China

Xi'an-Ankang Railway Construction Project (1)-(3) (CXVII-P73, CXVIII-P73, CXIX-P73)

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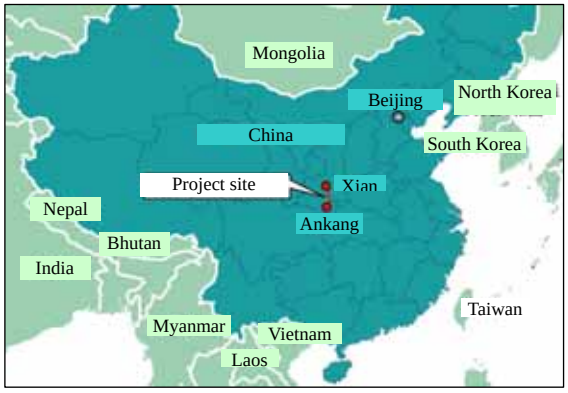
Field Survey: October 2004

1. Project Profile and Japan's ODA Loan



Project site location map
(Xian-Ankang, Shannxi Province)

Qingcha Tunnel

1.1 Background

The project site (Xian- Ankang) is located in the southern part of Shaanxi Province where the 3000-meter high Qinling Mountains extend over 1500 kilometers, and was therefore undeveloped due to difficulties in transportation and remoteness from cities. Southwest of the project site is Sichuan Province, the largest province with a population of 110 million accounting for 10% of the population of China. However, as there is no other transport route to Sichuan Province than taking a detour around the Qinling Mountains, there were only limited routes to transport energy and everyday commodities from the north.

Railway transport from other regions to Sichuan Province depended on Baoching Line (Baoji-Chengdu) from the north and Xiangyu Line (Xiangfan-Ankang-Chongquing) from the east, and both lines were operating to full capacity. It was particularly difficult to double-track Baoching Line, which takes a detour to avoid the Qinling Mountains because of 1) long distance of transport, 2) large cost to transport on a gradient at an angel of 3%, and 3) the topographical problem.

The opening of the electrified single track of Xian-Ankang Line not only helped increase the transport capacity within Shaanxi Province but also shortened the traveling distance to Chongquing and eased the transportation load on Baoching Line. At the same time, it forms a north-south network connecting two railway lines: Longhai Line (Lianyungang Port in Jiangsu Province-Xian-Baoji-Lanzhou) running east-west in the north and Xiangyu Line (Xiangfan-Ankang-Chongquing) in the south. Thus, the project contributed to the expansion of the transport capacity of northwest and southwest bound traffic.

1.2 Objective

The project's objective was to construct an electrified single-track railway line between Xian and Ankang in Shaanxi Province for the purpose of increasing the transportation of energy resources, freight, and passengers to Northwestern and Southeastern China, thereby contributing to the economic development of these regions.

1.3 Borrower/Executing Agency

Government of the People's Republic of China/Zhengzhou Railway Bureau of the Ministry of Railways

1.4 Outline of Loan Agreement

	Xian-Ankang Railway Construction Project (1) CXVII-P73	Xian-Ankang Railway Construction Project (2) CXVIII-P73	Xian-Ankang Railway Construction Project (3) CXIX-P73
Loan Amount / Loan Disbursed Amount	19,789million yen / 18,251million yen	2,526million yen / 2,122million yen	12,685million yen / 6,643million yen
Exchange of Notes / Loan Agreement	October 1995 / November 1995	December 1996 / December 1996	September 1997 / September 1997
Terms and Conditions - Interest rate - Repayment Period (Grace Period) - Procurement	 2.3% 30 years (10 years) General untied	 2.3% 30 years (10 years) General untied	 2.3% 30 years (10 years) General untied
Final Disbursement Date	December 2000	July 2002	January 2003
Main Contract	WIRTH MASCHINEN-UND BOHRGERATE-FABRIC GMBH (Germany), KUNMING MACHINERY FACTORY (China), UNIVERSAL BONANZA CO., LTD. (Hong Kong) etc.		
Consultant Contract	—		
Feasibility Study	1992 Chinese Government		

2. Results and Evaluation

2.1 Relevance

The Eighth 5-Year Plan (1991-1995) of China set a target of constructing north-south and east-west trunk railways and expanding railway transportation capacity (target total length: 60,000km - total length of railways in Japan is approximately 27,000 working kilometers). The project area is a significant area for the trunk north-south railway transportation. This project was to contribute to the expanding capacity of transportation to the northwestern and southeastern regions. Since the existing Baoching Line was the only route to transport coal and other products from the northern region to Shaanxi and Sichuan Provinces, it was urgently needed to increase the transportation capacity and reduce the transportation distance to Chongquing, the economic center of the inland region. Therefore, construction of an electrified single-track railway under the project was highly important. Thus, this project was of high priority and urgency.

