity
 Mean value in simulation was 100.2%

Value of the VOC

Triangular distribution with parameters:
 Minimum 90.0%
 Likeliest 100.0%
 Maximum 110.0%
 Selected range is from 90.0% to 110.0%
 Mean value in simulation was 100.0%

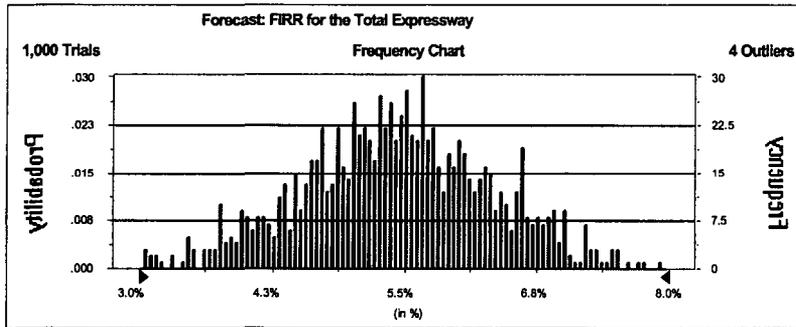
Appendix 2

**FIRR Simulation and Probabilistic Risk Analysis
(The Total Expressway)**

Summary:

Display Range is from 3.0% to 8.0% (in %)
 Entire Range is from 2.5% to 7.9% (in %)
 After 1,000 Trials, the Std. Error of the Mean is 0.0%

Statistics:	<u>Value</u>	Percentiles:		
Trials	1000			
Mean	5.4%		<u>Percentile</u>	<u>(in %)</u>
Median	5.4%		0%	2.5%
Mode	---		10%	4.2%
Standard Deviation	0.9%	Low Scenario	20%	4.7%
Variance	0.0%	→	30%	5.0%
Skewness	-0.10	Most Likely	40%	5.2%
Kurtosis	2.88	→	50%	5.4%
Coeff. of Variability	0.17	High Scenario	60%	5.6%
Range Minimum	2.5%	→	70%	5.9%
Range Maximum	7.9%		80%	6.2%
Range Width	5.4%		90%	6.6%
Mean Std. Error	0.03%		100%	7.9%



Assumptions

Toll Charges

Triangular distribution with parameters:
 Minimum 90.0%
 Likeliest 100.0%
 Maximum 110.0%
 Selected range is from 90.0% to 110.0%
 Mean value in simulation was 99.8%

Total Working Cost

Triangular distribution with parameters:
 Minimum 90.0%
 Likeliest 100.0%
 Maximum 110.0%
 Selected range is from 90.0% to 110.0%
 Mean value in simulation was 99.9%

Traffic Growth Rate

Normal distribution with parameters:
 Mean 100.0%
 Standard Dev. 10.0%
 Selected range is from -Infinity to +Infinity
 Mean value in simulation was 99.9%

Annex 4. Bank Inputs

(a) Missions:

Stage of Project Cycle	No. of Persons and Specialty (e.g. 2 Economists, 1 FMS, etc.)		Performance Rating		
	Month/Year	Count	Specialty	Implementation Progress	Development Objective
Identification/Preparation	11/19/92	4	Highway Engineer, Transport Specialist, Inland Waterway Specialist, Financial Specialist		
	03/08/93	4	Highway Engineer, Road Safety Specialist, Inland Waterway, Environmental Specialist		
Appraisal/Negotiation	07/24/93	5	Transport Specialist, Highway Engineer, Road Safety Specialist, Resettlement Specialist		
	11/27/93	5	Transport Specialist, Environmental Specialist, Highway Engineer, Road Safety Specialist, Resettlement Specialist		
	05/07/94	4	Environmental, Highway Engineer, Resettlement Specialist, Operation Officer		
	10/17/94	1	Resettlement Specialist		
	10/24/95	5	Institutional, Training and Equipment Specialist, Environmental, Resettlement Specialist, Highway Engineer, Operation Officer, Environmental Specialist		
	Supervision	11/23/95	8	Institutional, Training and Equipment Specialist, Resettlement Specialist, Highway Engineer, Procurement Specialist, Operation Officer, Environmental Specialist, Road Safety	S
	05/23/96	1	Procurement/Highway Engineer	S	U
	10/29/96	2	Procurement/Highway Engineer, Highway Engineer	S	S

