ASIAN DEVELOPMENT BANK

PCR: PRC 25252

PROJECT COMPLETION REPORT

ON THE

SECOND INDUSTRIAL ENERGY EFFICIENCY AND ENVIRONMENT IMPROVEMENT PROJECT
(Loan 1436-PRC)

IN THE

PEOPLE'S REPUBLIC OF CHINA

October 2003

CURRENCY EQUIVALENTS

Currency Unit – yuan (CNY)

		At Appraisal (3 October 1995)	At Project Completion (30 April 2003)
CNY1.00	=	$0.1197	$0.121
$1.00	=	CNY8.3538	CNY8.30

ABBREVIATIONS

ADB	–	Asian Development Bank
CECIC	–	China Energy Conservation Investment Corporation
EA	–	executing agency
EIA	–	environmental impact assessment
ECP	–	Exi Chemical Plant
EIRR	–	economic internal rate of return
FIRR	–	financial internal rate of return
GCF	–	Guanghua Cement Factory
GSM	–	Guiyang Steel Mills
HCCL	–	Huaxin Cement Company Limited
ICB	–	international competitive bidding
IS	–	international shopping
JGCF	–	Jinxi General Chemical Factory
MOF	–	Ministry of Finance
PIO	–	Project Implementation Office
PRC	–	People's Republic of China
SETC	–	State Economic and Trade Commission
TA	–	technical assistance
TSP	–	Tianjin Soda Plant
WACC	–	weighted average cost of capital

WEIGHTS AND MEASURES

Cal	–	calorie(s)
kg	–	kilogram(s)
mg/m^3	–	milligram(s) per cubic meter
m^3	–	cubic meter(s)
m^3/hour	–	cubic meter(s) per hour
t	–	ton(s)
t/d	–	tons per day
t/yr	–	tons per year
tce	–	tons of standard coal equivalent

NOTES

(i) In this report, "$" refers to US dollars.

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BASIC DATA

A. Loan Identification

1. Country	People's Republic of China
2. Loan Number	1436-PRC
3. Project Title	Second Industrial Energy Efficiency and Environment Improvement
4. Borrower	People's Republic of China
5. Executing Agencies	Part B: Huaxin Cement Co., Ltd. Part C: Jin Hua Chemical (Group) Corporation Part D: Tianjin Bohai Chemical Industry Corporation Part E: Guiyang Special Steel Company Ltd.
6. Amount of Loan	$178.0 million
7. PCR Number	PCR: PRC 746

B. Loan Data

1. Appraisal	
- Date Started	3 October 1995
- Date Completed	17 October 1995
2. Loan Negotiations	
- Date Started	27 March 1996
- Date Completed	29 March 1996
3. Date of Board Approval	9 May 1996
4. Date of Loan Agreement	11 November 1996
5. Date of Loan Effectiveness	
- In Loan Agreement	9 February 1997
- Actual	13 January 1997
- Number of Extensions	None
6. Closing Date	
- In Loan Agreement	30 June 2001
- Actual	25 February 2002
- Number of Extensions	One
7. Terms of Loan	
- Interest Rate	Pool-based variable lending rate for US dollars
- Maturity	20 years
- Grace Period	5 years
8. Terms of Relending	
- Interest Rate	Pool-based variable lending rate for US dollars
- Maturity	20 years
- Grace Period	5 years
- Second-Step Borrower	Part B: Huaxin Cement Co., Ltd.

Part C: Jin Hua Chemical (Group) Corporation
Part D: Tianjin Bohai Chemical Industry Corporation
Part E: Guiyang Special Steel Company Ltd.

9. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval
6 March 1997	25 February 2002	59 months
Effective Date	**Original Closing Date**	**Time Interval**
13 January 1997	30 June 2001	53 months

b. Amount ($ million)

Category	Original Allocation	Last Revised Allocation	Amount Canceled	Amount Disbursed
Civil Works	6.53	3.26	0	3.26
Machinery and Equipment	129.81	131.79	0.56	131.23
Human Resource Dev.	1.65	0.28	0.13	0.15
Engineering Services	2.76	0	0	0
Training	1.03	0	0	0
Unallocated	15.36	0	0	0
IDC	21.89	14.65	0	14.65
Total	**178.00**	**149.98**	**0.69**	**149.29**

IDC = interest during construction.

10. Local Costs (ADB-Financed)

- Amount ($) 0
- Percentage of Local Costs 0
- Percentage of Total Cost 0

C. Project Data

1. Project Cost ($ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	178.00	149.29
Local Currency Cost	239.00	127.86
Total	**417.00**	**277.15**

2. Financing Plan ($ million)

	Appraisal Estimate			Actual		
Cost	**Foreign**	**Local**	**Total**	**Foreign**	**Local**	**Total**
Implementation Costs						
Borrower-Financed	0.00	52.70	52.70	0.00	40.76	40.76
ADB-Financed	162.64	0.00	162.64	134.64	0.00	134.64
Other External Financing	0.00	165.36	165.36	0.00	74.13	74.13
Total	**162.64**	**218.06**	**380.70**	**134.64**	**114.89**	**249.53**
IDC Costs						
Borrower-Financed	0.00	20.94	20.94	0.00	12.97	12.97
ADB-Financed	15.36	0.00	15.36	14.65	0.00	14.65
Other External Financing	0.00	0.00	0.00	0.00	0.00	0.00
Total	**178.00**	**239.00**	**417.00**	**149.29**	**127.86**	**277.15**

ADB = Asian Development Bank, IDC = interest during construction.

3. Cost Breakdown by Project Component ($ million)

	Appraisal Estimate			Actual		
Component	**Foreign**	**Local**	**Total**	**Foreign**	**Local**	**Total**
Preliminary Expenses	0.00	1.11	1.11	0.00	1.45	1.45
Land Acquisition	0.00	0.91	0.91	0.00	1.27	1.27
Site Preparation	0.00	1.84	1.84	0.00	0.97	0.97
Engineering and Design including License Fees	2.76	7.13	9.88	0.00	2.45	2.45
Equipment and Material (Major Process)	122.66	28.73	151.39	131.23	43.69	174.92
Auxiliary Equipment	3.05	15.23	18.28	0.00	0.00	0.00
Import Duties	0.00	56.23	56.23	0.00	0.00	0.00
Domestic Transport	0.00	6.33	6.33	0.00	1.91	1.91
Construction and Erection Including civil works	6.53	58.50	65.03	3.26	43.68	46.94
Consulting Service	0.00	1.49	1.49	0.00	0.13	0.13
Training	1.65	1.40	3.05	0.15	0.16	0.31
Commissioning and Start Up	0.00	1.11	1.11	0.00	8.56	8.56
Energy and Environmental Management	4.10	3.95	8.05	0.00	0.06	0.06
Project Management	0.00	4.93	4.93	0.00	4.22	4.22
Base Cost	**140.74**	**188.91**	**329.65**	**134.64**	**114.89**	**249.53**
Physical Contingency	14.07	18.89	32.96	0.00	0.00	0.00
Subtotal	**154.81**	**207.80**	**362.61**	**134.64**	**114.89**	**249.53**
Price Contingency	7.82	10.27	18.09	0.00	0.00	0.00
IDC	15.36	20.93	36.29	14.65	12.97	27.62
Total	**178.00**	**239.00**	**417.00**	**149.29**	**127.86**	**277.15**

IDC = interest during construction.

4. Project Schedule

Milestone	Appraisal Estimate	Actual
Date of Contract with Foreign Consultants		
Part B	Aug 1997	
Part C	Jul 1997	
Part D	Aug 1997	
Part E	Oct 1997	
Completion of Detailed Engineering Designs		
Part B	Dec 1998	Mar 1998
Part C	Mar 1999	Sep 1997
Part D	Dec 1998	Jun 1998
Part E	Mar 1999	Dec 1998
Equipment and Supplies		
Dates		
First Procurement		
Part B	Oct 1997	Dec 1996
Part C	Jun 1997	Dec 1996
Part D	Jan 1997	Mar 1997
Part E	Apr 1997	Dec 1997
Last Procurement		
Part B	Dec 1997	Jul 1998
Part C	Dec 1997	Mar 2001
Part D	Sep 1997	Dec 1999
Part E	Jun 1998	Apr 2001
Completion of Equipment Installation	Mar 2000	Sep 1998
Part B	Jun 2000	Jun 1998
Part C	Dec 1999	Sep 1999
Part D	Jun 2000	Mar 2001
Part E		
Completion of Tests and Commissioning		
Part B	Mar 2001	Feb 1999
Part C	Dec 2000	Sep 1998
Part D	Mar 2000	Dec 1999
Part E	Dec 2000	Sep 2001
Beginning of Start-Up		
Part B	Oct 1999	Mar 1999
Part C	Oct 1999	Sep 1998
Part D	Oct 1999	Dec 1999
Part E	Oct 1999	Jun 2000

5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
(i) From Jan 1999 to Nov 2000	HS	HS
(ii) From Dec 2000 to May 2001	HS	S
(iii) From Jun 2001 to Dec 2002	S	S

HS = highly satisfactory, S = satisfactory.

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members[a]
Fact-Finding	17 May–2 Jun 1995	6	96	a,b,c,d,e,f
Appraisal	3–17 Oct 1995	5	70	a,b,d,e,g
Inception	16–20 Dec 1996	3	12	a,j
Disbursement	26–28 May 1997	1	2	h
Reformation	29 July–2 Aug 1997	2	8	a,b
Review 1	20–29 Oct 1997	2	18	a,j
Review 2	5–15 Oct 1998	2	10	a,j
Reappraisal	13–17 Sep 1999	3	12	a,b,i
Review 3	15–25 Nov 1999	2	14	a,j
Review 4	12–19 Oct 2001	2	14	a,j
Project Completion Review[b]	10–25 Mar 2003	4	60	a,j,k,l

[a] a – engineer, b – financial analyst, c – environment specialist, d – project economist, e – program economist, f – young professional, g – counsel, h – control officer, i – economist for environment, j – assistant project analyst, k – energy specialist, l – staff consultant.

[b] The Mission comprised C. S. Chin, senior portfolio management specialist and mission leader; M. Pajarillo, energy specialist (financial); M. D. Kawashima, assistant project analyst; and staff consultant.

I. PROJECT DESCRIPTION

1. The Government of the People's Republic of China (PRC), recognizing the importance of industrialization to its economic development, embarked on capital- and energy-intensive industrialization programs in the 1950s without due regard to their efficiency, sustainability or damage to the environment. These reforms laid the groundwork for spectacular economic growth in later years. The average annual growth rate of gross domestic product has exceeded 10% in real terms in the past decade. However, the Government's pursuit of economic self-sufficiency through industrialization also resulted in the adoption of obsolete technologies, poor product quality, and environmental degradation. Though installed electricity generation grew at an average annual rate of about 8% during the past decade, an acute power shortage constrained economic development. At the same time, fast economic growth coupled with the expansion in power generation increased environmental pollution. Realizing that energy conservation and environmental improvements are essential to sustaining rapid economic growth in the PRC, the Government's sectoral objectives since the 1980s have promoted a more market-oriented economy along with the adoption of energy-efficiency and environmental-improvement measures in energy-intensive industries. The successful implementation of an earlier loan[1] demonstrated that investments in energy conservation and environmental improvement in three energy-intensive industrial subsectors can be financially and economically viable. A follow-on project was approved to promote further policy reforms that encourage energy efficiency and to provide additional demonstration investments that can reduce energy consumption with substantial benefits for the environment in the industrial sector.

2. The main objective of the Project was to promote sustainable improvements in energy efficiency in the industrial sector with substantial environmental benefits. The Project aimed to support legislative and institutional reforms in energy conservation and market-based economics, while financing catalytic investments in energy efficiency and environmental improvements. In an attempt to achieve sector-wide demonstration effects, the Project focused on five enterprises in three major groups of energy-intensive industries namely cement, chemical, and metallurgy.

3. The Project, as appraised, consisted of energy-efficiency and environmental-improvement investments in five subprojects in three provinces and one municipality. The five subprojects are Huaxin Cement Company Limited (HCCL), Guanghua Cement Factory (GCF), Guiyang Steel Mills (GSM), Jinxi General Chemical Factory (JGCF), and Tianjin Soda Plant (TSP). However, GCF was unable to mobilize resources from the domestic financing institutions because of its deteriorating financial condition resulting from several unplanned investments. Exi Chemical Plant (ECP) replaced GCF in 1997, but in December 1999, the ECP subproject was also canceled due to its inability to secure the needed provincial government loan guaranty.

4. In May 1996, the Asian Development Bank (ADB) approved a loan of $178 million from its ordinary capital resources for the Project. The loan carried a term of 20 years, including a grace period of 5 years, with a variable interest rate determined according to ADB's variable lending rate system for US dollar loans plus an annual commitment charge. The loan proceeds were re-lent on the same terms and conditions to the five subproject enterprises under subsidiary loan agreements with each enterprise taking on the foreign-exchange and interest-variable risks. Each subproject enterprise was the Executing Agency (EA) of its component.

[1] ADB. 1992. *Project Completion Report on the Industrial Energy Conservation and Environment Improvement Project in People's Republic of China.* Manila.

5. All four subprojects were completed ahead of or on schedule. The original loan closing date was extended by 3 months to accommodate the completion of additional works financed using loan savings. A total of $149.3 million in loan funds were disbursed, while $28.7 million in funds were canceled. The subproject enterprises started loan repayment in 2001, and by April 2003 had repaid the principal of $9.7 million.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

6. The Government of the PRC recognized that (i) promoting energy conservation is important to address the shortfalls in energy supply, and (ii) increasing environmental problems are constraining sustainable economic growth and development. In response, the Government has invested increasingly in energy-efficiency and environmental-improvement measures, particularly in energy-intensive industries. Strengthening the legal and institutional framework to support energy conservation in the context of the market-oriented policy environment has also been a major focus. The Government strategy is in line with ADB's strategy for the PRC, which has three main objectives: (i) improving economic efficiency, (ii) reducing poverty, and (iii) improving the environment while conserving natural resources. The Project supports ADB's strategy for the PRC and is an integral part of the Government's national program for urban environmental improvement. Formulated with ADB technical assistance (TA),[2] the Project was designed to promote energy efficiency to address energy supply shortfalls and to reduce air and water pollution, thus facilitating sustainable economic growth. The TA assisted the Government in refining the action plan for introducing additional market-oriented measures to improve energy conservation policies and programs, including the subsequent enactment of the Energy Conservation Law. The Government agreed to consolidate and streamline agencies involved with energy management, including reorienting China Energy Conservation Investment Corporation (CECIC) as a commercial entity to finance small and medium-sized investments in energy conservation. An analysis of the impact of projects on the environment as well as their social benefits and costs is now routinely carried out before new investments are considered. ADB helped the PRC achieve its country strategies for economic growth and environmental protection by (i) financing direct investments in five demonstration projects that use cleaner production processes, such as conserving energy and improving the environment through industrial renovation; (ii) strengthening the institutional framework for management of energy conservation; and (iii) continued reforms in market-based energy pricing.

7. The project design was generally sound and the formulation process was considered adequate except that the Appraisal Mission failed to detect pending investments by GCF that eroded its financial performance. Stakeholders were consulted through the normal government process, and the project scope was determined through consultations with local and central governments and project enterprises. The selected subprojects are in industrial subsectors with high energy intensity and high aggregate energy use and in which enterprise reforms have been adopted. The TA confirmed that the energy-efficient production processes with substantial environmental improvements that were adopted were cost-effective and financially sustainable. The major events in project implementation are listed in Appendix 1.

[2] ADB. 1994. *Technical Assistance to the People's Republic of China for the Second Industrial Energy Efficiency and Environmental Improvement Project.* Manila.

B. Project Outputs[3]

1. Subproject B—Huaxin Cement Company Limited (HCCL)

8. HCCL aimed to replace its wet process and shaft kilns with a suspension preheater dry process kiln with a design capacity of 4,000 tons (t) per day (d) clinker. The scope included quarry equipment, a limestone crushing and preblending plant, a raw meal homogenizing and feeding plant, a kiln preheater and calciner system, a coal mill, instrumentation, a process and control system, conveying equipment, a weighing system, and waste gas treatment. HCCL was implemented as appraised except that the new facilities are producing about 5,500 t/d of clinker. While the two shaft kilns were shut down after the operation of the new facilities, the three wet process kilns continued to operate. Thus, the clinker production increased by 1.99 million tons per year (t/yr). However, the wet process kilns have been renovated at a cost of CNY15 million by Huaxin Cement Company (Huaxin), the EA for HCCL, to ensure compliance with national air discharge standards and to reduce aggregate energy consumption. Despite the higher throughput, the air discharge of dust particulate fell by 3,453 t/yr and energy consumption dropped by about of 28,600 tons of standard coal equivalent (ce) per year.[4] The Project helped to turn Huaxin into a large-scale and leading domestic cement producer, and helped HCCL to attract foreign equity investment. Appendix 2 shows the capacity, production volumes, and by-products for each plant.

2. Subproject C—Jinxi General Chemical Factory (JGCF)

9. JGCF aimed to replace mercury and diaphragm cells for caustic soda production with ion exchange membrane cells. The subproject scope included ion membrane electrolysis, brine purification and filtration, chlorine compression technology, instrumentation, and accessories. The subproject was implemented as planned except that the scope was expanded to include a prilled caustic soda plant using loan savings. The new facilities are producing about 120,000 t/yr of caustic soda, an increase of 40,000 t/yr over the design capacity. The Project reduced aggregate energy consumption with savings estimated at 57,240 tce/yr.[5] Despite the higher production capacity, the new facilities met national air and water discharge standards. The decommissioning of the mercury and diaphragm cells effectively eliminated harmful exposure to mercury, asbestos, lead and asphalt. The Project enabled Jinhua Chemical Group Corporation (Jinhua), the EA for JGCF, to be restructured into a shareholding company (renamed Jinhua Group Chlor-Alkali Company Limited) with its shares listed on the Shenzhen Stock Exchange since 1997. The performance of the ion membrane cells was so successful that Jinhua decided to negotiate with the same supplier for the supply of a similar process plant at a design capacity of 120,000 t/yr using a supplier's credit loan from Japan Bank for International Cooperation. The Project, together with the subsequent additional plant, propelled Jinhua into second place, from fifth, in terms of caustic soda production in the PRC.