The current Tenth 5-Year Plan (2001-2005) set a target of expanding the north-south and east-west railway network. The project area is included in area along the Baotou (Inner Mongolia) - Liuzhou (Guanxi Zhuangzu) Railway, a north-south trunk line, and also plays an important role in transportation to the northwestern and southeastern regions. In addition, this project is important in that it helps increase the transportation capacity and reduce the transportation distance to Shaanxi and Sichuan Provinces, in particular.

Thus, construction of an electrified single-track railway under this project remains significant and highly relevant today.

2.2 Efficiency

2.2.1 Output

The location of Xian-Ankang Railway (Xikan Line) is shown in Fig.1. The planned output of the project as shown below was implemented without major changes except for the extension of total tunnel length and the decrease in the number of substations by one, and an electrified single-track railway (246.7km) was constructed between Xian and Ankang as planned. With the completion of this line, the Longhai Line (Lianyungang Port in Jiangsu Province-Xian-Baoji-Lanzhou) running east-west in the north is connected to the Xiangyu Line（Xiangfan-Ankang-Chongquing）in the south (see Fig. 1). As for the Qinling Tunnel, it is the longest (18.5km) and deepest (1.6km from the mountain top to the deepest point）in China as of the time of the field survey. It was planned to expand the adit wide enough to let trains pass in the future as the necessity for double-tracking arises. However, in consideration of the expected demand in the future, both a horseshoe-shaped adit and a main adit were excavated and double-tracking work was implemented during the project period (see the photo on the right). As a result, the total construction length of tunnels increased by 18.5 km. The number of substations was one less than planned because one was decided to be constructed in the future depending on demand. Railway tunnels of this size in Japan are the New

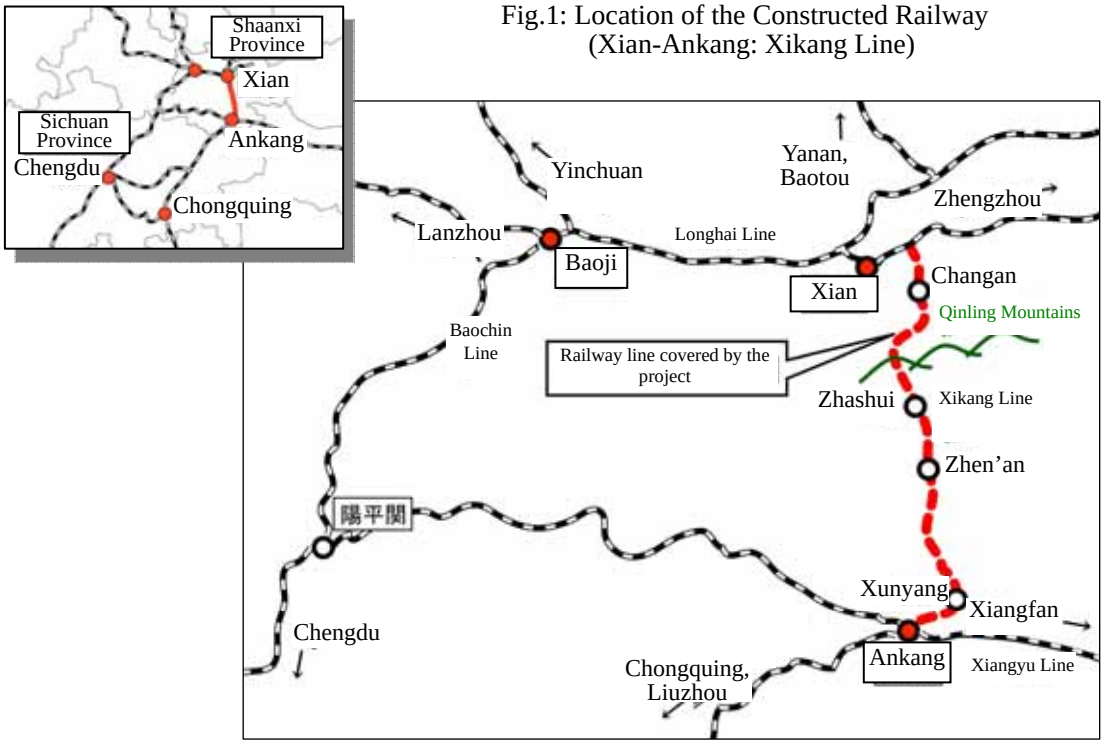
Kanmon Tunnel (18.7km) and Rokko Tunnel (16.2km) on Sanyo Shinkansen Line.