Stage of Project Cycle	No. of Persons and Specialty (e.g. 2 Economists, 1 FMS, etc.)		Performance Rating		
	Month/Year	Count	Specialty	Implementation Progress	Development Objective
	05/11/97	2	Highway Engineer, Resettlement Specialist	S	S
	11/19/97	2	Highway Engineer, Environment Specialist	S	S
	11/16/98	3	Highway Engineer, Environmental Engineer, Operation Officer	S	S
	03/28/99	3	Highway Specialist, Environmental Engineer, Highway Specialist	S	S
	04/21/00	1	Highway Engineer	S	S
ICR	11/00	1	Research Analyst		

(b) Staff:

Stage of Project Cycle	Actual/Latest Estimate	
	No. Staff weeks	US\$ ('000)
Identification/Preparation	62.3	197.0
Appraisal/Negotiation	125.3	280.8
Supervision	100.8	402.8
ICR	5.45	35.5
Total	293.9	916.0

As of March 2001.

Annex 5. Ratings for Achievement of Objectives/Outputs of Components

(H=High, SU=Substantial, M=Modest, N=Negligible, NA=Not Applicable)

	Rating				
<input checked="" type="checkbox"/> <i>Macro policies</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input checked="" type="checkbox"/> <i>Sector Policies</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input checked="" type="checkbox"/> <i>Physical</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input checked="" type="checkbox"/> <i>Financial</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input checked="" type="checkbox"/> <i>Institutional Development</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input checked="" type="checkbox"/> <i>Environmental</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA

Social

<input checked="" type="checkbox"/> <i>Poverty Reduction</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input checked="" type="checkbox"/> <i>Gender</i>	<input type="radio"/> H	<input type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input checked="" type="radio"/> NA
<input checked="" type="checkbox"/> <i>Other (Please specify)</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA

Resttlement

<input checked="" type="checkbox"/> <i>Private sector development</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input checked="" type="checkbox"/> <i>Public sector management</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA
<input checked="" type="checkbox"/> <i>Other (Please specify)</i>	<input type="radio"/> H	<input checked="" type="radio"/> SU	<input type="radio"/> M	<input type="radio"/> N	<input type="radio"/> NA

Market development: Higher Research and Learning Institutions providing consulting services

Annex 6. Ratings of Bank and Borrower Performance

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HU=Highly Unsatisfactory)

6.1 Bank performance

Rating

Lending

HS S U HU

Supervision

HS S U HU

Overall

HS S U HU

6.2 Borrower performance

Rating

Preparation

HS S U HU

Government implementation performance

HS S U HU

Implementation agency performance

HS S U HU

Overall

HS S U HU

Annex 7. List of Supporting Documents

The World Bank, *Staff Appraisal Report, Shanghai-Zhejiang Highway Project*, July 11, 1995.