3. Subproject D—Tianjin Soda Plant (TSP)

10. TSP aimed to improve the production of dense soda ash by modifying the technology of the ammonia shift, absorption, and distillation sections. The subproject scope covered a soda ash plant, an ammonia absorption and distillation plant, and an ammonia synthesis plant. The subproject was completed as appraised. The new facilities are producing about 47,000 t/yr of

[3] Originally, five subprojects A to E. However, subproject A was cancelled for reasons as explained in para 8 above.
[4] HCCL own monitoring.
[5] Jinhua own monitoring.

ammonia-soda, about 40,000 t/yr of dense soda ash, and about 8,000 t/yr of ammonia, at a lower unit energy consumption. The Project reduced aggregate energy consumption with savings estimated at 29,716 tce/yr.[6] A panel of experts independently concluded that the new facilities were meeting environmental discharge standards. The quality of construction and equipment was also determined to be good. The production of quality dense soda ash, ammonia, and other chemical products through the new facilities enabled Tianjin Bohai Chemical Industry Corporation (Tianjin Bohai), the EA for TSP, to obtain an ISO 9000 quality certificate and propelled the company into the top 100 large-scale chemical factories in the PRC. While its dense soda ash production contributed about 8% of the country's annual production, Tianjin Bohai accounted for about 27.5% of the PRC's exports of dense soda ash. Leading glass manufacturers in five countries use its dense soda ash in making high quality glass. Though its new cogeneration plant was not financed under the loan, Tianjin Bohai is currently supplying about 33% of the heating in the new economic development zone of Tanggu district in Tianjin.

4. Subproject E—Guiyang Steel Mills (GSM)

11. GSM aimed to modernize its special steel production by replacing its obsolete melting furnaces with a large electric arc furnace with downstream continuous casting facilities. The subproject scope included one 60 t electric arc furnace, one 60 t ladle furnace, three strand continuous casting machines, a water circulation and treatment system, an additive charging system, dedusting equipment, a power distribution system, laboratory equipment, a crane, scrap yard equipment and tapping car, and steel construction materials. The subproject was implemented as planned except that vacuum degassing equipment was added using loan savings. The vacuum degassing equipment was added to eliminate, through further processing of the molten steel, some gaseous contaminants that made the quality of the steel product inconsistent. Inexperienced operators, weak management, and the complexity of equipment operation prolonged the commissioning of the new facilities. This resulted in inconsistent special steel quality. In addition, the new facilities were operating at about half the designed throughput because of an irregular supply of scrap metal, the main raw material. An independent panel determined the new facilities to be of satisfactory quality and capable of meeting the designed throughput. The air pollution associated with steel production by the new facilities is within the national air discharge standards, though the air pollution from the old coking plant within the factory still exceeds the standards. Guiyang Special Steel Company Limited (GSSC), the EA for GSM, is planning to invest in a new coking plant to ensure that the entire factory can comply with the air discharge standards.

C. Project Costs

12. At appraisal, the total cost including contingencies and interest and other charges during construction was estimated at $417.0 million. The total includes a foreign exchange component of $178.0 million representing 43% of the project cost. At completion, the project cost was $277.1 million, which included $149.3 million in foreign exchange and $127.8 million equivalent in local currency costs. The lower investment costs were due to (i) the cancellation of the GCF subproject, which had a planned investment of $75.9 million; and (ii) strong competitive bidding for equipment. Excluding GCF, the actual project costs were lower than the appraisal estimate by $64.0 million or 19%. The breakdown of the appraisal estimate and actual project costs is shown in Appendix 3. In addition to the partial cancellation of loan funds allocated to GCF, there were loan savings of about $5.2 million. From those savings, $4.5 million was subsequently

[6] Tianjin Bohai own monitoring.

approved for the procurement of prilled caustic soda production equipment under JGCF and vacuum degassing equipment under GSM, while $0.7 million was canceled upon loan closure.

13. The cost of HCCL was $96.2 million, 33% lower than the appraisal estimate of $143.9 million even though the plant capacity was about 30% greater than the original design. The waiver of import duties on imported equipment, effective procurement packaging, and lower domestic equipment costs were the main reasons for the lower subproject costs of HCCL. The cost of JGCF was $52.1 million, 9% lower than the appraisal estimate even though the subproject scope was expanded to include prilled caustic soda processing equipment. The reduction in investments for JGCF resulted from the lower-than-expected cost of equipment, brought about by strong competitive bidding and a partial waiver of import duties. TSP's cost at $56.6 million was 19% lower than the appraisal estimate because of a waiver of import duties. The cost of $72.3 million for GSM was 3% higher than the appraisal estimate even with the waiver of import duties. The higher-than-expected cost was due to the expansion of the subproject scope to include a vacuum degassing equipment and the procurement of initial replacement parts.

14. The financing plan envisaged at appraisal included a $178.0 million loan from ADB to finance the entire foreign currency cost of the Project. The local currency cost of $239.0 million equivalent was to be met by domestic loans of $106.3 million equivalent and an equity contribution of $80.0 million plus a share issue and internal cash generation of $52.7 million from the enterprises. The actual funding came from (i) a $149.3 million ADB loan, representing 54% of the total project cost; (ii) $74.1 million equivalent from domestic borrowing, covering 27% of the project cost; and (iii) $53.7 million equivalent in equity contributions from the enterprises, representing 19% of the cost. Appendix 4 summarizes the proposed financing plan and the actual funding sources.

D. Disbursements

15. Loan disbursements were carried out in accordance with the ADB's *Disbursement Handbook*. Two months after the loan became effective in January 1997, disbursements began; the last disbursement was in February 2002. Disbursements were made mainly through commitment letters and direct payment. No imprest account was deemed necessary, though advances were made for training and human resource development. Loan closure was delayed by 2 months because the final liquidation of the advances took longer than expected. The total loan amount disbursed was $149.3 million with the remaining unutilized loan balance of $0.7 million canceled upon loan closure. Cumulative loan cancellations, including the funds from the earlier cancellation of GCF, totaled $28.7 million. Overall utilization of the ADB loan was, therefore, about 84%. Contract awards and loan disbursements were ahead of the appraisal projections except for the final year when the actual disbursement closely matched the projections, as shown in Appendix 5.

E. Project Schedule

16. The loan was approved on 9 May 1996 and became effective on 13 January 1997 with a planned loan closing date of 30 June 2001. Considering that the Project consisted of five subprojects in three provinces and one municipality—and the GCF enterprise's subsequent decision not to proceed with its subproject—the 249-day period from loan approval to loan effectiveness is a good achievement. The delay in loan signing and loan effectiveness did not affect the physical implementation of the Project as the remaining four subproject enterprises began procurements in accordance with the appraisal schedule. Due to delayed implementation

of the additional works using loan savings, the initial loan closing date of 30 June 2001 was extended by 6 months to 31 December 2001. The actual loan closing was on 25 February 2002 after the final liquidation of advances by Jinhua. The actual and projected implementation schedules are in Appendix 6. The four subprojects as originally appraised were completed, with HCCL, TSP, and JGCF ahead of schedule by 16, 12 and 11 months, respectively. GSM was completed on time.

17. HCCL started in October 1997 and was basically completed by the end of 1998. The first qualified clinker was produced in February 1999. Since then, the new facilities have been in normal production with annual throughput consistently exceeding the subproject design. JGCF began in January 1997 and completed the original project scope in May 1998. The new facilities began commercial operation in August 1998 with actual throughput consistently about 50% higher than specified. However, the additional processing equipment to produce prilled caustic soda was completed only by the end of 2002, with production commencing in early 2003. TSP began in December 1996 and was completed in December 1999, with commercial production of dense soda ash starting in early 2000. Though an independent panel concluded the new facilities meet product quality and throughput design specifications, and are in full compliance with the national air discharge standards, the facilities were operating intermittently in 2000–2001 due to reduced demand for dense soda ash. GSM started in June 1998 and was basically completed in June 2000, but commissioning took more than 6 months as the operators and management team were unfamiliar with the proper operation of the furnaces and control systems. In fact, the new facilities were put into commercial operation only in early 2001, as the special steel product was not consistent in quality. In addition, the new facilities operated intermittently due to a shortage of scrap metal, which is the main source of feedstock. In order to improve the steel quality, ADB approved in late 1999 the use of loan savings for the procurement of 60 t/yr vacuum degassing equipment to remove gaseous contaminants. The installation of the vacuum degassing equipment was completed in December 2001 and the equipment started operations in early 2002.

F. Implementation Arrangements

18. As envisaged at appraisal, each subproject enterprise was to be the EA responsible for implementation of its component through its newly established project implementation office (PIO). Each PIO is headed by a general manager and staffed with qualified and experienced personnel. Using their own funds, the PIOs have engaged domestic design institutes for preliminary design work and detailed engineering. Similarly, the PIOs have engaged domestic procurement agencies to help procure equipment and services financed under the loan. Appendix 7 shows the current individual enterprise structure. To ensure prompt completion and high standards, Huaxin engaged three specialized firms to supervise project implementation. The former State Economic and Trade Commission (SETC) was responsible for coordination of the Project. Though a policy coordination office (PCO) with representatives from various ministries was established, the PCO remained inactive following the government reorganization in 1998. However, the implementation of the energy conservation law, market-based policy reforms, and other institutional measures continued under the ministries. The use of domestic consulting firms for design and procurement proved to be effective, as the Project was implemented within the appraisal schedule and cost. The new facilities met, or even exceeded, the design capacity and requirements.

G. Conditions and Covenants

19. Overall, the loan covenants have been complied with except for (i) the financial covenants on debt service and current ratio by three enterprises (GSSC, Huaxin, and Tianjin Bohai) and (ii) the failure of Huaxin to close its three wet process kilns because of the high market demand for cement. Huaxin also explained that the required environmental improvement measures have been carried out for these three kilns (Appendix 8). The mercury-contaminated plant and the asbestos-contaminated plant in JGCF have been dismantled and properly disposed as planned. Tianjin Bohai was able to extend the useful life of its sludge disposal site after installing a sludge concentrating machine, as less sludge is now generated for disposal. However, Tianjin Bohai has also constructed a new sludge disposal site adjacent to the existing site. A check of the site confirmed that proper environmental protection measures are in place to ensure compliance with environmental requirements. At their own initiative, the individual enterprises conducted limited workshops to publicize their achievements in energy savings and environmental improvement to encourage adoption for similar technologies by enterprises in the same sectors. However, SETC made no concerted effort to publicize these achievements to facilitate replication. Each enterprise regularly submitted project progress reports and annual audited financial reports with only an occasional slight delay. None of the enterprises has submitted its annual report on benefit monitoring and evaluation since loan closure.

H. Related Technical Assistance

20. ADB approved a project preparatory TA[7] grant to explore the need for further policy reforms to promote energy conservation and to examine the feasibility of additional demonstration investments in subprojects in the industrial sector that could be supported by a follow-on loan. The TA identified reforms needed to enhance market-oriented incentives for continued improvements in the energy conservation policies and programs. In addition, the TA confirmed that the project scope and selection of subprojects were appropriate and the Project was cost-effective and financially sound. The TA also assisted the Government in refining the action plan for introducing additional market-oriented measures aimed at improving energy conservation policies and programs. The project preparatory TA was rated as partially successful because it failed to identify the pending financial problems of one subproject enterprise, which necessitated an early substitution of the GCF subproject. No advisory TA was provided.

I. Consultant Recruitment and Procurement

21. Using its own funds, each PIO engaged one or two domestic design institutes, in accordance with procurement procedures acceptable to ADB, to help prepare preliminary designs and detailed engineering. Huaxin, at its own expense, also engaged three domestic consulting firms to assist in project supervision and commissioning. While international engineering firms were envisaged to provide process licenses and supply key equipment, none was engaged as the enterprises were familiar with the new process and were confident that they could select the most appropriate technology and process. This resulted in substantial savings in engineering services. For procurements using international competitive bidding and international shopping procedures, domestic procurement agencies were engaged at the enterprise's expense to draft bidding documents and assist in bid evaluation and contract management. The services of the domestic consulting firms and design institutes were considered satisfactory. The use of a procurement agency to assist in procurements proved to

[7] Footnote 2.

be wise as the enterprises, with limited understanding of the English language, were unfamiliar with overseas procurements and ADB procedures. All the enterprises were satisfied with the services rendered by the procurement agencies.

22. All equipment was procured in accordance with ADB's *Guidelines for Procurement*. Equipment with a contract value of more than $500,000 each was procured following international competitive bidding procedures; that with a contract value less than $500,000 each was procured using international shopping procedures. However, the value of 11 of the international shopping contracts awarded was higher than $500,000 because either (i) the bid prices exceeded estimates, or (ii) subsequent contract variation orders included additional spares or items. In addition, ADB approved direct purchases for 10 contracts and three repeat orders for procurement of critical computer components. While some enterprises found ADB guidelines to be cumbersome, all agreed that the guidelines ensured procurement of the most suitable equipment at the most competitive price and accounted for substantial savings in foreign costs for equipment procured using loan funds. The details of the procurement packages financed by ADB and the mode of procurement are given in Appendix 9.

J. Performance of Consultants, Contractors, and Suppliers

23. The domestic design institutes provided appropriate preliminary designs and detailed engineering on time. However, the cost estimates prepared by the design institutes were generally high, resulting in substantial cost underruns. All the enterprises were satisfied with their services. Domestic consulting firms recruited for project supervision and the procurement agencies engaged were likewise generally satisfactory.

24. The civil work contractors and the equipment installation contractors were competent and completed all assignments in a satisfactory and timely manner, while also delivering good quality. Equipment suppliers generally complied with their contractual terms, except for the late delivery and poor quality of some domestically manufactured equipment for GSM. Most facilities either met or exceeded the design requirements.

K. Performance of the Borrower and the Executing Agency

25. The Borrower executed the loan and project agreements in about 6 months because the enterprise for GCF was unable to secure the required domestic funding. Once it was determined that GCF would be excluded from the Project, the Borrower promptly completed all requirements for loan effectiveness. Although the loan signing was delayed, loan effectivity took place within the normally allowed 90 days from loan signing. Project implementation started promptly after the loan became effective with the exception of GSM, which started about 18 months later because of the slow mobilization of the required domestic funding. In fact, JGCF began procuring equipment immediately after the loan was approved in order not to miss the relatively short construction period for 1997. Implementation was generally in line with arrangements envisaged at appraisal and was completed generally ahead of schedule. That three subprojects were completed ahead of schedule and with some loan savings, and that the equipment generally performed above design capacity, testified to the enterprises' strong capability in project implementation and their knowledge of the new process. The training provided under the Project enabled the assisted enterprises to operate and maintain the project facilities in a systematic manner. However, the Mission encountered difficulties in obtaining the required data because most EA staff who were actively involved with project implementation had retired. The performances of the Borrower and the four EAs were considered satisfactory.

L. Performance of ADB

26. ADB regularly fielded missions to review the progress and help resolve procurement and implementation problems. ADB maintained close coordination and good relationships with the Borrower and the EAs throughout project implementation. All procurement matters referred to ADB were promptly cleared and no dispute was noted. The four enterprises appreciated the advice and assistance provided by the review missions. When it was realized that the GCF subproject could not proceed, ADB readily agreed to examine the proposal to substitute another subproject. When there was substantive loan savings, ADB promptly approved using the savings to procure additional processing equipment for JGCF and GSM to enhance the quality and market value of products produced. In addition, ADB granted an extension of the loan closing date by 6 months when delays were encountered in the completion of the additional facilities. Overall, ADB's performance is considered highly satisfactory.

III. EVALUATION OF PERFORMANCE

A. Relevance

27. The Project was consistent with the Government's emphasis on sustainable economic development and was part of the national plan for energy conservation and environmental improvement. Likewise, the Project was in line with ADB's operational priorities for the country at the time of appraisal and remains relevant under the current thrust for sustainable economic development and protecting the environment. However, ADB has moved away from financing energy conservation industrial projects in the PRC in recent years. The Project is rated "relevant."

B. Efficacy in Achievement of Purpose

28. The Project achieved its main objectives of (i) promoting sustainable energy efficiency improvements with substantial environmental benefits in the industry sector, (ii) strengthening the management of energy conservation and environment improvement, and (iii) introducing clean production technology. However, the objective of demonstrating that investments in energy efficiency and environmental improvement can be replicated by other enterprises in the same sector has not been fully achieved. Concerted efforts were not made to publicize the project's achievements, still other enterprises have adopted similar modifications on their own. Nevertheless, five industrial enterprises received ADB financing in subsequent loans for environmental improvement. The Project was rated "efficacious."

C. Efficiency in Achievement of Outputs and Purpose

29. The four subprojects were completed and began commercial operation either ahead of schedule or on time and within the appraisal cost estimates. In addition, the project facilities were able to reach design capacity. However, all the project enterprises were experiencing poor financial performance because of declining prices for their products after the Project came on stream. Nevertheless, the Project was rated "efficient" in achievement of purpose because (i) it was completed on time and within the project cost estimates, and (ii) all the project facilities either met or exceeded the design capacity and environmental discharge standards.

1. Financial Analysis

30. The financial performance of the project enterprises from 1996 to 2002 is elaborated and shown in Appendix 10. The financial internal rate of return (FIRR) for each subproject was recalculated on the basis of its financial performance up to 2002. Financial projections were based on data provided by the enterprises. Actual capital costs incurred for the subprojects were used. Revenue was based on incremental sales attributed to the Project. Actual operating and maintenance costs were assumed with corresponding adjustments for the higher production volumes. Revenues and expenses were maintained in 2002 price terms. The reevaluated FIRR of the individual subprojects was lower than the appraisal estimate mainly due to the combined effect of lower selling prices of their major products and higher-than-projected input costs, but in all cases, it is higher than the weighted-average cost of capital (WACC). Table 1 summarizes the FIRR and WACC at appraisal and as reevaluated at the project completion review. Details are shown in Appendix 11.

Table 1: Recalculated FIRR and WACC

Subproject	FIRR at Appraisal (%)	FIRR at PCR (%)	WACC at Appraisal (%)	WACC at PCR (%)
HCCL	11.6	10.0	6.3	4.3
JGCF	12.8	11.5	3.9	4.5
TSP	10.5	8.8	6.3	4.9
GSM	12.4	8.5	3.9	5.1
Whole Project	—	9.5	—	4.7

FIRR = financial internal rate of return, GSM = Guiyang Steel Mills, HCCL = Huaxin Cement Company Limited, JGCF = Jinxi General Chemical Factory, PCR = project completion report, TSP = Tianjin Soda Plant, WACC = weighted-average cost of capital.
Source: Staff estimates.