＜Output＞

- Railway 246.7km
- Bridges 168 (41.2km)
- Tunnels 101
  (planned 121.1km→actual 139.6km, up15%)
- Culverts 280 (11.3km)
- Stations 26
  (25 were newly constructed)
- Substations 7
- Communication and signal equipment

Qinling Tunnel

Fig.1: Location of the Constructed Railway
(Xian-Ankang: Xikang Line)



2.2.2 Project Period

The project period was from November 1995 to January 2001 (63 months) against the scheduled November 1995 (signing of the loan agreement) to December 2000 (62 months). The project was implemented almost as planned.

2.2.3 Project Cost

The project cost was 158,916 million yen, a little over the planned 158,777million yen. This is attributable to fluctuations of foreign exchange rates, which pushed up the local currency portion

and the total project cost in terms of yen in spite of the decrease in the foreign currency portion due to effective contracting through international competitive bidding.

Thus, in terms of output, project period and project cost were almost as planned, and the overall efficiency of the project was good.

2.3 Effectiveness

2.3.1 Traffic Increase on Xikang Line

Table 1: Indicators of Traffic Volume on Xian-Ankang Line

Indicator	Plan	Actual	
		2002	2003
Freight Traffic Volume (ten thousand ton-km)	342,000 (2000) 434,340 (2005)	368,500	406,288
Passenger Traffic Volume (ten thousand person-km)	92,796 (2000) 114,228 (2005)	103,984	121,136
Number of Passengers (ten thousand)	407 (2000)	400	454
Number of Train Services (average number of train services/day)	n.a.	46[1)]	48

Source: Zhangzhou Railway Bureau of MOR
Note 1) Data for 2001

The Xikang Line has been operated smoothly since it was opened to service, achieving freight traffic volume of 4,062.88 million ton-km [1] and passenger traffic volume of 1,211.36 million person-km[2] in 2003 (the freight traffic volume in Japan in 2003 was 22.8 billion ton-km and the passenger traffic volume was 385 billion person-km). This freight traffic volume is equivalent to 94% of the target volume for 2005 set at appraisal, and the passenger traffic volume exceeded the target volume for the same year. There was a larger-than-expected demand for passenger transportation, in particular. According to the Ministry of Railways (MOR), long-distance passenger trains operated on this line are always nearly full. Also, the project was of great significance to the residents along Xikang Line in that it provided an important means of transportation in this inconveniently located area. It takes around 4 hours from Xian to Ankang by train using this railway while it takes around 8 hours by bus[3], and the railway fare is one-third of the bus fare. This fact indicates that railways are important for local residents as a fast and cheap means of transportation.

As evident by the location of railway lines shown in Fig.1, distance and time of transportation from Xian to Ankang are reduced significantly by using Xikang Line compared with using Baoching Line. The transportation distance between Xian and Ankang has been reduced by 542km, and the traveling time has been reduced by around 14 hours. The total number of up and down train services operated per day in 2003 was 48 on average.

The amount of freight transported on the railway line constructed under the project in 2003 was 15.16 million tons, or nearly 76% of the capacity of 20 million tons. Since there is a strong demand for transportation, double-tracking of this line in the future is being considered.

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[1] Ton-km: tonnage of freight × kilometers transported

[2] Passenger-km: number of passengers × kilometers transported

[3] As of 2004, via available general roads. Flight service also used to be operated before the opening of the railway.

2.3.2 Recalculation of Financial and Economic Internal Rate of Return

Calculation of Financial Internal Rate of Return (FIRR) taking into account the following elements resulted in 5.0% at the time of appraisal, whereas FIRR based on the actual data of the same elements was incalculable because, in spite of sharp increase in the traffic volume, the cash flow estimated by MOR is negative for 2004 and later due to the high cost that resulted from low transportation charges.

In calculating Economic Internal Rate of Return (EIRR), savings of the road construction cost, maintenance cost, and time were included in the benefits at appraisal, whereas more realistic indicators of benefits were used this time. As a result, EIRR was calculated at 7.0% based on the elements shown below.