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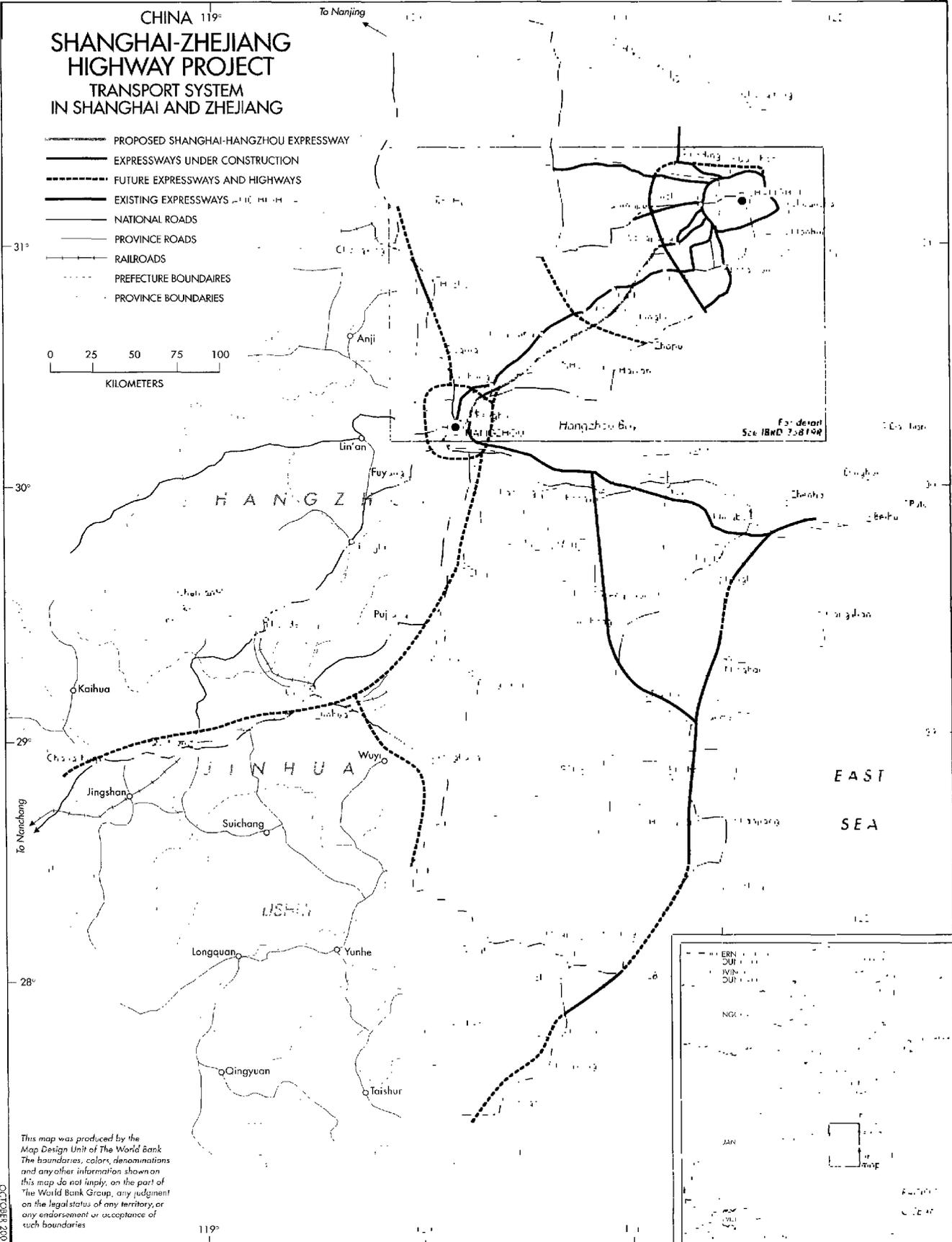
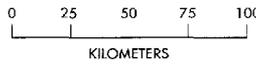
MAP SECTION

CHINA 119°

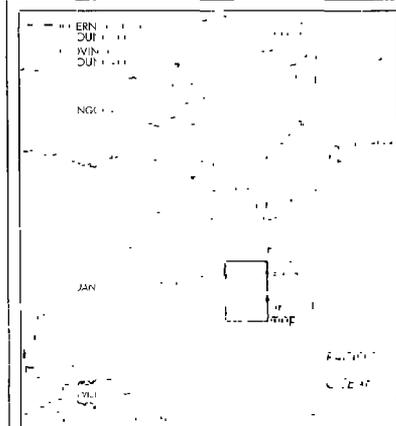
SHANGHAI-ZHEJIANG HIGHWAY PROJECT

TRANSPORT SYSTEM IN SHANGHAI AND ZHEJIANG

- PROPOSED SHANGHAI-HANGZHOU EXPRESSWAY
- EXPRESSWAYS UNDER CONSTRUCTION
- - - FUTURE EXPRESSWAYS AND HIGHWAYS
- EXISTING EXPRESSWAYS
- NATIONAL ROADS
- PROVINCE ROADS
- RAILROADS
- - - PREFECTURE BOUNDARIES
- - - PROVINCE BOUNDARIES