2. Economic Analysis

31. An economic evaluation was carried out for the individual subprojects following the methodology used at appraisal but with certain changes in assumptions as explained in Appendix 12. Table 2 shows the recalculated economic internal rate of return (EIRR) of the subprojects compared with appraisal.

Table 2: Recalculated EIRR

Subproject	EIRR at Appraisal (%)	EIRR at PCR (%)
HCCL	13.2	12.7
JGCF	20.2	18.5
TSP	14.1	12.3
GSM	16.0	12.2
Whole Project	—	13.2

EIRR = economic internal rate of return, GSM = Guiyang Steel Mills, HCCL = Huaxin Cement Company Limited, JGCF = Jinxi General Chemical Factory, PCR = project completion report, TSP = Tianjin Soda Plant.
Source: Staff estimates.

32. The reevaluated EIRR for all subprojects was lower than the appraisal estimate due to lower benefits and higher operating costs than originally anticipated at appraisal. Nevertheless, the reevaluated EIRR for the individual subprojects and for the entire Project are still higher than the economic opportunity cost of capital of 12%.[8]

D. Preliminary Assessment of Sustainability

33. While the financial condition of Tianjin Bohai and GSSC is currently weak, their performance is expected to improve now that more competent and better-qualified management staff is in place and the prices of the products have firmed up. Tianjin Bohai has invested in a new cogeneration plant to reduce its production costs further. With the commissioning of its new cogeneration plant planned for the second quarter of 2003, and taking into account its strategic location, Tianjin Bohai's performance should strengthen in the coming years. GSSC planned to construct a new rolling steel mill to use the excess carbon steel generated by its continuous casting mill in the production of higher value steel plates particularly suited for automobile manufacturing, which are in short supply. GSSC's performance is also expected to strengthen after the completion of its planned expansion. With the combination of higher quality products at lower production costs from the new facilities and the training provided under the Project, all the assisted enterprises have strengthened their market positions. The Project is rated likely to be sustained.

E. Environmental, Sociocultural, and Other Impacts

34. Each enterprise prepared the environmental impact assessment (EIA) report for its subproject with assistance from the authorized environmental agencies in accordance with the PRC's Environmental Protection Law. The state environmental protection agency and the local environmental protection bureaus approved the reports. The summary EIA prepared by the Borrower was circulated to ADB's Board in August 1995. During project implementation, the EAs (or the appointed supervising firms) supervised the introduction of mitigating measures as outlined in the summary EIA. Proper enclosures were erected at the work sites. No land was acquired as all project facilities were carried out on land within the enterprise's compound. About $14.9 million, or 5.4% of the actual project cost, was spent on environmental improvement-related works. Appendix 13 shows the investments by individual enterprises in environmental improvements. The acquisition of state-of-art industrial pollution control technologies and the adoption of clean production technology have ensured that the project facilities are operated and maintained in conformity with the PRC's environmental protection standards for solid, liquid and gaseous waste discharge and disposal. A panel of experts, which included environmental specialists, conducted an independent assessment of environmental compliance during performance evaluation of the project facilities in 2001–2002. Each project facility met environmental standards for the applicable respective industry. Appendix 14 shows the environmental impact of the Project.

35. Specifically, HCCL included the provision of 59 high efficiency dedusting systems for all emission points, including three electrostatic precipitators at the new dry process line. With the operation of the project facilities, the two shaft kilns were dismantled and disposed. However, the three wet process kilns, which should have been decommissioned after the operation of the project facilities, continued to operate (though with the new dedusting system). The operation of the new dry process line, together with the 59 dedusting systems, has effectively reduced dust emission density to less than 100 milligrams (mg) per cubic meter (m^3), which is the national air

[8] Guidelines for the Economic Analysis of Projects issued in February 1997.

discharge standard for cement industry. Dust emissions after the completion of the Project have been reduced to 3,545 t/yr from 9,608 t/yr, a net reduction of 6,063 t/y. If the three wet process kilns were shut down, dust emissions would be reduced by an additional 3,453 t/yr. The project facilities also have effectively reduced energy consumption to an average of 769 Cal for each kilogram of clinker produced (comparable to advanced cement production), resulting in net coal savings of about 28,600 tce per year. Appendix 15 details the energy savings under the Project.

36. The production of caustic soda using ion-membrane electrolysis under JGCF has allowed the decommissioning and dismantling of the diaphragm electrolysis plant and the mercury electrolysis plant, resulting in the elimination of mercury, lead, and asbestos poisoning and the significant reduction in related occupational sickness. The project facilities also have reduced wastes-gas discharge to 86,510 cubic m^3 per hour from 164,000 m^3/h; wastewater discharge to 172,700 t/yr from 280,000 t/yr; and solid waste to 7,000 t/yr from 7,133 t/yr. The new technology also has lowered energy consumption, with annual energy savings of 57,240 tce. The dismantled mercury plant included contaminated earth, which was sold to a specialized hazardous waste treatment shop for recovery of mercury to ensure no further contamination.

37. The facilities provided under TSP reduced energy consumption to 0.55 million Cal from 0.71 million Cal for each ton of dense soda ash produced. For each ton of ammonia produced, energy consumption dropped to 12.58 million Cal from 14 million Cal. The wastewater and air discharge complied with the national discharge standards for the chemical industry. In addition, Tianjin Bohai is finalizing the replacement of its 12 inefficient and polluting boilers with a high efficiency boiler and cogeneration plant. The new boiler and cogeneration plant, which was scheduled for commissioning in June 2003, is expected to improve the air quality in the surrounding populated area as the plant will meet about one third of the heating requirements in the area. In fact, property values in the area have risen by at least 20% since the project facilities came on stream.

38. While the facilities provided under GSM met national standards for air, wastewater discharge, and noise levels, the overall air quality within the factory has not improved substantially because some old and obsolete coking and milling plants are still being operated. GSSC plans to replace the obsolete plants and construct a new milling plant during the next 5 years in order to comply with the environmental standards for the steel industry. GSSC also plans to optimize the plant capacity and maximize profits through the production of higher valued products such as automobile body parts. The new furnaces and continuous casting mill provided under GSM reduced energy consumption by 12%.

3. Social Impact

39. The facilities under the Project were constructed on their own premises, so neither land acquisition nor resettlement was needed. The construction of the project facilities provided about 4,450 person-years of temporary employment, including the hiring of local residents amounting to 650 person-years during project implementation. About 15% of these were women. In addition, the project facilities created permanent employment for 2,810 people through additional employment and redeployment, 24% of whom were female.

4. Capacity Building

40. The Project provided 1,725 person-days of overseas training and 20,775 person-days of domestic training on effective operation and maintenance of the project facilities to staff, as detailed in Appendix 16. The close involvement of senior management staff during project implementation exposed them to modern management techniques for effective planning and implementation and gave them a better understanding of the new technology and automated control systems. This exposure also helped GSSC, Jinhua, and Tianjin Bohai obtain International Organization for Standardization (ISO) 9000 certification after operation of the project facilities. In addition, Jinhua is in the process of securing ISO 14000 certification. For GSSC, Jinhua, and Tianjin Bohai, ADB training on project implementation and procurement has strengthened the staffs' financial management capabilities and enhanced their confidence in conducting and participating more aggressively in international competitive bidding. The four assisted enterprises are among the top 500 domestic enterprises in the PRC. Jinhua and Tianjin Bohai rank second and fifth, respectively, in terms of soda production in the PRC.

5. Enterprise Restructuring

41. The exposure of senior management staff of the assisted enterprises to modern business management enabled them to accelerate the restructuring of their enterprises. Within 1 year of project approval by ADB, Jinhua completed its assets reevaluation and was restructured into a shareholding company. An initial public offering immediately followed in 1997, and its shares are now actively traded on the Shenzhen Stock Exchange. GSSC was restructured into a limited corporation, but a public offering will depend on its financial performance over the next 3 years. Tianjin Bohai, which was a publicly traded company, was delisted in 2000 after suffering losses for 3 years due to weak demand for its products. The addition of the project facilities enabled Huaxin to attract a strategic partner from Switzerland. The production of consistently high quality products at lower costs by the project facilities has enhanced competitiveness in both the domestic and international markets.

6. Policy Reforms

42. The Project enabled the Government to implement market-oriented measures for continued improvements in energy conservation policies and programs. Though ADB is no longer financing any industrial energy conservation projects, a similar approach to energy conservation with environment improvements is being replicated by other industrial enterprises in the same sector. The PRC has effectively relied on market mechanisms to encourage energy conservation. All input and output pricing mechanisms and the distribution system have been liberalized. An energy conservation law was approved in 1998, and standards governing the conduct of energy audits and the monitoring of energy consumption were established. Incentives were extended to industries producing energy-efficient products. The impact of projects on the environment and their social benefits and costs is assessed before new investments are considered. The CECIC mandate gradually has been reoriented from solely allocating government resources to mobilizing commercial resources to finance small and medium investments in energy efficiency improvement.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

43. The Project was implemented as envisaged at appraisal except for the cancellation of one subproject and some changes in project scope to enhance the project benefits and to upgrade computer software in anticipation of year 2000 (Y2K) problems. The Project basically achieved its main objective of improving energy efficiency and reducing air and water pollution generated by the assisted enterprises. Four of the five subprojects were completed as envisaged and within the schedule established at appraisal. The facilities provided under the Project performed as envisaged. The Project has helped GSSC, Jinhua, and Tianjin Bohai secure ISO 9000 certification. However, the lower market prices for the products, produced by the project facilities have prevented the assisted enterprises from achieving good financial performances and complying fully with the financial covenants of the loan. Consequently, the reevaluated FIRR for each subproject was lower than at appraisal, but still above the WACC. With the achievement of the main objectives of energy efficiency and environment improvement, even with the increase in production, the Project is rated as "successful."[9] The review has validated the methodology used and the rating given.

B. Lessons Learned

44. The financial performance of each project enterprise was generally weak because input costs were higher-than-expected and market prices for the products were lower-than-anticipated. The use of more conservative price and cost assumptions should be considered in future projects to provide an adequate cushion for potential downside risks, particularly in light of the emerging global competition.

45. The engagement of a domestic agency to assist the EAs in procurement proved to be wise, particularly as the EAs were not familiar with ADB's *Guidelines for Procurement*. The use of a procurement agency to provide expertise in preparing bidding documents ensured smooth and timely procurement and enabled valuable experience to be passed on to the new EAs.

46. Significant cost underruns were noted due to the overestimation of costs at appraisal as well as lower equipment costs brought about by keen competitive bidding. The appraisal missions should carry out separate cost estimates using the most recent available contracted prices for equipment.

C. Recommendations

1. Project-Related

47. Since the three wet process kilns at HCCL are still in operation and will not be decommissioned until 2008, it is recommended that the Ministry of Finance (MOF) and the local environment protection bureau closely monitor the operation of these three kilns to ensure that they are in compliance with environmental standards and are shut down as scheduled.

48. Though the new facilities provided have reduced air pollution from GSM, its old facilities continue to be a major source of air pollution to the surrounding residential areas. MOF should

[9] This PCR is one of about 50% of all PCRs proposed this year that has been independently reviewed by the Operations Evaluation Department.

help GSSC secure financing for the replacement of the old facilities as well as the planned construction of a new rolling steel plant improve the sustainability of GSM.

49. A comprehensive analysis of the proposed project scope, including a careful audit of its outputs and material balance, is essential to ensure that the facilities provided are of optimum plant size and that all intermediate products are fully utilized for the production of higher-valued products. This would help to avoid a situation where intermediate products had to be sold with lower profit margins, as was the case of GSM.

50. The Operations Evaluation Department should prepare the Project Performance Audit Report for the Project in 2005 or later. By that time JGCF's prilled soda plant would have been in operation for more than two years and the old sludge disposal site would have been decommissioned.

2. General

51. A more detailed risk analysis should be carried out to ensure that ADB-financed projects in the industrial sector are financially viable and their products will continue to be in demand and remain competitive for the life of the project, particularly now that the PRC is a member of the World Trade Organization. Sufficient resources should be provided for human resource development so that assisted enterprises can be managed in a professional manner and on a commercial basis.

52. Industrial production using obsolete technologies is a major contributor of air and water pollution in the PRC, and the continued operation of such energy-intensive, inefficient and highly polluting industries has major environmental repercussions at national and transnational levels. ADB-financed projects addressing environmental problems generally have been successful, though the financial performance of a majority of industrial enterprises has been unfavorable due to their inability to respond to changing market conditions. ADB should, therefore, continue to lend for industrial energy efficiency and environment improvement projects in the PRC. However, a more stringent subproject selection process should be implemented to ensure enterprise competitiveness is maintained in an increasingly liberalized policy regime and market-based economy. Finally, the project scope should also include the provision of adequate loan funds to finance modern management and marketing training to enable enterprises to respond to changing market conditions.

CHRONOLOGY OF MAJOR EVENTS

17 May 1995	Fact-Finding Mission fielded
26 June 1995	Management Review Meeting
2 August 1995	Summary environmental impact assessment circulated
3 October 1995	Appraisal Mission fielded
12 March 1996	Staff Review Committee meeting
27 March 1996	Loan negotiations
9 May 1996	ADB approves a loan of $178.0 million from ADB's ordinary capital resources to the People's Republic of China (PRC) for the *Second Industrial Energy Efficiency and Environment Improvement Project* (Loan 1436-PRC)
11 November 1996	Loan signing
16 December 1996	Inception Mission fielded
December 1996	Government requests ADB to consider replacing one enterprise, Guanghua Cement Factory (Part A), with Exi Fertilizer Plant due to Guanghua's inability to mobilize the required local resources on time
December 1996	Construction work under Part D starts
13 January 1997	Loan effectiveness
6 March 1997	First disbursement
January 1997	Construction work under Part C starts
16 May 1997	Loan Disbursement Mission fielded
29 July 1997	Loan Reformulation Mission fielded
August 1997	Appraisal of Exi subproject carried out
October 1997	Construction of Kiln No. 5 under Part B starts
20 October 1997	Review Mission
26 December 1997	The Board approves the replacement of the Guanghua Cement Factory subproject (GCF) with Exi Chemical Plant (ECP) subproject because of GCF's inability to mobilize the required local resources on time due to its deteriorating financial condition resulting from several unplanned investments

4 May 1998	Request received to use loan savings to finance the prilled caustic soda plant for Part C and revamp the low pressure boiler for Part D
27 May 1998	Request received to reallocate loan proceeds totaling $4.14 million from the Human Resources Development (HRD) and Unallocated categories to the Equipment category under the Tianjin Soda Plant subproject (Part D). The funds are to be used to finance the procurement of necessary equipment not foreseen during the appraisal stage, to ensure safe and reliable operation of the plant
8 July 1998	Director of Infrastructure, Energy, and Financial Sectors Department (IED) approves the Borrower's request to reallocate $4.14 million in loan proceeds under Part D
July 1998	Construction work under Part E starts
28 August 1998	Commissioning of caustic soda plant under Part C starts
August 1998	Part C completed and in commercial operation.
December 1998	Part B completed
December 1998	Part D completed and in commercial operation
5 October 1998	Review Mission
January 1999	Commissioning of kilns under Part B starts
15 February 1999	Part B commences operation
23 February 1999	First qualified clinker produced under Part B
26 February 1999	The Ministry of Finance (MOF) requests cancellation of Exi Chemical Plant (Part A) and reallocation of loan funds to Part C and Part D
9 August 1999	Part C requests to use loan savings to solve year 2000 (Y2K) problem
12 August 1999	Approval given to use a portion of loan savings to solve Y2K problem in the distributed control system of the three production plants of Part C
24 August 1999	MOF requests the cancellation of ECP subproject and loan fund reallocation
31 August 1999	Director of IED approves the use of loan savings through a minor change in project scope under Part C, a reallocation of loan proceeds of about $7.0 million, and a reallocation of $1.5 million of the loan funds to be released from the ECP subproject

8 September 1999	Approval to directly purchase four additional technology and equipment packages to match with the 50,000 tons per day (t/d) caustic soda (prill) production under Part C
13 September 1999	Reappraisal Mission
10 September 1999	Contract variations to include cable bridge support, control table, and high voltage power cable approved under Part B
17 September 1999	Performance test for kiln and mill system under Part B completed
15 November 1999	Review Mission
December 1999	Capacity and standard test run under Part B completed
14 December 1999	Vice-President (East) approves the Borrower's request to cancel the ECP subproject through a major change in project scope and its allocated loan funds of $28.02 million, thereby reducing the loan amount to $149,980,000
16 August 2000	Approval given to use the anticipated loan savings of about $1.5 million to procure an additional ion exchange membrane and to increase the loan allocation for the interest during construction category by reallocating $1.8 million under Part C
15 September 2000	Contract for the supply of a 150 t/d caustic soda prills awarded in Part C
20 November 2000	Review Mission
January 2001	Part E commissioned
9 February 2001	Request received to reallocate loan proceeds under Part E
27 February 2001	Director of EID approves the request to reallocate loan proceeds among the subprojects and use loan savings under Part E to procure additional spare parts for electric arc furnace and continuous casting machine
3 April 2001	MOF requests extension of the loan closing date by 3 months from 30 June 2001 to 30 September 2001
6 April 2001	MOF requests reallocation of loan proceeds under Part C
11 April 2001	Director of IED approves the Borrower's request to reallocate loan proceeds under Part C from HRD category to Equipment category to accommodate the total contract price for the last package
19 April 2001	Manager of Energy Division (East) approves extension of loan closing date from 30 June 2001 to 30 September 2001 to enable Part C to complete the additional work of processing liquid caustic soda into crystallized soda

18 May 2001	Special Review Mission
30 June 2001	Original loan closing date
1 July 2001	The State Environmental Protection Agency accepts the environment protection under Part B
1 August 2001	Two shaft kilns of Hongqi Cement Plant under Part B are closed and demolished
20 September 2001	Approval given to use the remaining funds for overseas training to purchase loose components and spare parts for test run operation of Part E
8 October 2001	Review Mission
18 December 2001	Vacuum degassing furnace under Part E starts production
25 February 2002	ADB cancels the undisbursed loan balance of $682,597.40 and loan account is closed
10 March 2003	Project Completion Review Mission fielded

CAPACITY PRODUCTION VOLUMES AND BY-PRODUCTS

Table A2.1: Capacity, Actual and Projected Production of Project Facilities, 2000–2005

Plant	Product	Capacity metric ton per year	Actual Production 2000	2001	2002	Projected 2003	2004	2005
HCCL	clinker	1,240,000	1,383,322	1,616,749	1,701,010	1,705,000	1,725,000	1,705,000
JGCF	caustic soda	80,000	126,130	102,823	116,183	120,000	130,000	120,000
TSP	dense soda ash	400,000	361,033	394,890	452,701	400,000	400,000	400,000
GSM	steel billet	300,000	37,396	80,722	36,999	183,753	229,000	256,000

GSM = Guiyang Steel Mills, HCCL = Huaxin Cement Company Limited, JGCF = Jinxi General Chemical Factory, TSP = Tianjin Soda Plant.