(Assumptions for the calculation of FIRR)

Project life: 30 years

Benefits: freight charge income and passenger fare income

Costs: project cost, maintenance cost

(Assumptions for the calculation of EIRR)

Project life: 30 years

Benefits: saving of transportation cost generated by changing the route from Baoching Line to Xikang Line

Costs: project cost, maintenance cost

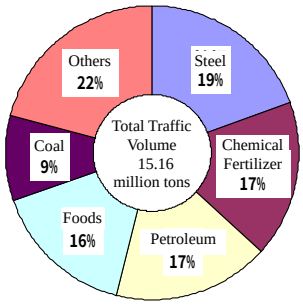
To sum up the above, the railway line covered by the project is not so profitable. However, considering that increased traffic volume has been achieved and further increase in the demand for transportation is expected, this project was highly effective.

2.4 Impact

2.4.1 Stable Supply of Goods and Energy to Sichuan Province

Among various goods transported on the railway line constructed under the project are steel, chemical fertilizer, petroleum, and food as shown in Fig. 2. According to MOR, 95% of the downbound freight traffic from Xian is destined for Sichuan Province, indicating that this line contributes to the stable supply of goods and energy to Sichuan Province[4].

Fig.2: Freight Traffic Volume of Major Items (2003)



Source: Zhengzhou Railway Bureaus of MOR

Sichuan Province achieved real GRDP growth rate of 9.2% in 2001 and 11.8 % in 2003, which were higher than the national average (7.5% in 2001, 8.3% in 2002, 9.1% in 2003). This project seems to have partially helped promote economic activities.

2.4.2 Economic Revitalization along the Railway

This project was to construct a railway line in a region difficult to access, and the constructed railway line was to be used by local residents as a new means of transportation as already stated in the section of Effectiveness. In addition, it had an economic revitalization impact on the region along the railway through the increase in the transportation of local resources. According to the report by MOR, traffic volume has increased since the opening of this line with respect to such items as petroleum as well as metal ore, nonmetal ore, and phosphate ore produced at mines along the railway. According to the Ankang Branch of Zhengzhou Railway Bureau of MOR, traffic volume of nonmetal ore, the main item transported on this line (occupying 60-80% of the total), sharply increased from 420,000 tons in 2001 to 580,000 tons in 2003. Also, in the area around Zhashui Station, industries have been developed because the project provided a means to transport silver and phosphate ore produced in the area. Thus, the economic development impact of the opening of the railway is reported (see “Box: Impact of the opening of the railway on economic development in Zhashui County” for details).

According to MOR, the increased passengers include local residents who use the railway as a mode of transportation and tourists. It is reported that the tourism industry has been developed along Xikang Line. The number of tourists to Ankang, which has historic tourist sites like Xian has increased since the completion of the project by 50% from 500,000 in 2000 to 750,000 in 2003. From the fact that the tourists from Xian have increased in particular, it can be said that the increase in tourists was brought about by the opening of the railway line constructed under the project.

[4]Upbound freight traffic is destined for within Shaanxi Province and various other places such as Gansu Province, Xinjiang Uygur, Beijing, Shanghai, etc.

Before the completion of the project, Baoching Line was the only railway line that connected Xian and Ankang. After the opening of the railway line constructed under the project, as mentioned in the section on “Effectiveness”, the time necessary to travel from Xian has been substantially shortened, and this is a factor behind the increase in tourists. Beneficiaries of this project in terms of passengers are about 4.5 million persons (as of 2003). In terms of the population of the regions around the railway line constructed under the project, the number of beneficiaries exceeds 10 million persons (Xian: 7 million; Zhashui and Zhen’an Counties in Shangluo City: 0.43 million; Ankang: 3 million). No negative impact of the railway construction on the environment has been reported.

Box: Impact of the opening of the railway on economic development in Zhashui County

Zhashui County in Shangluo City, Shaanxi Province is located along the railway line constructed under the project, 115 km from Xian and has a population of 155,000 (as of 2002). It is famous for its production of iron ore and has tourism resources such as the limestone cave. These industries were further developed after the opening of the railway.