For detail
See IBD 708199



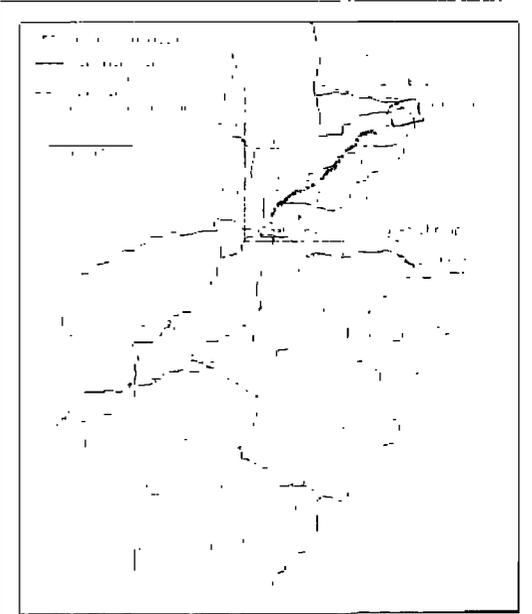
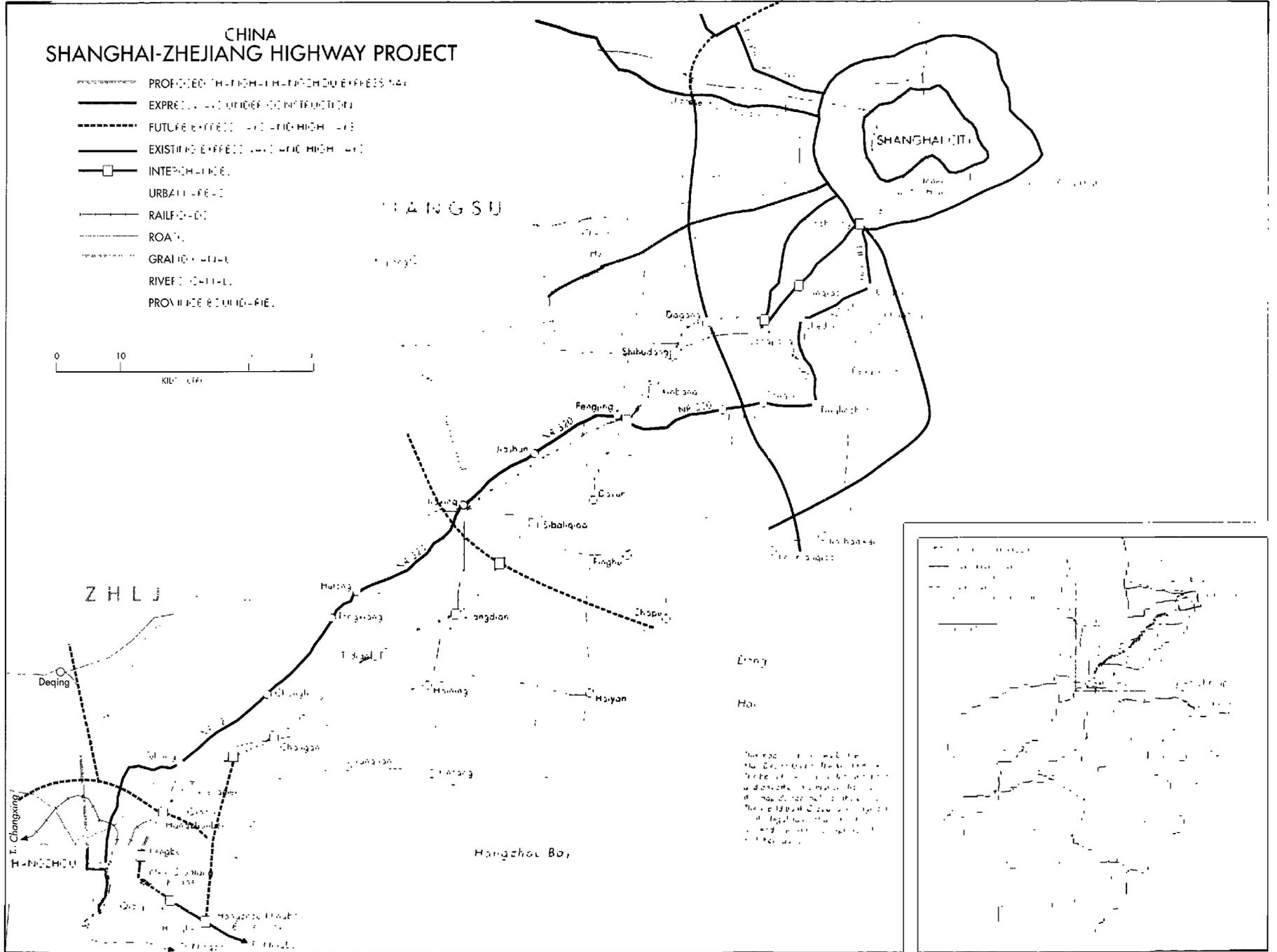
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OCTOBER 2001

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CHINA SHANGHAI-ZHEJIANG HIGHWAY PROJECT

-  PROPOSED HIGH-LEVEL INTERCHANGES
-  EXPRESSWAY UNDER CONSTRUCTION
-  FUTURE EXPRESSWAY AND HIGHWAY
-  EXISTING EXPRESSWAY AND HIGHWAY
-  INTERCHANGE
-  URBAN AREA
-  RAILROAD
-  ROAD
-  GRADE SEPARATION
-  RIVER CHANNEL
-  PROVINCE BOUNDARY



This map is prepared for the Shanghai-Zhejiang Highway Project. It shows the proposed expressway and highway routes, interchanges, and urban areas. The map is based on the latest available data and is subject to change without notice.