Source: Huaxin, Jinhua, Tianjin Bohai, and Guiyang Special Steel Company Limited.

Table A2.2: By-Products and Other Products by Plant

Plant	By-Product
HCCL	cement 425 and 525
JGCF	liquid chlorine, vinyl chloride monomer, propylene oxide, chloro benzene, acetylene, polyvinyl chloride, polyurethane glycol, propane oxide, and tuluene
TSP	caustic soda, ammonia, ammonia chloride, sodium bicarbonate, liquid nitrogen, calcium chloride, liquid oxygen, argon, and liquid carbon dioxide
GSM	carbon steel, alloy steel, spring steel

GSM = Guiyang Steel Mills, HCCL = Huaxin Cement Company Limited, JGCF = Jinxi General Chemical Factory = TSP = Tianjin Soda Plant.

Source: Huaxin, Jinhua, Tianjin Bohai, and Guiyang Special Steel Company Limited.

COST BREAKDOWN BY PROJECT COMPONENTS

($ million)

Component	Appraisal Estimate			Actual		
	FX	LC	Total	FX	LC	Total
Part B: Huaxin Cement Company Ltd.						
Preliminary Expenses	0.00	0.18	0.18	0.00	0.15	0.15
Land Acquisition	0.00	0.26	0.26	0.00	0.17	0.17
Site preparation	0.00	1.09	1.09	0.00	0.27	0.27
Engineering and Design including License Fees	0.30	3.01	3.31	0.00	1.39	1.39
Equipment and Material (Major Process)	36.00	12.05	48.05	43.92	8.73	52.65
Auxiliary Equipment	0.00	4.84	4.84	0.00	0.00	0.00
Import Duties	0.00	17.11	17.11	0.00	0.00	0.00
Domestic Transport	0.00	2.19	2.19	0.00	0.00	0.00
Construction and Erection including Civil Works	0.00	26.11	26.11	0.00	24.38	24.38
Consulting Service	0.00	0.00	0.00	0.00	0.00	0.00
Training	0.70	0.63	1.33	0.00	0.01	0.01
Commissioning and Start-up	0.00	0.37	0.37	0.00	0.32	0.32
Energy and Environmental Management	1.80	1.84	3.64	0.00	0.00	0.00
Project Management	0.00	3.39	3.39	0.00	1.16	1.16
Others	0.00	0.00	0.00	0.00	3.18	3.18
Base Cost	**38.80**	**73.07**	**111.87**	**43.92**	**39.76**	**83.68**
Physical Contingency	3.88	7.31	11.19	0.00	0.00	0.00
Subtotal	**42.68**	**80.38**	**123.06**	**43.92**	**39.76**	**83.68**
Price Contingency	2.23	3.90	6.13	0.00	0.00	0.00
IDC	5.09	9.63	14.72	5.09	7.48	12.57
Total	**50.00**	**93.91**	**143.91**	**49.01**	**47.24**	**96.25**
Part C: Jin Hua Chemical (Group) Co., Ltd.						
Preliminary Expenses	0.00	0.18	0.18	0.00	0.61	0.61
Land Acquisition	0.00	0.00	0.00	0.00	0.00	0.00
Site preparation	0.00	0.14	0.14	0.00	0.70	0.70
Engineering and Design including License Fees	0.78	0.70	1.48	0.00	0.61	0.61
Equipment and Material (Major Process)	18.58	11.33	29.91	21.98	6.06	28.04
Auxiliary Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Import Duties	0.00	8.59	8.59	0.00	1.91	1.91
Domestic Transport	0.00	0.36	0.36	0.00	0.00	0.00
Construction and Erection including Civil Works	0.00	2.38	2.38	0.00	9.50	9.50
Consulting Service	0.00	0.12	0.12	0.00	0.03	0.03
Training	0.30	0.00	0.30	0.04	0.03	0.07
Commissioning and Start-up	0.00	0.18	0.18	0.00	1.16	1.16
Energy and Environmental Management	0.25	0.42	0.67	0.00	0.06	0.06
Project Management	0.00	0.42	0.42	0.00	1.37	1.37
Others	0.00	0.00	0.00	0.00	3.16	3.16
Base Cost	**19.91**	**24.82**	**44.73**	**22.02**	**25.20**	**47.22**
Physical Contingency	1.99	2.48	4.47	0.00	0.00	0.00
Subtotal	**21.90**	**27.30**	**49.20**	**22.02**	**25.20**	**47.22**
Price Contingency	1.10	1.42	2.52	0.00	0.00	0.00
IDC	2.00	3.60	5.60	3.80	1.03	4.83
Total	**25.00**	**32.32**	**57.32**	**25.82**	**26.23**	**52.05**

FX = foreign exchange, IDC = interest during construction, LC = local currency.

Component	Appraisal Estimate			Actual		
	FX	LC	Total	FX	LC	Total
Part D: Tianjin Soda Plant						
Preliminary Expenses	0.00	0.09	0.09	0.00	0.69	0.69
Land Acquisition	0.00	0.00	0.00	0.00	0%	0.00
Site Preparation	0.00	0.00	0.00	0.00	0.00	0.00
Engineering and Design including License Fees	0.00	0.91	0.91	0.00	0.45	0.45
Equipment and Material (Major Process)	23.50	3.06	26.56	30.76	15.02	45.78
Auxiliary Equipment	2.39	9.08	11.47	0.00	0.00	0.00
Import Duties	0.00	10.75	10.75	0.00	0.00	0.00
Domestic Transport	0.00	1.09	1.09	0.00	0.00	0.00
Construction and Erection including Civil Works	0.00	4.34	4.34	0.00	2.30	2.30
Consulting Service	0.00	0.12	0.12	0.00	0.00	0.00
Training	0.05	0.00	0.05	0.00	0.00	0.00
Commissioning and Start-up	0.00	0.09	0.09	0.00	0.00	0.00
Energy and Environmental Management	0.25	0.02	0.27	0.00	0.58	0.58
Project Management	0.00	0.79	0.79	0.00	0.00	0.00
Base Cost	**26.19**	**30.34**	**56.53**	**30.76**	**19.04**	**49.80**
Physical Contingency	2.62	3.03	5.65	0.00	0.00	0.00
Subtotal	**28.81**	**33.37**	**62.18**	**30.76**	**19.04**	**49.80**
Price Contingency	1.47	1.69	3.16	0.00	0.00	0.00
IDC	2.72	1.73	4.45	2.70	4.06	6.76
Total	**33.00**	**36.79**	**69.79**	**33.46**	**23.10**	**56.56**
Part E: Guiyang Steel Mills						
Preliminary Expenses	0.00	0.30	0.30	0.00	0.00	0.00
Land Acquisition	0.00	0.00	0.00	0.00	1.10	1.10
Site preparation	0.00	0.42	0.42	0.00	0.00	0.00
Engineering and Design including license fees	1.38	0.81	2.19	0.00	0.00	0.00
Equipment and Material (Major Process)	21.58	0.00	21.58	34.57	13.88	48.45
Auxiliary Equipment	0.66	1.16	1.82	0.00	0.00	0.00
Import Duties	0.00	9.00	9.00	0.00	0.00	0.00
Domestic Transport	0.00	1.27	1.27	0.00	0.00	0.00
Construction and Erection including civil works	6.53	9.30	15.83	3.27	7.50	10.77
Consulting Service	0.00	0.12	0.12	0.00	0.10	0.10
Training	0.40	0.09	0.49	0.11	0.12	0.23
Commissioning and Start up	0.00	0.42	0.42	0.00	0.00	0.00
Energy and Environmental Management	1.50	1.52	3.02	0.00	6.50	6.50
Project Management	0.00	0.14	0.14	0.00	1.69	1.69
Base Cost	**32.05**	**24.55**	**56.60**	**37.94**	**30.89**	**68.83**
Physical Contingency	3.20	2.46	5.66	0.00	0.00	0.00
Subtotal	**35.25**	**27.01**	**62.26**	**37.94**	**30.89**	68.83
Price Contingency	1.71	1.32	3.03	0.00	0.00	0.00
IDC	3.04	1.73	4.77	3.06	0.40	3.46
Total	**40.00**	**30.06**	**70.06**	**41.00**	**31.29**	**72.29**

FX = foreign cost, IDC = interest during construction, LC = local currency.

PROJECT COST AND FINANCING SOURCES
($ million)

Table A4.1: Project Cost

Subproject	Appraisal			Actual		
	FX	LC	Total	FX	LC	Total
Part A:	30.00	45.89	75.89	0.00	0.00	0.00
Part B: Huaxin Cement Co., Ltd.	50.00	93.89	143.89	49.01	47.24	96.25
Part C: Jin Hua Chemical (Group) Corp.	25.00	32.34	57.34	25.82	26.23	52.05
Part D: Tianjin Soda Plant	33.00	36.80	69.80	33.46	23.10	56.56
Part E: Guiyang Steel Mills	40.00	30.07	70.07	41.00	31.29	72.29
Total	**178.00**	**239.00**	**417.00**	**149.29**	**127.86**	**277.15**

FX = foreign currency, LC = local currency.
Source: Huaxin, Jinhua, Tianjin Bohai, and Guiyang Special Steel Company Limited.

Table A4.2: Financing Sources

Subproject	Appraisal				Actual			
	ADB Loan	Commercial Bank Loan	Own Resources	Total	ADB Loan	Commercial Bank Loan	Own Resources	Total
Part A	30.00	25.30	20.59	75.89	0.00	0.00	0.00	0.00
Part B	50.00	39.76	54.13	143.89	49.01	39.77	7.47	96.25
Part C	25.00	17.23	15.11	57.34	25.82	19.18	7.05	52.05
Part D	33.00	11.08	25.72	69.80	33.46	7.99	15.11	56.56
Part E	40.00	12.89	17.18	70.07	41.00	7.20	24.09	72.29
Total	**178.00**	**106.26**	**132.73**	**417.00**	**149.29**	**74.14**	**53.72**	**277.15**

ADB = Asian Development Bank.
Source: Huaxin, Jinhua, Tianjin Bohai, and Guiyang Special Steel Company Limited.

PROJECTED AND ACTUAL LOAN DISBURSEMENTS
Quarterly and Cumulative Disbursements

Year	Quarter	Projected ($ million)	Actual Quarterly Disbursement ($ million)	Actual Cumulative Disbursement ($ million)	Actual % of Loan
1997	I	0.000	4.404	4.404	2.9
	II	0.200	2.352	6.756	4.5
	III	1.920	2.505	9.261	6.2
	IV	23.000	25.636	34.897	23.4
	Subtotal	**25.120**	**34.897**		
1998	I	14.000	11.053	45.950	30.8
	II	8.000	12.978	58.928	39.5
	III	8.000	9.475	68.403	45.8
	IV	6.000	12.515	80.918	54.2
	Subtotal	**36.000**	**46.021**		
1999	I	7.600	8.401	89.319	59.8
	II	2.600	10.846	100.165	67.1
	III	0.800	10.424	110.589	74.1
	IV	1.400	12.227	122.816	82.3
	Subtotal	**12.400**	**41.898**		
2000	I	2.300	4.771	127.587	85.5
	II	2.500	4.693	132.280	88.6
	III	3.300	1.839	134.119	89.8
	IV	3.000	4.529	138.648	92.9
	Subtotal	**11.100**	**15.832**		
2001	I	3.200	0.625	139.273	93.3
	II	2.300	2.671	141.944	95.1
	III	5.400	6.806	148.750	99.6
	IV	0.000	0.517	149.267	100.0
	Subtotal	**10.900**	**10.619**		
2002	I	0.000	0.033	149.300	100.0
	II	0.000	0.000	149.300	100.0
	III	0.000	-0.001	149.299	100.0
	IV	0.000	0.000	149.299	100.0
	Subtotal	**0.000**	**0.032**		
		Total	**149.299**		

Source: Loan Financial Information System.