Zhashui Station

The volume of freight traffic at Zhashui Station (see the photo on the right) increased 4 fold from 20,400 tons in the first year of operation (2001) to 80,700 tons (2003). The sharp increase in the traffic volume indicates that there was a great demand to transport local products. Gold, silver, iron ore, zinc, and copper are major metals produced along the railway. Some mines are famous throughout China. Companies owned by the provincial government, develop and manage silver and iron mines. Before the railway was constructed under this project, these products were transported by truck on unpaved roads and the transporting capacity was limited. Therefore, mines were developed on a limited scale in spite of rich deposits. Thanks to the completion of the railway, mine development was promoted to achieve a 70-80% increase in output. The production increase led to an increase in the income of companies and thus resulted in the development of the local economy. Iron ore is mainly transported to steelworks within the province and in Hubei Province, and silver is mainly transported to silver refineries in Harbin, Heilongjiang Province and other destinations in the northeastern region. As for passenger transportation, the number of passengers using Zhashui station reached 140,400 in the January-September period in 2004, marking a sharp increase from 127,000 in the entire year of 2002. In addition to local residents who use the railway as a mode of transportation, tourists have increased since the opening of the railway because there are tourist resources such as the limestone cave near the station. Also, employment expansion as a result of the development of the local industries and acceleration of real estate development around the station had an impact on improving the living standards of local residents. (Based on the interview with the railway operation staff of Ankang Branch of Zhengzhou Railway Bureau, MOR)

2.4.3 Traffic Easement on Baoching Line (Baoji-Chengdu)

After the completion of the project, 10 freight trains and 5 passenger trains that operated in both directions on Baoching Line were transferred to the Xikang Line, showing that the project had an

effect of easing the tight traffic situation on Baoching Line.

Freight traffic volume on Baoching Line after completion of the Xikang Line increased from 7,337 million ton-km (2000) to 13,436.50 million ton-km (2003), marking a 1.8 fold increase in 3 years. The demand for transportation seems to be remaining strong.

Thus, the impact of this project is considerable and is expected to continue for the future.

2.5 Sustainability

2.5.1 Executing Agency

2.5.1.1 Technical Capacity

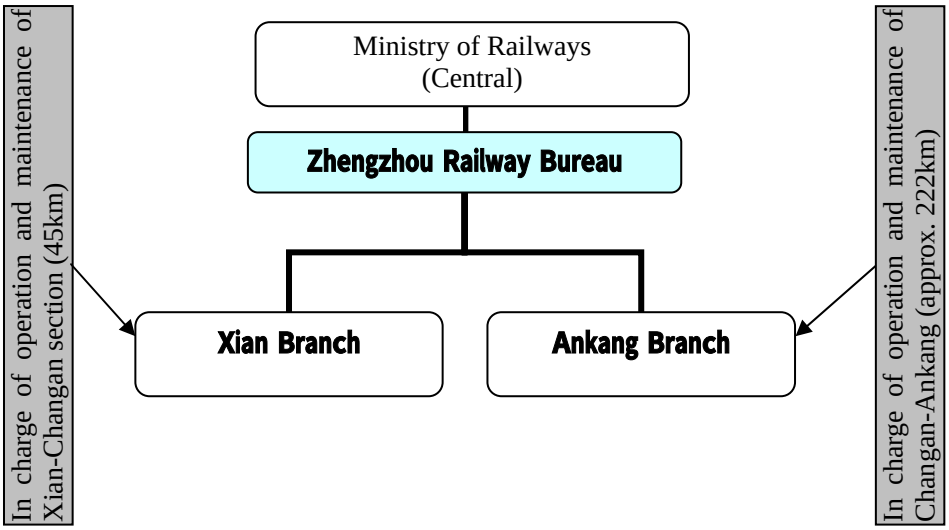
The training program for employees is budgeted and implemented in accordance with the unified standard within MOR based on the training plan established every year. A technical proficiency test for the staff is conducted on a regular basis, and continued efforts have been made to enhance their technical level. Therefore, there is no concern over the technical capacity.

2.5.1.2 Operation and Maintenance System

As described in Fig.4, 45.5km or one-fifth of the railway section under the control of Zhengzhou Railway Bureau, one of the regional bureaus of MOR (China National Railways) is operated and maintained by Xian Branch, and 222.0km or four-fifths is operated and maintained by Ankang Branch. At Ankang Branch, about 1,300 employees are assigned responsibilities involving operation and maintenance of the railway line constructed under this project. Employees of MOR perform all the operation and maintenance activities without outsourcing as of the time of the field survey.

According to MOR, MOR is now considering a way of reforming the entire structure and

Fig.4: Operation and Maintenance Organization of the Project Target Line (as of 2004)



organization, but there is no plan for major changes in the operation and maintenance system of the line covered by this project for a while. Under the overall policy of improving productivity, saving time and workforce, and saving space, they are proceeding with closing down or integrating repair shops, and introducing mechanical equipment. Regarding the railway line covered by this project, an automated system realized operation and maintenance by a small number of staff. MOR is working on overall efficiency improvement and streamlining. It is favorable that importance is attached to the efficiency of the organizational structure for the operation and maintenance of this railway line, while due consideration given to safety and personnel reduction has been carried out depending on the level of automation of the operational system.

2.5.1.3 Financial Status

MOR does not conduct financial analysis for each railway line, and financial statements are prepared for each region's bureau. Therefore, financial data on the railway line constructed under the project will be included in the financial statements of Xian Branch and Ankang Branch shortly. As of 2004 when the field survey was carried out, financial accounting of this line was conducted separately on a temporary basis. Major revenue and expenditure items up to 2003 are

unit: ten thousand yuan

Item	2001	2002	2003
(1)Income from main business	39,046	62,851	67,824
(2)Operating expenses	34,627	54,647	62,915
(3)Operating tax and other expenses	1,265	1,993	1,988
(4)Profit from main business (=1-2-3)	3,154	6,211	2,921
(5)Management expenses	1,692	4,211	2,847
(6)Financial expenses	839	685	345
(7)Operating profit (=4-5-6)	623	1,315	-271

Source: Zhengzhou Railway Bureau of MOR

Table 2: Major Items of Revenue and Expenditure of Xian-Ankang Railway

shown in Table 2. With the increase in traffic volume, business income increased. The increase in business income was relatively low in 2003 compared with the increase in traffic volume, whereas operating expenses increased substantially and, as a result, operating profit was a negative figure. This is attributable to the increase in depreciation expenses included in operating expenses from 87.13 million yuan in 2002 to 142.48 million yuan in 2003, an increase by 55.35 million yuan. According to MOR, the main reason is the change in the calculation method of depreciation expenses.

2.5.2 Operation and Maintenance Status

Since the completion of the project, no breakdown or accident has been reported to date. Operation and maintenance activities in general seem to be performed properly.

In summary, the operation and maintenance status is good, and there is no problem with the technical capacity and organization, and no serious problem with the financial status at present. Therefore, there is almost no problem with sustainability in general.

3. Feedback

3.1 Lessons Learned

None

3.2 Recommendations

None

Comparison of Original and Actual Scope

Item	Plan (as of Phase III)	Actual
①Output		
1)Construction of Railway	246.7km	As planned
2)Construction of Bridges	168 (41.2km)	As planned
3)Construction of Tunnels	101 (121.1km)	101 (139.6km)
4)Construction of Culverts	280 (11.3km)	As planned
5)Stations	26 (25 to be newly constructed)	As planned
6)Substations	8	7
7)Others	Communication and signal equipment	As planned
②Project Period		
1)Land expropriation / relocation	Oct.1994－Dec.1998	Oct.1994－Dec.1998
2)Preparation for construction	Oct.1994－Dec.1998	Oct.1994－Dec.1998
3)Roadbed and civil engineering	Jun.1996－Jun.1999	Jan.1996－Jun.1999
4)Bridges and culverts	Jun.1996－Jun.1999	Jan.1996－Jun.1999
5)Tunnels	Oct.1994－Dec.1999	Oct.1994－Jun.2000
6)Tracks	Sep.1996－Mar.2000	Oct.1998－Sep.2000
7)Communication and signal	Jan.1991－Dec.2000	Jan.2000－Dec.2000
8)Electrification	Jun.1996－Dec.1997 Jan.1999－Dec.2000	Jun.1996－Dec.2000 Jan.2000－Dec.2000
9)Buildings, etc.	Jan.1998－Dec.2000	Jul.1997－Jun.2001
10)Completion and start of operation	Dec.2000	Jan.2001
③Project Cost		
Foreign Currency	35,000million yen	27,043million yen
Local Currency	123,777million yen (9,101million yuan)	131,873million yen (9,101million yuan)
Total	158,777million yen	158,916million yen
ODA Loan Portion	35,000million yen	27,043million yen
Exchange Rate	1yuan＝11.7yen (for 1995) 1yuan＝12yen (for 1996) 1yuan＝13.6yen (for 1997) (Average rate in each expenditure year)	1yuan=14.5yen (1994-2000 average rate)