PROJECT IMPLEMENTATION SCHEDULE

Figure A6.1: Huaxin Cement Company Limited

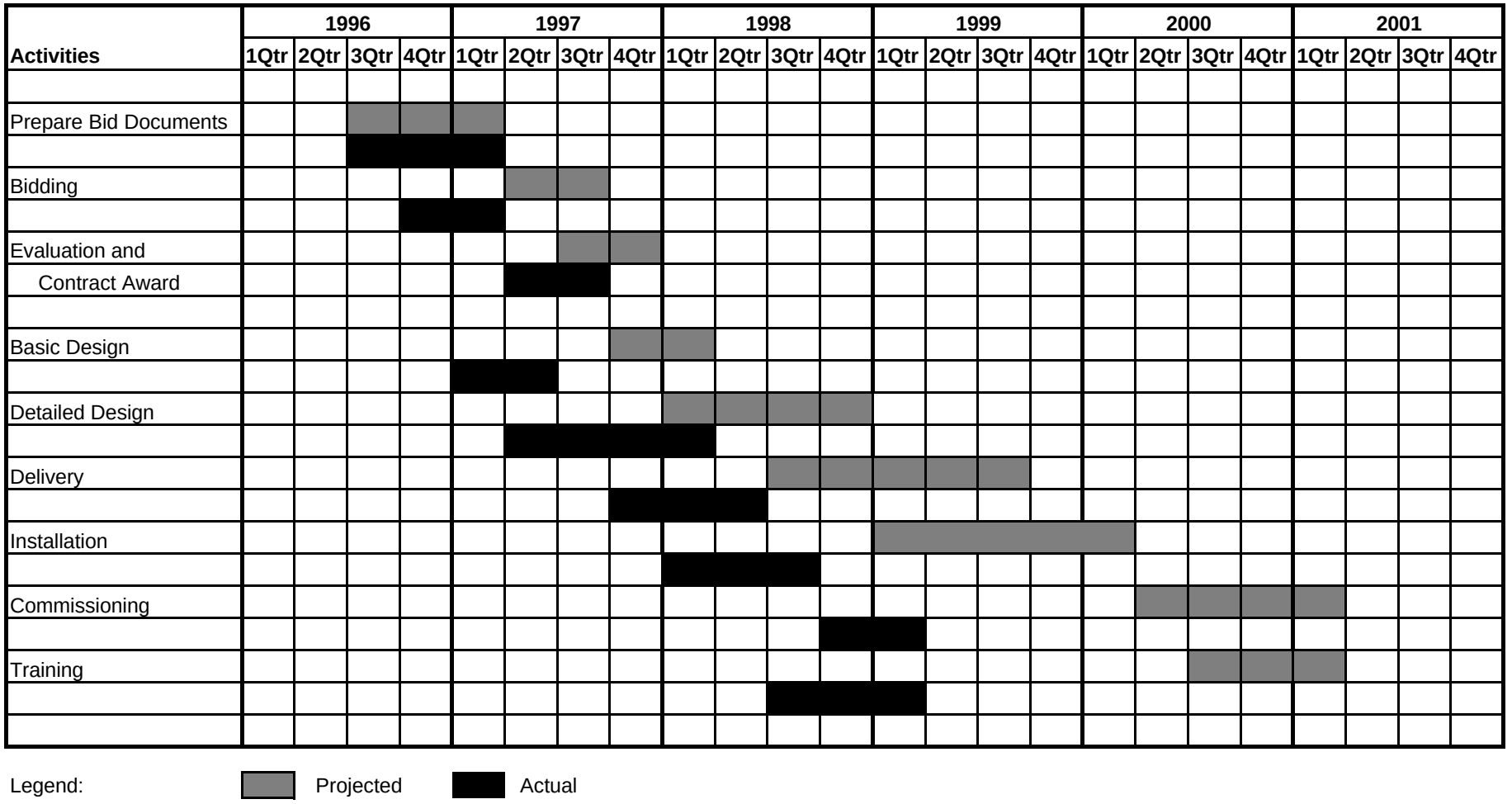


Figure A6.2: Jinxi General Chemical Factory

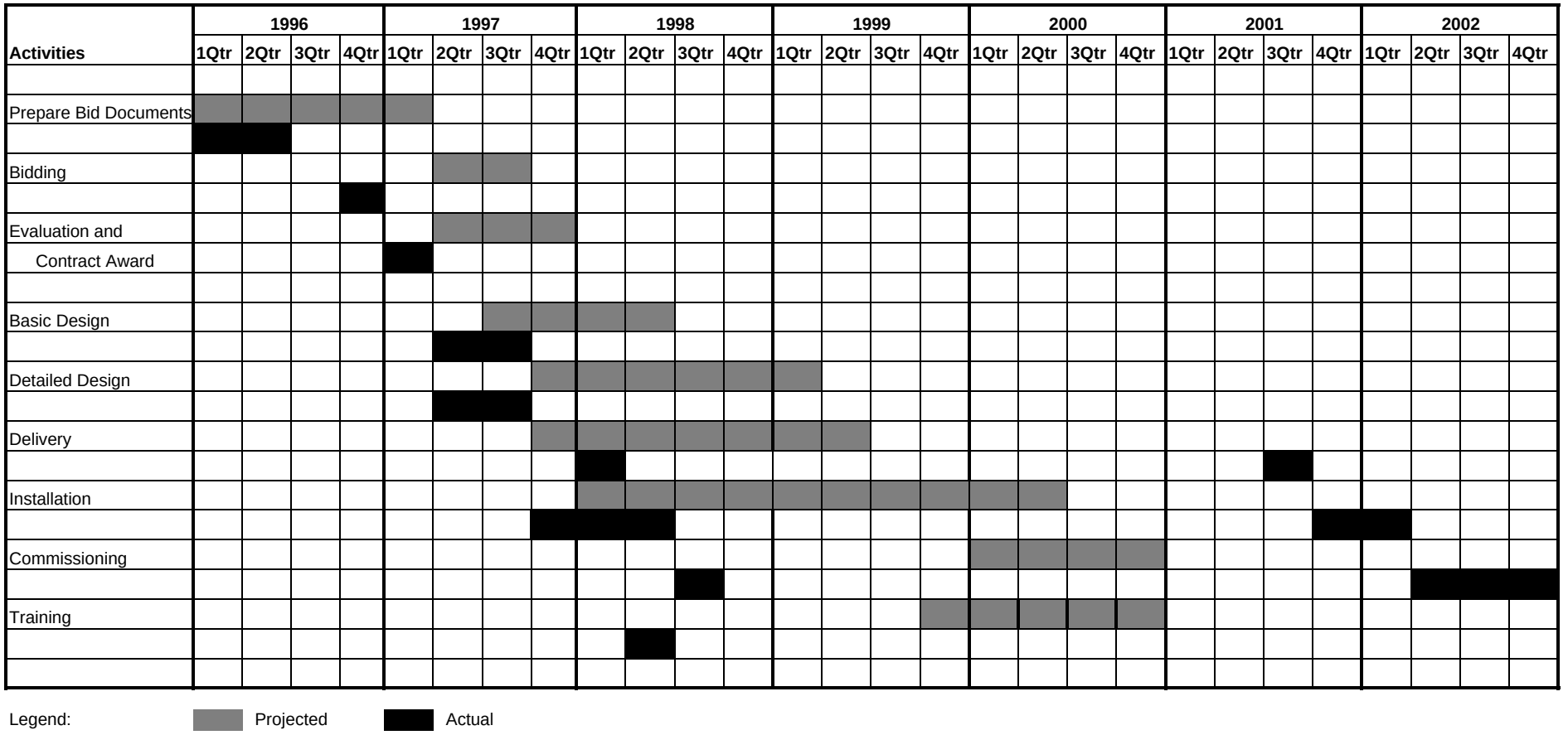
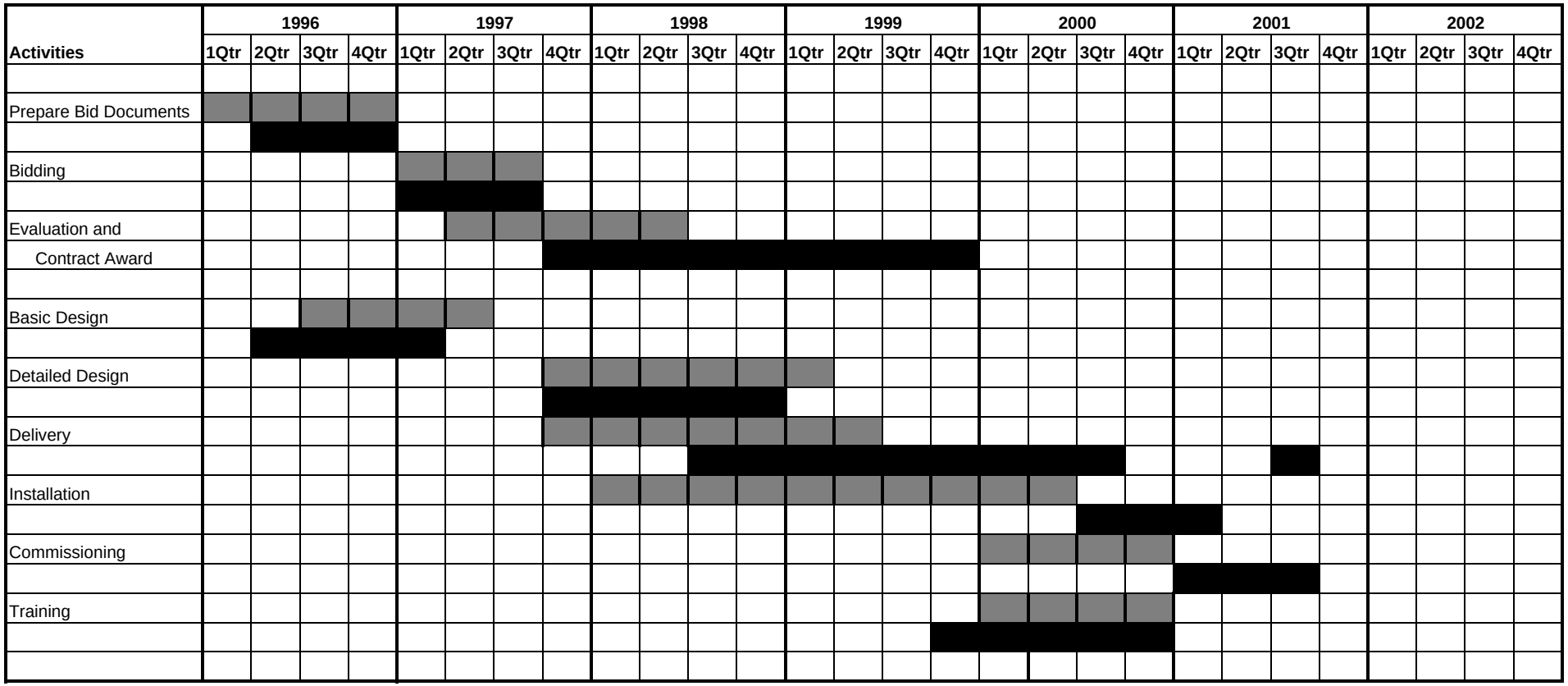


Figure A6.3: Tianjin Soda Plant

Activities	1996				1997				1998				1999				2000				2001				2002			
	1Qtr	2Qtr	3Qtr	4Qtr	1Qtr	2Qtr	3Qtr	4Qtr	1Qtr	2Qtr	3Qtr	4Qtr	1Qtr	2Qtr	3Qtr	4Qtr	1Qtr	2Qtr	3Qtr	4Qtr	1Qtr	2Qtr	3Qtr	4Qtr	1Qtr	2Qtr	3Qtr	4Qtr
Prepare Bid Documents																												
Bidding																												
Evaluation and Contract Award																												
Basic Design																												
Detailed Design																												
Delivery																												
Installation																												
Commissioning																												
Training																												

Legend: Projected Actual

Figure A6.4: Guiyang Steel Mills



ORGANIZATION CHARTS OF PROJECT IMPLEMENTATION AGENCIES

Figure A7.1: Organization Chart of Huaxin Cement Shareholding Company

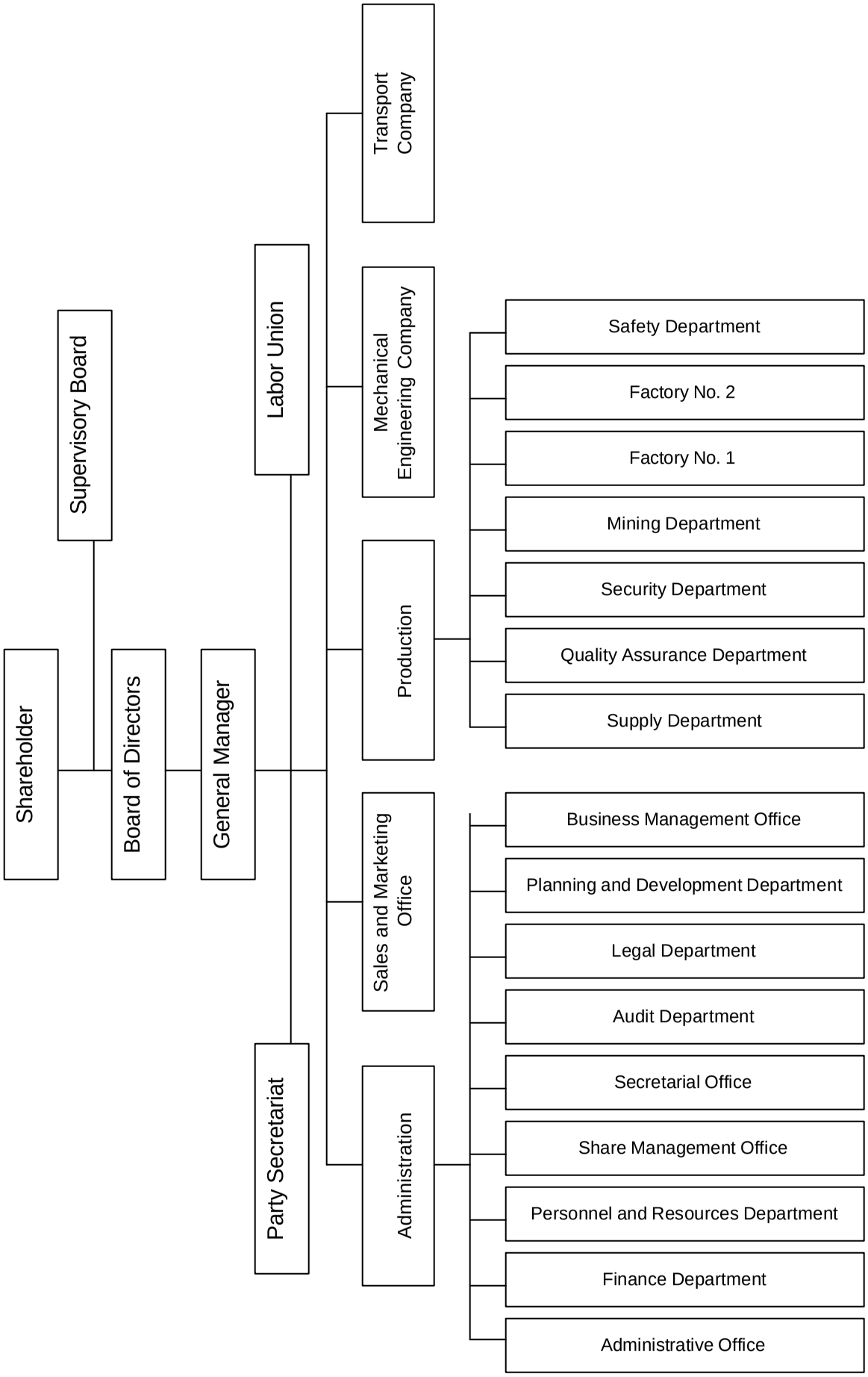
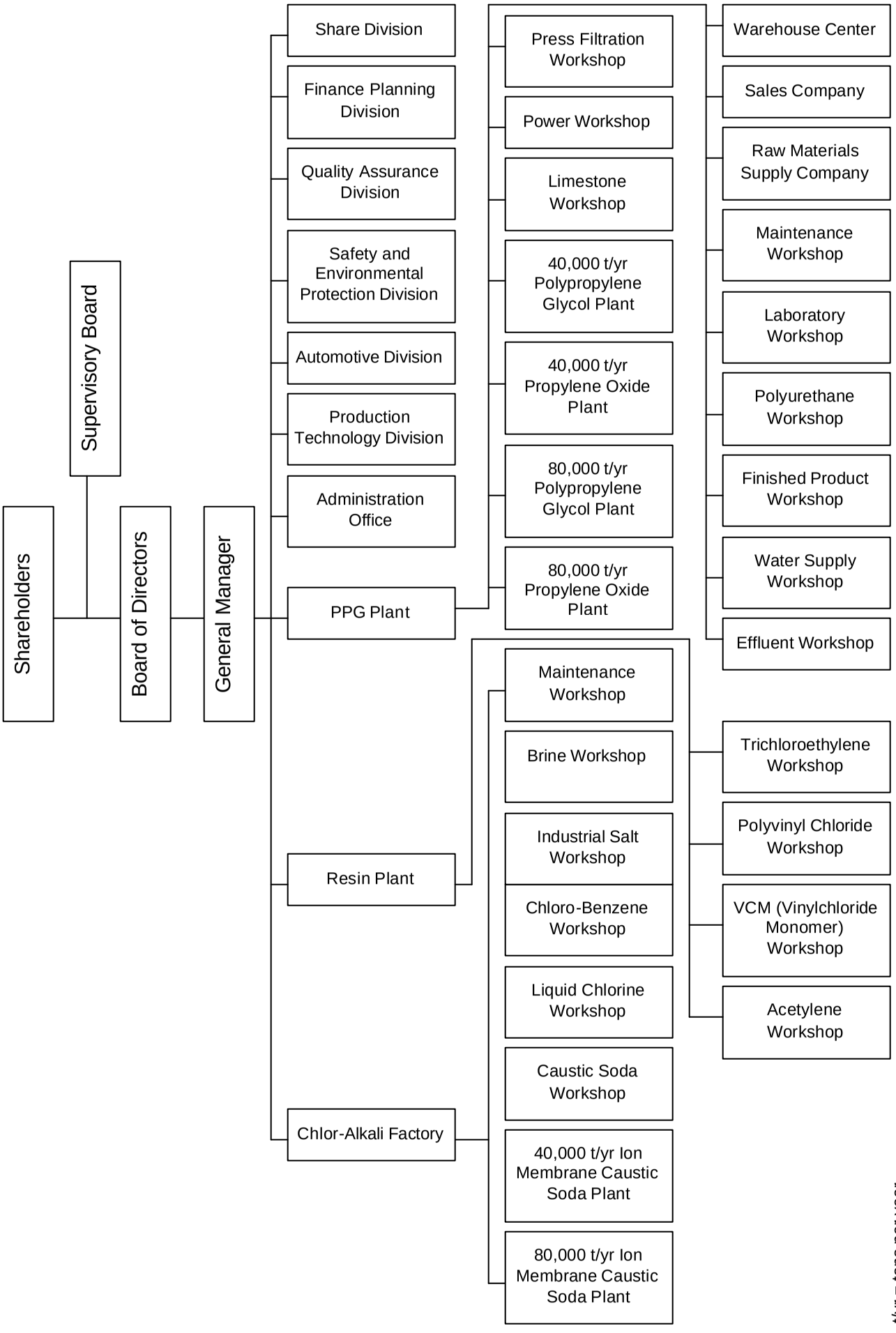


Figure A7.2: Organization Chart of Jinhua Chemical (Group) Corporation



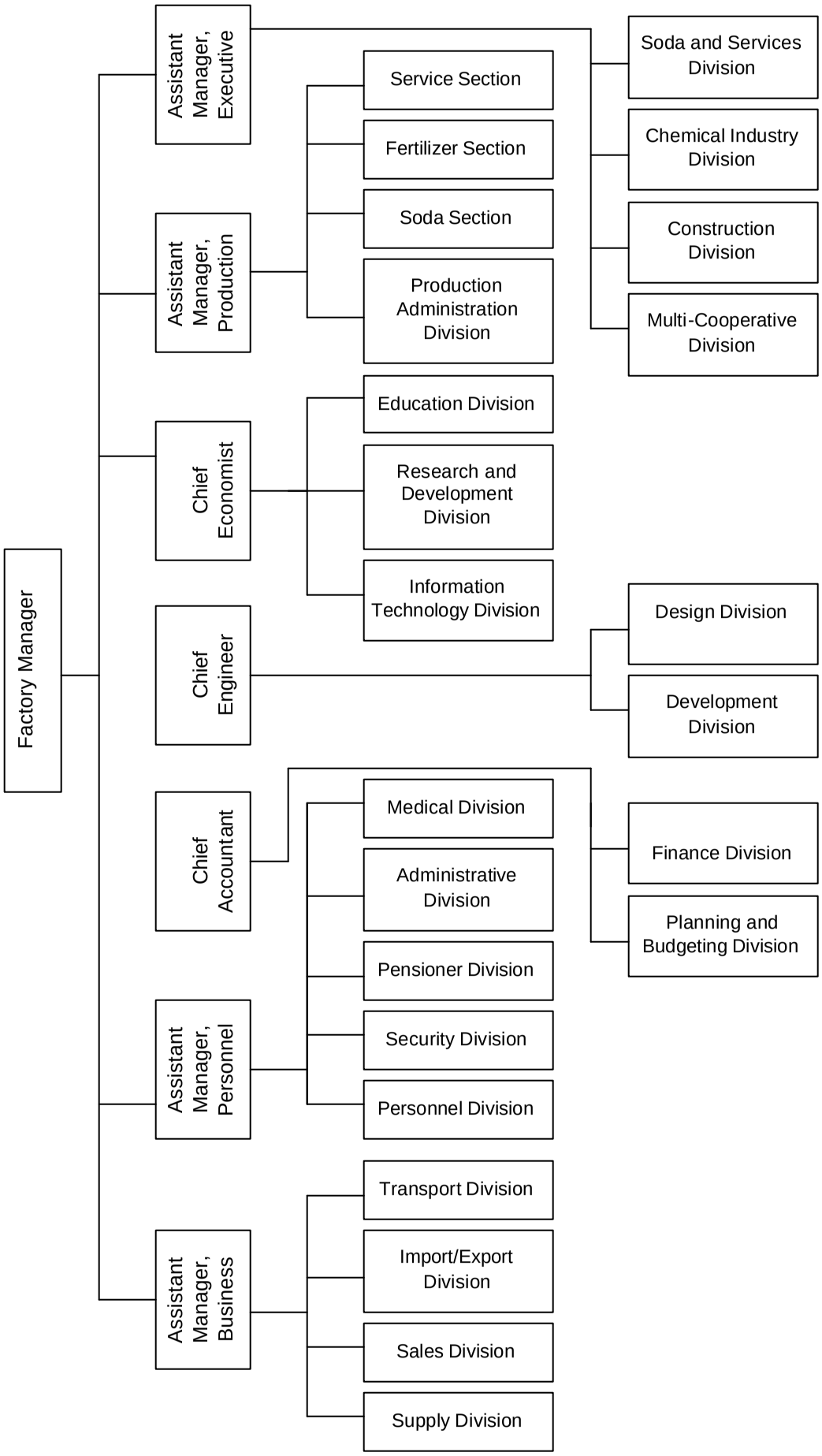
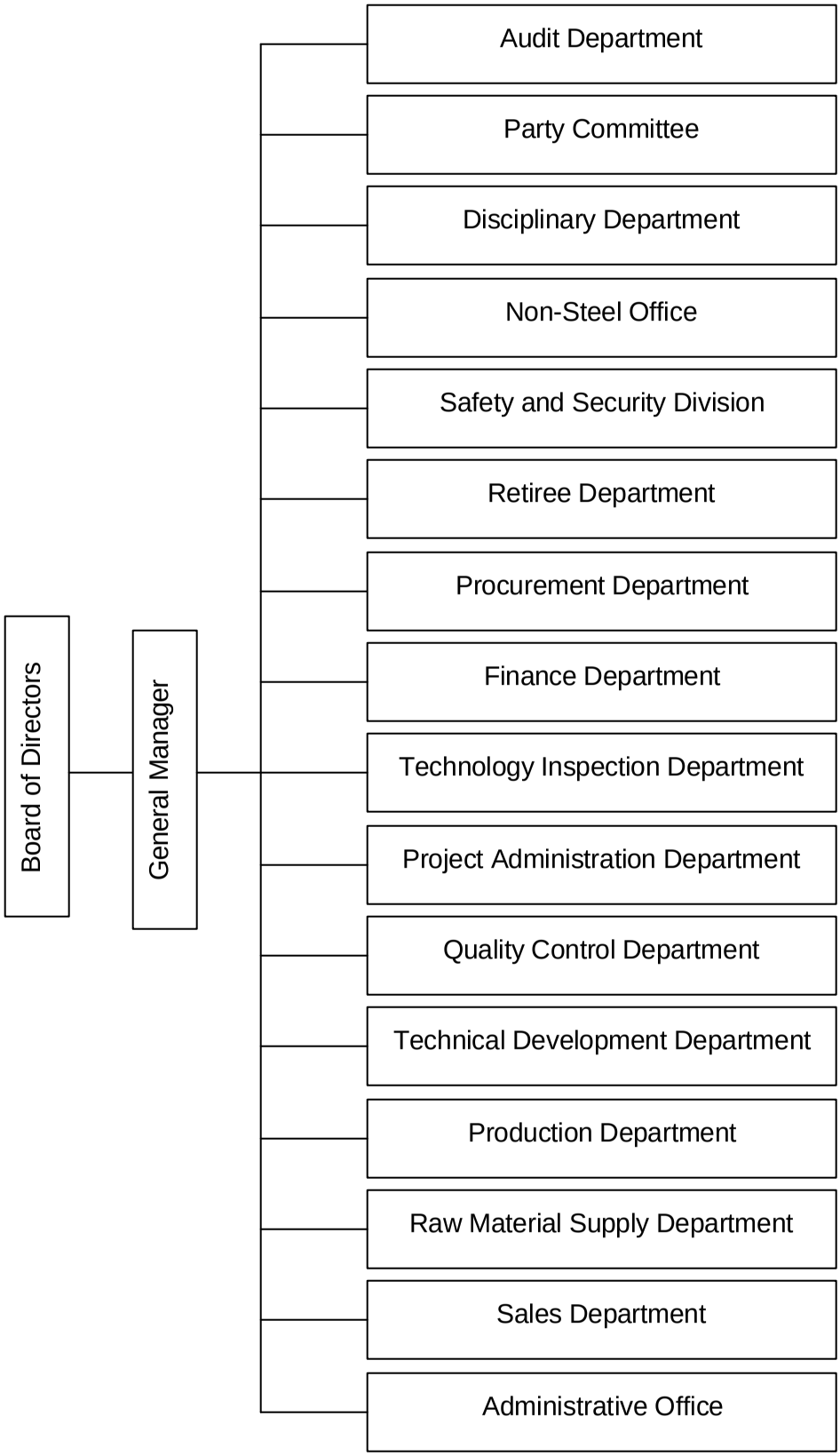


Figure A7.3: Organization Chart of Tianjin Bohai Chemical Industry Corporation

Figure A7.4: Organization Chart of Guiyang Special Steel Company Limited



COMPLIANCE WITH LOAN COVENANTS

Covenant	Reference	Remarks
Loan Effectiveness		
1. The State Council of the Borrower will approve the Loan Agreement (LA).	LA, Section 6.01(a)	Complied with.
Procurement		
2. Procurement of goods and services will be in accordance with Asian Development Bank's (ADB) *Guidelines for Procurement.*	LA, Schedule 4, para. 2	Complied with.
Execution of the Project		
3. The State Economic and Trade Commission (SETC) shall establish a policy coordination office (PCO), which shall be headed by a director. The Borrower shall cause the PCO to: (i) coordinate the implementation of energy conservation law, market-based policy reforms and other institutional measures relating to the Project; (ii) coordinate among the concerned agencies of the Borrower and the enterprises; (iii) monitor the use of loan proceeds and the progress of project implementation; and (iv) review periodically the compliance of the enterprises with covenants set forth in this Loan Agreement and in the project agreement.	LA, Schedule 6, para. 1	Partly complied with, as PCO was not active in monitoring the Project.
4. Each enterprise shall be the implementing agency for its respective part of the Project. Each enterprise shall establish and maintain, throughout the implementation of the Project, a project implementation office (PIO). The PIOs shall be headed by the Director or General Manager of each enterprise. Each PIO shall at all times be fully equipped and supported, and shall be staffed in a manner satisfactory to ADB, with all the requisite qualified full-time technical, procurement, accounting, administrative, and translation personnel.	LA, Schedule 6, para. 2	Complied with.
Environment		
5. Each enterprise shall ensure that its part of the Project is designed and implemented, and that the project facilities are operated and maintained in strict conformity with applicable national, provincial, and local environmental protection laws, regulations, and standards of the Borrower concerning solid, liquid, and gaseous waste disposal.	LA, Schedule 6, para. 9(a)	Complied with.

Covenant	Reference	Remarks
6. Each enterprise shall (i) ensure that the pollution control and monitoring equipment designed for inclusion in the project facilities become fully operational and (ii) throughout the life of the project facilities, carefully and continuously monitor the efficacy of the pollution control equipment (with appropriate consultation with State Environmental Protection Agency (SEPA), and promptly make all necessary repairs and renewals thereof.	LA, Schedule 6, para. 9(b)	Complied with.
7. Huaxin Cement Company Limited (HCCL) shall close and dismantle its wet process kilns and shaft kilns within 1 month of the successful commissioning (demonstrating achievement of design specifications and performance capacity) of the kilns to be erected under the Project. All equipment, accessories, piping, and support structures from the dismantled kilns shall be properly decommissioned, decontaminated, and disposed of.	LA, Schedule 6, para. 9(f)	Partly complied with, as the wet process kilns won't be decommissioned until 2008, though air pollution from the wet process kilns was controlled effectively.
8. Jinxi General Chemical Factory (JGCF) shall pack, label, and seal all equipment contaminated with mercury, lead, and asbestos prior to disposal in a secured landfill site to prevent unauthorized recovery and reuse of the discarded materials. Prior to the dismantling of materials contaminated with asbestos, JGCF shall ensure that the workers are properly briefed on the safety and risks involved and provided with safety equipment and clothing. In the disposal of mercury, JGCF shall obtain from the mercury processing plant a certification that it accepts all responsibilities related to safety and environmental protection from the time the plant takes possession of the mercury.	LA, Schedule 6, para. 9(g)	Complied with.
9. Tianjin Soda Plant (TSP) shall secure its existing disposal site for sludge and solid wastes to prevent their unauthorized use. In the event that the site shall subsequently be used for other purposes, TSP shall first obtain all necessary clearances from the concerned Borrower agency, and shall provide the user with full details of materials in the site. TSP shall apply Project environmental protection measures to other areas of its operations in order to maximize environmental benefits, particularly in relation to the dust emission from the calcining unit.	LA, Schedule 6, para. 9(h)	Complied with.

Covenant	Reference	Remarks
10. Guiyang Steel Mills (GSM) shall conduct a detailed geological survey of the landfill site for the disposal of the slag and other wastes generated by GSM operations. GSM shall prevent groundwater contamination at the site. Appropriate monitoring stations and programs shall be implemented in the site.	LA, Schedule 6, para. 9(i)	Complied with.
11. Each enterprise shall at all times operate its facilities in accordance with all applicable safety standards and shall ensure that the levels of fumes and dust at its facilities conform to applicable safety standards of the Borrower acceptable to ADB.	LA, Schedule 6, para. 10	Complied with.
Policy		
12. The Borrower shall adopt and implement the energy conservation law concerning energy management. The Borrower shall establish standards governing the conduct of energy audits and the monitoring of energy consumption. The Borrower shall establish a system of penalties and incentives to promote efficient energy usage.	LA, Schedule 6, para. 13	Complied with.
13. The Borrower shall promote energy efficiency and improve energy management pursuant to the action plan that includes reforms to achieve market-determined energy pricing, and shall keep ADB informed of the progress on such measures during the implementation of the Project.	LA, Schedule 6, para. 14	Complied with.
14. The Borrower shall coordinate with the China Energy Conservation Investment Corporation (CECIC) in preparing and submitting to ADB, by 31 December 1997, an action program that shall reorient its operations from allocating government resources to mobilizing financing for energy conservation projects on a commercial basis. After exchanging views with ADB, CECIC shall take steps to implement the action program to enable CECIC to function as a commercial entity to finance energy conservation investments.	LA, Schedule 6, para. 15	Partly complied with as CECIC is actively involved with mobilizing financing for energy conservation projects but still operates as a government entity.
15. The Borrower shall ensure that upon completion of the respective components, but no later than 31 December 2001, the enterprises will organize workshops and seminars to widely disseminate information on the implementation of energy efficiency and environmental improvement measures for adoption by other enterprises in the subsectors.	LA, Schedule 6, para. 16	Partly complied with as a few workshops and seminars were organized to disseminate information.

Covenant	Reference	Remarks
Financial		
16. Each enterprise shall maintain at all times (i) a debt service ratio of no less than 1.25:1, (ii) a debt-equity ratio of no more than 65:35, and (iii) a current ratio of no less than 1:1.	PA, Section 2.16	Partly complied with, as three of the four enterprises were unable to meet the specified debt service ratio.
Reports		
17. Each enterprise shall provide project benefits monitoring and evaluation (PBME) reports to ADB. Such PBME reports shall be provided to ADB within 60 days after the end of each full production year for 5 years after completion of the part of the Project carried out at each respective enterprise. Such PBME reports shall encompass (i) an assessment of the actual product output and quality improvement attained as compared with the targeted output and quality and (ii) an assessment of the extent of the benefits realized with respect to the energy and pollution control agreed to by the Borrower and ADB. Such assessments may include the improvements in coal equivalent per ton of output, reductions.	LA, Schedule 6, para. 11	Partly complied with as PBME reports were only submitted once in 2002.
18. Each enterprise shall carry out the Project with due diligence and efficiency, and in conformity with sound administrative, financial, engineering, environmental, and energy conservation practices.	PA, Section 2.01(a)	Complied with.
19. Each enterprise shall furnish ADB quarterly progress reports on the execution of the Project and on the operation and management of the project facilities.	PA, Section 2.08(b)	Complied with.
20. Promptly after physical completion of the Project, but in any event no later than 6 months thereafter or such later date as ADB may agree for this purpose, each enterprise shall prepare and furnish ADB a report on the execution and initial operation of the Project, including its costs, the performance by each enterprise of its obligations under this Project Agreement, and the accomplishment of the purposes of the loan.	PA, Section 2.08(c)	Complied with.

Covenant	Reference	Remarks
Accounts		
21. Each enterprise shall (i) maintain separate accounts (the project accounts) for the Project and its overall operations; (ii) have such project accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually in accordance with appropriate auditing standards consistently applied, by independent auditors whose qualifications, experience, and terms of reference are acceptable to ADB; and (iii) furnish ADB promptly after their preparation, but in any event no later than 6 months after the close of the fiscal year to which they relate, certified copies of such audited project accounts and financial statements and the report of the auditors relating thereto (including the auditors' opinion on the use of the loan proceeds and compliance with the covenants of this Loan Agreement), all in the English language.	PA, Section 2.09	Complied with.

SUMMARY OF CONTRACT PACKAGES

PCSS No.	Item	Mode of Procurement	Date of Contract	Contract Number	Contract Amount ($)	Amount Disbursed ($)
PART B: HUAXIN CEMENT COMPANY LTD.						
0002	Limestone and Marl Crushing Plant (Pkg. 1)	ICB	16 Dec 96	96MMG-407(62)401CN	1,104,134	1,104,134
0003	Limestone and Marl Pre-blending (Pkg. 2)	ICB	16 Dec 96	96-MMG-407(62)402FR	1,978,409	1,978,409
0004	Raw material Grinding and Waste Gas Treat (Pkg. 3) and Preheater Calciner Kiln and burner (Pkg. 5)	ICB	16 Dec 96	96-MMG-407(62)403DK	16,963,667	16,963,666
0005	Raw Mill Homogenizing and Kiln Feeding (Pkg. 4) and Clinker Cooler (Pkg. 6)	ICB	16 Dec 96	96MMG-407(62)404HK	3,931,041	3,931,041
0006	Coal Pre-blending (Pkg. 7)	ICB	16 Dec 96	96MMG-407(62)407CN	517,954	517,954
0007	Pulverized Coal Grinding (Pkg. 8)	ICB	15 Dec 96	96MMG-407(62)408CN	338,997	338,997
0008	Reducer of Cement Mill (Pkg. 10)	ICB	16 Dec 96	96MMG-407(62)410DE	700,000	630,000
0009	Electrostatic Precipitator (Pkg. 11)	ICB	16 Dec 96	96MMG-407(62)411CN	1,383,814	1,383,814
0010	High, Low Voltage Switch Cabinet (Pkg. 13)	ICB	16 Dec 96	96MMG-407(62)413CN (CHY 19,313,455)	2,332,376	2,332,376
0011	Process Control Equipment (Pkg. 12)	ICB	16 Dec 96	96MMG-407(62)412CN (CHY 7,787,609)	940,483	940,483
0026	Pulverized Coal Bin, Pulverized Coal Measuring, and Conveying Equipment (Pkgs. 1 and 3)	IS	20 May 97	96MMG-407(62)421DE	947,923	947,702
0027	Clinker Conveying Equipment (Pkgs. 2 and 4)	IS	20 May 97	96MMG-407(62)422DE	985,352	985,352
0028	Fan (Pkg. 5)	IS	19 May 97	96MMG-407(62)425DE	325,278	325,278
0029	3500KW Motor(Pkg. 6) and 3000KW Motor (Pkg. 7)	IS	19 May 97	96MMG-407(62)426CN	207,114	207,114
0030	Squirrel Cage Induction Motor (Pkg. 8) and Current Source DC Link (Pkg. 9)	IS	20 May 97	96MMG-407(62)428HK	531,933	531,933
0031	Raw Mill Quality Control System (QCX) (Pkg. 10)	IS	18 May 97	96MMG-407(62)430HK	260,000	260,000
0032	Quarry Equipment (Pkg. 13)	IS	17 May 97	96MMG-407(62)433HK	499,042	499,042
0033	Quarryman ALS (Auto Scanning Laser System)	IS	17 May 97	96MMG-407(62)434GB	80,300	80,300
0034	Refractories in Kiln (Pkg. 15)	IS	17 May 97	96MMG-407(62)435DE	494,922	494,922
0045	Monitoring and Measuring System (Pkg. 11)	IS	26 May 97	97MMG-407(62)431FR	362,138	362,138
0046	Gas Analyzer (Pkg. 12)	IS	26 May 97	97MMG-407(62)432CN	470,000	470,000
0057	Hydraulic Excavator (Pkg. 1A)	IS	06 Nov 97	97MMG-407(62)440US	382,500	382,500
0058	Hydraulic Excavator (Pkg. 2A)	IS	06 Nov 97	97MMG-407(62)441US	382,500	382,500
0059	Belt Conveyor (Pkg. 9A) and Bag Filter (Pkg. 11A)	IS	26 Nov 97	97MMG-407(62)443CN	921,933	921,933
0060	Wheeled front end loader, hydraulic bulldozer	IS	26 Nov 97	97MMG-407(62)446CN	780,997	780,997
0061	Hoisting Equipment Machine (Pkg. 13A)	IS	26 Nov 97	97MMG-407(62)448CN	416,339	416,339
0062	Cement Mill (Pkg. 5A)	IS	26 Nov 97	97MMG-407(62)447CN	382,849	382,848
0063	Bricklayer and Kiln Lining Demolition Machine	IS	30 Dec 97	97MMG-407(62)449CN	304,119	304,119
0071	Motor (Pkg. 6A)	IS	12 Dec 97	97MMG-407(62)442CN	217,763	217,763
0072	High Efficiency Separator and Bucket Elevator	IS	12 Dec 97	97MMG-407(62)444US	328,600	328,600
0074	Compressor and Roots Blower (Pkg. 7A)	IS	14 Jan 98	97MMG-407(62)450CN	313,400	313,400
0075	Transformer	IS	12 Dec 97	97MMG-407(62)452CN	89,700	80,730
0076	Refractory (Pkg 15A and 18A)	IS	12 Dec 97	97MMG-407(62)451CN	679,547	679,547
0080	Rubber Belt (Pkg. 10A)	IS	26 Nov 97	97MMG-407(62)445CN	206,470	206,470
0088	Instrumentation (Pkg.17A)	IS	16 May 98	98CN01M6215404295	252,618	252,618
0102	Cables and Brackets (Pkg. 1B)	IS	6 Aug 98	98CN01M6215005296	590,757	590,757
0103	Instrumentations and Cables (Pkg. 2B)	IS	3 Aug 98	98CN01M6215005297	446,057	446,057
0104	Bulk Cement Unloader (Pkg. 4B)	IS	11 Sep 98	98CN01M6215005299	485,000	485,000
0105	Crossbelt Analyzer System (Pkg. 5B)	IS	11 Sep 98	98US01M6215005300	480,000	480,000
0108	Water Treatment equipment	IS	7 Oct 98	98CN01M6214914301	316,892	316,892
0112	Belt Conveyor (Pkg. 7B)	IS	23 Dec 98	98CN01M6214903303	362,680	362,680
0113	Bag Filters and Miscellaneous (Pkg. 8B)	IS	23 Dec 98	98CN01M6215005304	301,932	301,932

ICB = international competitive bidding, IS = international shopping.

PCSS No.	Item	Mode of Procurement	Date of Contract	Contract Number	Contract Amount ($)	Amount Disbursed ($)
PART C: JINXI GENERAL CHEMICAL FACTORY						
0001	Caustic Soda Plant Using Ion-Exchange Membrane Process (JIN-1)	ICB	27 Dec 96	96UMXH/600316JP	11,351,250	11,351,250
0012	Chlorine Compressor Unit (JIN-3)	ICB	18 Feb 97	96UMXH/500316JP-1	1,339,000	1,339,000
0021	Liquid Caustic Soda Evaporation Unit (JIN-5)	ICB	26 Apr 97	96UMXH/500316JP-3IT	884,100	884,100
0035	Rectifier Unit Equipment Package for the Production of Caustic Soda Using Ion-Exchange Membrane Package (JIN-4)	ICB	29 May 97	96UMXH/500316JP-4CN	790,600	790,600
0037	Distributed Control System (JIN-01)	IS	24 May 97	96UMXH/500316JP-5HK	189,000	189,000
0085	PH Measuring Systems	D/P	19 Mar 98	96UMXH/500316JP-6CH	49,400	49,400
0086	Moisture in Chlorine Analyzers	D/P	19 Mar 98	96UMXH/500316JP-7HK	48,600	48,600
0095	Direct Reading ICP Spectrometer System	IS	1 Jul 98	96UMXH/500316JP-7US	70,000	70,000
0109	Gas Chromatograph	D/P	10 Dec 98	96UMXH/500316JP-8JP	18,200	18,200
0120	Upgrading for DCS System to Solve Y2K	R/O	2 Jun 99	96UMXH/500316JP-11HK	399,800	399,800
0124	Chlorine Gas Compressor	D/P	17 Apr 99	96UMXH/500316JP-10JP	661,500	628,845
0125	Liquid Caustic Soda Evaporation Unit	R/O	22 Apr 99	96UMXH/500316JP-91T	870,000	826,710
0126	DCS System	R/O	30 Jun 99	96UMXH/500316JP-12HK	180,000	180,000
0128	Rectification Technology and Equipment	D/P	18 Oct 99	96UMXH/500316JP-13CN	664,110	664,110
0136	360 KW Diesel Generator Unit	D/P	22 May 00	96UMXH/500316JP-15HK	49,800	49,800
0138	Liquid Caustic Soda Concentraction and Prilling Unit (JIN-7)	ICB	26 Sep 00	96UMXH/500316JP-141T	3,400,000	3,369,775
0139	860 pcs. Ion Exchange Membrance (JIN-8)	ICB	16 Mar 01	96UMXH/500316JP-16JP	1,000,000	1,000,000
0144	Various Computer Hardware		5 Jan 01	COM01	17,401	17,401
0145	Overseas Training (Japan and France)		19 Jun 99	Training01	41,674	41,674

D/P = direct purchase, ICB = international competitive bidding, IS = international shopping, R/O = repeat order.

PCSS No.	Item	Mode of Procurement	Date of Contract	Contract Number	Contract Amount ($)	Amount Disbursed ($)
PART D: TIANJIN SODA PLANT						
0013	Pusher Centrifuges (Model P-80/2) (TIAN-1)	ICB	25 Mar 97	97UMXH/3940803CH	910,000	910,000
0014	Complete Set of Synthesis Gas Compressor	IS	13 Mar 97	97UMXH/3940801CN	333,020	333,020
0015	Synthesis Circulating Gas Compressor	IS	13 Mar 97	97UMXH/3940802CN	215,000	215,000
0016	One Set H2-N2 Gas Compressor	IS	12 Mar 97	97UMXH/3940805CN	385,540	385,540
0017	Circulating Turbo-Compressor	IS	12 Mar 97	97UMXH/3940806CN	409,850	409,850
0018	Fluidbed Cooler	IS	15 Apr 97	97UMXH/3940808DE	360,000	360,000
0019	Ammonia Distillation and Absorption Unit (TIAN 3)	ICB	8 Apr 97	97UMXH/3940804CN	6,392,776	6,392,776
0020	Dense Soda Dryer Unit (TIAN 2)	ICB	7 Apr 97	97UMXH/3940807CN	712,500	712,500
0022	Automatic Tensioning Rotex Screeners	IS	24 Apr 97	97UMXH/3940809SG	404,844	404,844
0023	Static Equipment of Oil Gasification Unit	IS	29 Apr 97	97UMXH/3940810CN	278,940	278,940
0024	Heat Exchangers	IS	6 May 97	97UMXH/3940811CN	426,240	426,240
0025	Storage Tanks unit	IS	6 May 97	97UMXH/3940812CN	459,809	459,809
0036	Hydraulic Truck Crane and Diesel Forklift	IS	19 Jun 97	97UMXH/3940819CN	499,800	499,800
0038	Bulk Transport Equipment (Pkg. TJ-I-15)	IS	30 May 97	97UMXH/3940813CN	279,470	279,470
0039	Static Equipment of Purification unit (TJ-III-15)	IS	5 Jun 97	97UMXH/3940814CN	372,150	372,150
0040	Static Equipment of Rectification Unit (TJ-III-20)	IS	5 Jun 97	97UMXH/3940815CN	160,300	160,300
0041	Hydration Crystallizer Unit and Spareparts for 2 yrs.	IS	18 Jun 97	97UMXH/3940816CN	470,000	470,000
0042	Thickener Unit and Spareparts for 2 yrs. (TJ-I-2)	IS	18 Jun 97	97UMXH/3940817CN	400,000	400,000
0043	Distributed Control System (DCS)	ICB	26 Jun 97	97UMXH/3940820SG	868,000	868,000
0044	Static Equipment of Synthesis (TJ-III-16)	IS	27 Jun 97	97UMXH/3940851CN	783,000	783,000
0047	Hydrogen Recovery Unit	IS	16 Jul 97	97UMXH/3940853CN	200,000	200,000
0048	Transformer Substation Unit (TJ-III-27)	IS	29 Jul 97	97UMXH/3940852CN	659,000	659,000
0049	Washing Equipment (Pkg. TJ-I-5)	IS	30 Jul 97	97UMXH/3940818CN	492,600	492,600
0050	Nitrogen Gas Turbo Compressor (TJ-III-8)	IS	4 Sep 97	97UMXH/3940841CN	494,000	494,000
0051	Oxygen Gas Turbo Compressor (TJ-III-2)	IS	4 Sep 97	97UMXH/3940842CN	497,600	497,600
0052	Booster Expansion Turbine	IS	4 Sep 97	97UMXH/3940843CN	476,000	476,000
0053	Rehab of Recycle Gas Heater, Waste Heat	IS	06 Oct 97	97UMXH/3940855CN	424,600	424,600
0054	Storage and Packing Unit (TJ-I-8)	IS	15 Oct 97	97UMXH/3940854CN	240,149	240,149
0055	Special Machine and Pump (TJ-III-24)	IS	16 Oct 97	97UMXH/3940856CN	499,500	499,500
0056	Argon Column Unit (TJ-III-5)	IS	15 Oct 97	97UMXH/3940844CN	496,384	496,384
0064	Air Cooling unit (TJ-III-6)	IS	25 Nov 97	97UMXH/3940845CN	477,108	477,108
0065	Dedust and Purification Unit (TJ-III-7)	IS	25 Nov 97	97UMXH/3940846CN	405,783	405,783
0066	Air Turbo Compressor	IS	25 Nov 97	97UMXH/3940847CN	498,635	498,635
0067	Equipment Pumps (TJ-II-2)	IS	25 Nov 97	97UMXH/3940857CN	486,960	486,960

ICB = international competitive bidding, IS = international shopping.

PCSS No.	Item	Mode of Procurement	Date of Contract	Contract Number	Contract Amount ($)	Amount Disbursed ($)
0077	Equipment for Separating and Fine Distilling	IS	10 Feb 98	98UMXH/3940801CN	496,000	496,000
0078	Equipment for Separating Air (TJ-III-9)	IS	10 Feb 98	98UMXH/3940802CN	499,000	499,000
0079	Static Equipment for Ammonia Distribution and Absorption	IS	10 Feb 98	98UMXH/3940803CN	495,400	495,400
0081	Transmitters and Instrument (TJ-I-9)	IS	02 Mar 98	98UMXH/3940804CN	495,076	495,076
0082	Transmitters and Instruments for Ammonia Distribution	IS	02 Mar 98	98UMXH/3940805CN	489,852	489,852
0083	Electric Equipment (TJ-1-14)	IS	03 Mar 98	98UMXH/3940806CN	499,350	499,350
0084	Conveying Equipment (TJ-I-7)	IS	03 Mar 98	98UMXH/3940807CN	387,408	387,408
0089	Transmitter and Instrument	IS	26 May 98	98UMXH/3940808CN	492,000	492,000
0090	Special Pipe Materials (TJ-I-11)	IS	26 Mar 98	98UMXH/3940809CN	498,600	498,600
0096	Control Valves (TJ-III-23)	IS	16 Jul 98	98UMXH/3940810CN	494,560	494,560
0097	Special Materials (TJ-I-12)	IS	15 Jul 98	98UMXH/3940813CN	495,925	495,925
0098	Special Pumps (TJ-I-6)	IS	15 Jul 98	98UMXH/3940814CN	493,392	493,392
0099	Special Materials (TJ-III-26)	IS	15 Jul 98	98UMXH/3940815CN	487,444	487,444
0100	Special Pipes (TJ-II-4)	IS	23 Jul 98	98UMXH/3940811HK	497,209	497,209
0101	Special Pipes (TJ-III-25)	IS	23 Jul 98	98UMXH/3940812HK	499,468	499,468
0106	Carbon Black Recovery Unit (TJ-III-18)	IS	24 Sep 98	98UMXH/3940816CN	499,860	499,860
0107	Particular Tubular Products (TJ-II-5)	IS	6 Oct 98	98UMXH/3940817HK	498,500	498,500
0114	Special Valves of Heavy Soda Unit	IS	23 Dec 98	98UMXH/3940801HK	461,800	461,800
0127	Resolve Control Valve	D/P	20 Sep 99	99UMXH/393B804HK	8,600	8,600
0132	Y2K Software Package and Parts for DCS	D/P	10 Dec 99	99UMXH/39B803HK	480,000	480,000
0133	Transmitters	D/P	27 Dec 99	99UMXH/393B805HK	20,000	20,000

DCS = data control system, D/P = direct purchase, IS = international shopping.

PCSS No.	Item	Mode of Procurement	Date of Contract	Contract Number	Contract Amount ($)	Amount Disbursed ($)
PART E: GUIYANG STEEL MILLS						
0068	60T Ultra High Power Direct Current Electric Aarc furnace (UHP EAF) (Subpackage No. 1)	ICB	18 Dec 97	97TPJZA/4512001CL	10,446,663	10,313,994
				(EUR 117,048)	103,377	0
0069	Dedusting System (Subpackage No. 1.2)	ICB	18 Dec 97	97TPJZA/4512002	1,433,502	1,433,502
0070	Ferro-Alloys and Additive Charging System (Pkg No.2.2)	ICB	18 Dec 97	97TPJZA/4512003	466,175	466,175
0073	3-strand continuous casting machine (Pkg. No. 3)	ICB	20 Jan 98	97TPJZA/4512004CT	5,162,940	5,119,891
				(SWF 8,085,000)	1,062,400	1,062,400
				(EUR 205,302)	180,194	0
0087	60T Ladle Furnace (Subpackage No. 2.1)	ICB	28 Mar 98	98TPJZA/4512005	1,451,118	1,451,118
0091	125/32T Teeming Bridge Crane (Pkg. No. 4)	ICB	19 Jun 98	98TPJZA/4512006	452,746	452,746
0092	50/10T Bridge Crane and 50/10/2T Bridge Crane (Pkg. 5)	ICB	19 Jun 98	98TPJZA/4512007	310,012	310,012
0093	16/3.2T Bridge Crane/10+10T Bridge Crane (Pkg. 6)	ICB	19 Jun 98	98TPJZA/4512008	306,786	306,786
0111	Steel Products for Construction (Pkg 7.3)	ICB	10Dec98	98TPJZA/4512011CD0	2,693,053	2,693,053
0115	Freight Cost (Equipt under PCSS Nos. 0068 and 0073)	IS	2 Mar 99	99TPJZA/4512012	138,107	138,107
0116	Steel Products (Pkg 7.4)	ICB	6 May 99	99TPJZA/4512013CD	929,078	929,078
0117	Scrap Buckets and Bucket Cars, Ladles (Pkg. 10)	IS	28 May 99	99TPJZA/4512014	300,069	300,069
0118	Ladle and Tundish Drying and Preheating System (Pkg. 12)	IS	27 May 99	99TPJZA/4512016	351,191	316,072
0119	Dedusting System for LF and Ferro-Alloys Charging System	IS	28 May 99	99TPJZA/4512017	318,953	318,953
0121	Equipment and Materials of Water Circulating (Pkg. 8)	ICB	3 Sep 99	99TPJZA/4512018	1,122,592	1,122,592
0122	Equipment and Materials of Power Supply and Distribution (Pkg. 9)	ICB	3 Sep 99	99TPJZA/4512019	2,041,272	2,041,272
0123	Chemical Examination and Analysis Facilities	IS	27 Jul 99	99TPJZA/4512015MC	388,777	388,777
0129	Refractory Materials (Pkg. 14)	IS	23 Oct 99	99TPJZA/4512021	525,027	525,027
0130	Electrode (Pkg. 15)	IS	6 Oct 99	99TPJZA/4512020CT	510,337	510,337
0134	Vacuum Degassing Furnace (Pkg. 16)	ICB	31 May 00	2000TPJZA/45120023	1,118,011	1,118,011
0135	Auxiliary Equipment for Steel Making Plant (Pkg. 18)	ICB	31 May 00	2000TPJZA/4512022	645,585	645,585
0137	Billet Chipping Unit (Pkg. 17)	ICB	1 Aug 00	2000TPJZA/45120024	892,053	892,053
0140	Electric Spare Parts (Pkg. 19)	IS	26 Apr 01	2001TPJZA/4512027	407,786	407,786
0141	Mechanical Spare Parts (Pkg. 20)	IS	26 Apr 01	2001TPJZA/4512025	284,900	284,900
0142	Electrode 2 (Pkg. 21)	IS	26 Mar 01	2001TPJZA/4512026	418,829	418,829
0143	Crystalizer Electromagnetism Rabbler	D/P	12 Sep 01	99TPJZA/4512028	109,358	109,358
0094	Steel Products (Pkg. 7.1)	ICB	19 Jun 98	98TPJZA/4512009CD	2,260,309	2,260,309
0110	Color Press Steel Plate and Cold-Rolled Plate (Pkg. 7.2)	ICB	10 Dec 98	98TPJZA/4512010CD	756,049	756,049
0111	Steel Products for Construction (Pkg 7.3)	ICB	10 Dec 98	98TPJZA/4512011CD0	248,642	248,642
0131	Overseas Training	Others	27 Oct 99	W/A GG0301	109,740	109,740

D/P = direct purchase, ICB = international competitive bidding, IS = international shopping.

FINANCIAL PERFORMANCE OF SUBPROJECT ENTERPRISES

1. The financial performance of the project enterprises from 1996 to 2002 is summarized below.

2. Huaxin is a joint stock limited company with shares listed on the Shanghai Stock Exchange. Huaxin was able to attract a foreign strategic investor to invest in the company. The financial performance of the company generally has been satisfactory. The company has registered modest profits in the past seven years (1996 to 2002) of operation, averaging about 3% of sales. The unaudited results for 2002 show that the profitability level was sustained. The company is able to service its maturing long- term obligations, although its computed debt service coverage ratio (DSCR) fell below covenant in some years. The current ratio (CR) also has fallen below the minimum requirement of 1:1 with notable increases in the short-term loans and accounts payable. The company management is confident that operations and profitability will moderately improve in the next few years, supported by a stable, although modest, increase in the demand for cement.

3. Jinhua was restructured into a shareholding company at the end of 1997 with its shares listed on the Shenzhen Stock Exchange. The financial performance of Jinhua since 1996 has been satisfactory albeit with declining profitability due to aging facilities. Its profits from 1996 to 2000 averaged about 10% of sales. In 2001 the company suffered a minimal loss, but recovered in 2002. The company is in compliance with all the financial covenants. The financial prospects of the company appear good and a number of replacement and expansion projects are underway.

4. Tianjin Bohai sustained substantial losses in 1998 and 1999, totaling about 20% of sales. The losses continued until 2000, although at a much lesser degree (about 4% of sales). As a result, the company's stocks were delisted from the Shanghai Stock Exchange in 2000. Operations improved in 2001, with almost break-even results. The auditor, however, noted the delay in the transfer of the assets placed in operation, which resulted in further understatement of the losses or overstatement of income. Financial statements for 2002 registered modest income. The company has not been able to meet the covenants on DSCR and CR, and remits to the municipal finance bureau only a fraction of its debt service requirements. The company implements measures to improve its profitability and continues to reconfigure its product mix to produce goods with better demand and price in the market.

5. Guiyang Special Steel Company Limited (GSSC) registered modest profits until 2000 (about 1-2% of sales), but it began incurring substantial losses in 2001. Its losses in 2001 accounted for about 9% of sales and worsened in 2002 with losses totaling CNY142 million, or 48% of sales. Total sales also declined by 40% from the year-ago level. The covenants on DSCR and CR have not been complied with since 1998, and internal cash generation has been negative for the past two years. Unless GSSC is able to implement radical remedial measures to turn its profitability around, the sustainability of the project is at risk.

Table A10.1: Financial Performance of Huaxin Cement Company, Limited, 1996–2002
(CNY million)

Year Ending December 31	1996	1997	1998	1999	2000	2001	2002
Income Statements							
Sales	307.19	287.93	340.46	455.38	594.63	691.88	801.09
Less: Cost of Sales	202.15	191.07	228.61	318.24	408.15	486.22	572.85
Gross Profit	105.04	96.86	111.85	137.14	186.47	205.66	228.24
Other Operating Income	0.55	1.04	(0.39)	2.34	1.83	5.43	13.99
Less: Operating Expenses	85.01	85.26	71.31	109.91	114.48	128.54	137.17
Selling Expenses	45.41	47.09	25.33	38.65	39.46	41.58	50.38
Administrative Expenses	39.60	38.18	45.98	71.26	75.02	86.96	86.79
Operating Income	20.58	12.64	40.15	29.57	73.82	82.55	105.06
Less: Financial Expenses	12.58	10.47	28.32	21.68	49.44	49.54	72.60
Nonoperating Income/(Expense)	10.35	5.77	(4.97)	(3.31)	(2.85)	0.58	0.16
Net Income Before Tax	18.35	7.93	6.86	4.58	21.53	33.59	32.62
Net Income After Tax	**15.90**	**7.55**	**5.20**	**3.59**	**18.10**	**30.97**	**29.88**
Cash Flow Statements							
Net Income After Tax		7.55	5.20	3.59	18.10	30.97	29.88
Add: Non-cash Charges		32.95	47.31	74.62	107.03	100.73	108.28
Interest Expense		10.47	28.32	35.84	63.31	60.52	69.66
Internal Cash Generation		50.97	80.83	114.05	188.44	192.22	207.83
Borrowings		338.04	350.49	185.09	174.44	235.75	450.66
Equity Contributions and Grants Received		2.45	0.13	171.28	11.67	0.00	0.00
Other Sources		0.95	3.63	6.02	9.62	8.99	81.76
Total Sources of Funds		**392.42**	**435.08**	**476.44**	**384.15**	**436.96**	**740.25**
Capital Expenditures		298.41	328.85	196.51	68.76	118.09	214.58
Debt Service		25.76	110.44	99.40	106.23	99.68	277.52
Principal Repayment		15.29	34.95	27.33	62.27	62.26	170.20
Interest Charges		10.47	75.49	72.07	43.97	37.42	107.32
Other Payments		13.85	7.43	91.39	4.17	12.90	11.39
Changes in Working Capital and Other Accounts		59.92	(26.47)	(5.38)	227.50	230.51	231.21
Total Application of Funds		**397.95**	**420.25**	**381.93**	**406.66**	**461.17**	**734.70**
Changes in Cash		**(5.52)**	**14.83**	**94.52**	**(22.51)**	**(24.21)**	**5.55**
Cash Balance, Beginning of Year		46.11	40.59	55.42	149.93	127.43	103.22
Cash Balance, End of Year	46.11	40.59	55.42	149.93	127.43	103.22	108.76
Balance Sheets							
Current Assets	213.24	253.88	260.07	420.60	440.18	454.44	361.31
Cash and Deposits	46.11	40.59	55.42	241.01 [a]	218.50 [a]	194.29 [a]	108.76
Accounts Receivables	67.99	85.20	89.13	82.06	102.68	124.28	118.03
Other Receivables	53.44	70.87	61.42	35.86	29.34	41.82	30.27
Inventories	45.70	57.23	54.11	61.68	89.66	94.05	104.25
Long-Term Investments	66.25	70.69	63.05	74.26	66.57	76.06	30.24
Property, Plant, and Equipment, Net	419.43	501.57	604.83	1,412.21	1,404.96	1,388.69	1,496.75
Construction in Progress	278.99	460.65	643.30	75.08	60.90	113.76	194.93
Intangibles and Deferred Assets	34.25	34.95	84.46	17.82	17.25	15.59	228.80
Other Assets	0.00	0.00	0.00	16.97	18.16	22.12	0.00
Total Assets	**1,012.17**	**1,321.73**	**1,655.72**	**2,016.93**	**2,008.01**	**2,070.67**	**2,312.03**
Current Liabilities	231.36	217.58	301.73	435.48	452.25	583.80	543.25
Accounts Payable	20.45	38.40	52.30	79.59	95.46	100.55	152.19
Short-Term Loans	152.91	95.14	150.11	223.22	217.54	326.81	259.89
Deposits and Accrued Charges	40.03	60.51	86.80	124.03	135.60	153.45	131.17
Others	17.96	23.53	12.52	8.64	3.65	2.99	0.00
Long-Term Debt	235.17	559.82	801.39	877.90	814.72	718.94	825.52
Deferred Income	0.00	0.00	0.00	0.00	9.49	14.16	113.30
Minority Interests	3.65	2.06	2.19	12.22	22.12	26.49	84.30
Stockholders Equity	541.99	542.27	550.40	691.33	709.44	727.27	745.66
Paid-In Capital	251.40	251.40	251.40	328.40	328.40	328.40	328.40
Surplus, Reserves, and Retained Earnings	290.59	290.87	299.00	362.93	381.04	398.87	417.26
Total Liabilities and Equity	**1,012.17**	**1,321.73**	**1,655.72**	**2,016.93**	**2,008.01**	**2,070.67**	**2,312.03**
Financial Indicators							
Return on Net Fixed Assets (%)[b]	4.91	2.74	7.26	2.93	5.24	5.91	7.28
Debt Service Coverage Ratio (times)[c]		1.98	0.73	1.15	1.77	1.93	0.75
Debt/Debt Plus Equity (% of debt)[d]	30.26	50.80	59.28	55.94	53.45	49.71	52.54
Current Ratio[e]	0.92	1.17	0.86	0.97	0.97	0.78	0.67

[a] Includes restricted cash of CNY91.072 million.
[b] Net operating income after taxes as a percentage of average net fixed assets in operation.
[c] Ratio of internal cash generation to debt service requirement.
[d] Ratio of long-term debt to long-term debt plus equity.
[e] Ratio of current assets to current liabilities.

Note: Accounts are for the consolidated operations of the company. Some adjustments were made in the cashflow statements based on available information.
Source: Huaxin Cement Company Limited.

Table A10.2: Financial Performance of Jinhua Chemical Group Chlor Alkali Company, Limited, 1996–2002

(CNY million)

Year Ending December 31	1996	1997	1998	1999	2000	2001	2002
Income Statements							
Sales	640.24	698.21	634.94	670.37	743.44	1,125.43	1,393.04
Less: Cost of Sales	494.05	578.52	575.99	614.40	668.69	1,055.38	1,348.06
Gross Profit	146.19	119.70	58.95	55.97	74.75	70.05	44.98
Other Operating Income	0.00	2.13	0.25	1.25	0.59	0.46	0.00
Less: Total Operating Expenses	23.24	24.93	13.48	18.90	30.27	49.40	33.29
Operating Expenses	3.41	4.66	13.48	2.86	5.96	6.42	8.72
Administrative Expenses	19.83	20.27		16.04	24.31	42.99	24.57
Operating Income	122.95	96.89	45.71	38.32	45.07	21.10	11.69
Less: Financial Expenses	17.87	(1.27)	(25.97)	(1.19)	5.68	40.36	29.16
Nonoperating Income/(Expense)	(1.14)	(0.99)	7.73	26.64	3.42	(5.44)	27.80
Net Income Before Tax	103.94	97.17	79.41	66.14	42.81	(24.70)	10.33
Net Income After Tax	**103.94**	**97.17**	**67.50**	**46.93**	**27.58**	**(14.96)**	**10.33**
Cash Flow Statements							
Net Income After Tax	103.94	97.17	67.50	46.93	27.58	(14.96)	10.33
Add: Non-cash Charges	17.30	23.65	(3.58)	60.50	59.88	98.59	163.19
Interest Expense	17.87	(1.27)	(25.97)	(1.19)	5.68	40.36	29.16
Internal Cash Generation	139.11	119.54	37.95	106.24	93.13	123.99	202.68
Borrowings	0.00	185.70	62.41	48.22	111.47	10.00	79.20
Equity Contributions and Grants Received	16.27	726.37	0.13	0.00	0.00	0.00	0.00
Proceeds from Investments/Others	0.00	0.95	6.40	4.43	3.24	173.28	1,275.49
Total Sources of Funds	**155.38**	**1,032.57**	**106.88**	**158.89**	**207.85**	**307.27**	**1,557.37**
Capital Expenditures	9.55	228.65	76.90	55.98	235.76	137.94	65.69
Debt Service	1.00	37.92	4.58	57.09	12.08	55.91	152.91
Principal Repayment	1.00	39.19	2.71	40.00		41.87	68.49
Interest Charges		(1.27)	1.87	17.09	12.08	14.04	84.42
Other Payments	111.40	130.14	40.00	62.76	0.00	0.00	979.58
Changes in Working Capital/Others	75.54	133.31	106.36	104.71	96.44	(88.82)	156.91
Total Application of Funds	**197.48**	**530.02**	**227.85**	**280.54**	**344.27**	**105.03**	**1,355.09**
Changes in Cash	**(42.10)**	**502.56**	**(120.97)**	**(121.65)**	**(136.43)**	**202.24**	**202.28**
Cash Balance, Beginning of Year	52.13	10.02	512.58	391.62	269.98	133.55	335.79
Cash Balance, End of Year	10.03	512.58	391.62	269.97	133.55	335.78	538.07
Balance Sheets							
Current Assets	149.61	619.76	744.12	700.11	447.92	716.77	1,013.25
Cash and Deposits	10.02	512.58	391.62	269.98	133.55	335.79	538.07
Short-Term Investment	0.00	0.00	40.00	0.00	0.00	0.00	0.00
Accounts Receivables, Net	55.03	73.87	140.25	100.55	84.91	104.23	75.58
Other Receivables	30.05	42.78	114.93	272.91	132.27	87.19	0.00
Inventories, Net	50.12	(12.58)	54.89	55.01	85.09	136.41	87.47
	4.40	3.10	2.43	1.66	12.10	53.15	312.13
Long-Term Investments	15.00	15.00	15.00	126.15	126.58	85.15	0.00
Fixed Assets	408.72	573.12	912.89	865.59	1,612.16	2,481.05	2,495.67
Less: Accumulated Depreciation	167.45	270.66	266.88	310.56	533.67	631.90	779.55
Fixed Assets, Net	241.27	302.46	646.01	555.03	1,078.49	1,849.15	1,716.12
Construction in Progress	0.00	132.54	0.21	59.15	823.74	135.76	220.66
Intangibles and Deferred Assets	0.00	11.28	10.11	16.18	58.51	50.43	69.09
Total Assets	**405.88**	**1,081.04**	**1,415.46**	**1,456.62**	**2,535.24**	**2,837.25**	**3,019.12**
Current Liabilities	109.81	(51.95)	192.08	155.24	272.42	623.54	840.05
Accounts Payable	97.59	(83.34)	27.22	120.46	138.19	306.39	413.99
Short-Term Loans	4.54	21.95	40.00	0.00	40.00	237.54	178.24
Deposits and Accrued Charges	2.45	2.93	10.35	13.31	23.21	26.54	0.00
Others	5.23	6.52	114.52	21.48	71.02	53.07	247.82
Long-Term Debt	51.90	198.42	289.31	350.34	1,286.87	1,255.00	1,021.62
Stockholders Equity	244.17	934.57	934.07	951.04	975.95	958.71	1,157.45
Paid-In Capital	83.24	340.00	340.00	340.00	340.00	340.00	340.00
Surplus, Reserves, and Retained Earnings	160.93	594.57	594.07	611.04	635.95	618.71	817.45
Total Liabilities and Equity	**405.88**	**1,081.04**	**1,415.46**	**1,456.62**	**2,535.24**	**2,837.25**	**3,019.12**
Financial Indicators							
Return on Net Fixed Assets (%)[a]	50.96	35.64	9.64	6.38	5.52	1.44	0.66
Debt Service Coverage Ratio (times)[b]	139.11	3.15	8.28	1.86	7.71	2.22	1.33
Debt/Debt Plus Equity (% of debt)[c]	17.53	17.51	23.65	26.92	56.87	56.69	46.88
Current Ratio[d]	1.36	(11.93)	3.87	4.51	1.64	1.15	1.21

[a] Net operating income after taxes as a percentage of average net fixed assets in operation.
[b] Ratio of internal cash generation to debt service requirement.
[c] Ratio of long-term debt to long-term debt plus equity.
[d] Ratio of current assets to current liabilities.

Note: Accounts are for the consolidated operations of the company. Some adjustments were made in the cash flow statements based on available information.
Source: Jinhua Chemical Group Chlor Alkali Company, Limited.

Table A10.3: Financial Performance of Tianjin Bohai Chemical Industry Corporation, 1996–2002
(CNY million)

Year Ending December 31	1996	1997	1998	1999	2000	2001	2002
Income Statements							
Sales	974.83	837.33	744.73	654.54	749.09	837.91	847.68
Less: Cost of Sales	832.24	686.22	680.85	636.88	662.46	698.38	705.61
Gross Profit	142.59	151.10	63.87	17.66	86.64	139.53	142.07
Other Operating Income	0.15	0.05	0.40	(2.45)	0.41	(0.29)	0.52
Less: Total Operating Expenses	101.61	108.05	185.07	106.11	105.07	111.97	115.12
Operating Expenses	13.32	14.37	17.50	23.50	19.49	14.36	26.59
Administrative Expenses	88.29	93.68	167.57	82.62	85.58	97.61	88.53
Operating Income	41.13	43.11	(120.79)	(90.90)	(18.02)	27.27	27.47
Less: Financial Expenses	29.08	30.61	36.19	26.57	22.76	21.71	25.01
Interest Expense (assumed at 6% of STL)	10.35	13.47	15.73	16.00	17.53	16.30	19.57
Nonoperating Income/(Expense)	23.13	9.66	3.17	1.49	9.46	(5.23)	2.45
Adjustment of Prior Year's Income		(8.22)	0.00	0.00	0.00	0.00	0.00
Net Income Before Tax	35.18	13.93	(153.82)	(115.98)	(31.31)	0.33	4.91
Net Income After Tax	**46.34**	**12.75**	**(153.82)**	**(115.98)**	**(31.31)**	**0.22**	**4.77**
Cash Flow Statements							
Net Income After Tax		12.75	(153.82)	(115.98)	(31.31)	0.22	4.77
Add: Non-cash Charges		66.49	93.49	64.87	39.62	21.44	66.08
Interest Expense		30.61	36.19	26.57	22.76	21.71	25.01
Internal Cash Generation		109.86	(24.14)	(24.55)	31.06	43.37	95.86
Borrowings		108.38	477.60	210.24	3,027.03	264.70	400.69
Equity Contributions and Grants Received		100.39	0.00	0.00	1.37	0.00	0.00
Proceeds from Investments		0.50	5.02	4.73	2.68	6.27	4.74
Total Sources of Funds		**319.13**	**458.48**	**190.42**	**3,062.15**	**314.34**	**501.29**
Capital Expenditures		140.87	241.14	78.12	129.88	43.15	61.86
Debt Service		82.52	72.67	69.13	42.38	225.32	400.99
Principal Repayment		51.91	37.78	39.38	15.81	208.14	384.35
Interest Charges		30.61	34.89	29.76	26.57	17.18	16.64
Other Payments		80.65	364.60	124.16	2,968.26	77.10	54.11
Changes in Working Capital/Others		22.64	(233.34)	(85.05)	(118.36)	(34.74)	
Total Application of Funds		**326.68**	**445.07**	**186.37**	**3,022.15**	**310.83**	**516.96**
Changes in Cash		**(7.56)**	**13.41**	**4.06**	**39.99**	**3.51**	**(15.67)**
Cash Balance, Beginning of Year		18.60	11.04	24.46	28.51	68.51	72.01
Cash Balance, End of Year	18.60	11.04	24.46	28.51	68.50	72.01	56.34
Balance Sheets							
Current Assets	677.41	723.73	702.01	710.98	688.92	743.73	774.35
Cash and Deposits	18.60	11.04	24.46	28.51	68.51	72.01	56.34
Notes Receivable	11.17	20.85	13.97	14.01	3.25	0.52	2.78
Accounts Receivables, Net	204.04	295.75	386.04	379.32	267.81	321.41	328.98
Other Receivables	295.21	268.78	172.76	197.70	250.88	261.63	294.08
Inventories, Net	124.90	117.14	88.02	71.19	80.19	69.13	68.30
Other Current Assets	23.49	10.16	16.76	20.26	18.28	19.02	23.86
Long-Term Investments	21.90	52.07	57.26	57.60	63.06	74.61	121.60
Fixed Assets	1,055.18	1,167.93	1,180.69	1,207.87	1,223.59	1,328.65	1,391.03
Less: Accumulated Depreciation	345.57	398.25	465.93	526.49	566.54	623.06	688.31
Fixed Assets, Net	709.62	769.68	714.75	681.38	657.06	705.58	702.73
Construction in Progress	108.84	137.03	389.64	449.05	554.28	533.79	537.86
Intangibles and Deferred Assets	8.98	8.92	13.49	8.81	5.10	10.05	9.63
Total Assets	**1,526.74**	**1,691.42**	**1,877.16**	**1,907.83**	**1,968.43**	**2,067.76**	**2,146.16**
Current Liabilities	482.71	528.05	705.47	785.76	846.70	906.25	983.38
Accounts Payable	187.26	222.42	324.92	440.17	426.44	471.25	505.76
Short-Term Loans	172.51	224.42	262.20	266.70	292.10	271.70	326.15
Advances and Accrued Charges	37.29	30.71	39.71	13.46	29.62	44.84	29.962
Others	85.64	50.50	78.65	65.44	98.54	118.46	121.50
Long-Term Debt	444.66	450.65	630.74	712.66	751.50	531.96	527.36
Stockholders Equity	599.37	712.72	540.95	409.41	370.23	629.77	635.43
Paid-In Capital	234.28	334.67	324.67	324.67	324.67	458.40	458.40
Surplus, Reserves, and Retained Earnings	365.09	378.05	216.28	84.74	45.56	171.37	177.026
Total Liabilities and Equity	**1,526.74**	**1,691.42**	**1,877.16**	**1,907.83**	**1,968.43**	**2,067.98**	**2,146.16**
Financial Indicators							
Return on Net Fixed Assets (%)[a]	5.80	5.83	(16.27)	(13.02)	(2.69)	4.00	3.90
Debt Service Coverage Ratio (times)[b]	0.00	1.33	(0.33)	(0.36)	0.73	0.19	0.24
Debt/Debt Plus Equity (% of debt)[c]	42.59	38.74	53.83	63.51	66.99	45.79	45.35
Current Ratio[d]	1.40	1.37	1.00	0.90	0.81	0.82	0.79

[a] Net operating income after taxes as a percentage of average net fixed assets in operation.
[b] Ratio of internal cash generation to debt service requirement.
[c] Ratio of long-term debt to long-term debt plus equity.
[d] Ratio of current assets to current liabilities.

Note: Accounts are for the consolidated operations of the company. Some adjustments were made in the cash flow statements based on available information.
Source: Tianjin Soda Plant.

FINANCIAL EVALUATION

A. General

1. The financial internal rate of return (FIRR) was reevaluated on the basis of financial data and assumptions provided by the enterprises. Capital costs were based on investments made for the subprojects. Incremental revenues were determined from the sales of the major products and by-products. Incremental operations and maintenance costs were based on costs presented in the financial statements and adjusted to reflect assumed production levels and product mix. As at appraisal, the economic life of the subprojects was assumed to be 15 years with zero residual value. All revenues and expenditures are in constant 2002 prices and exclude depreciation and interest.

B. Capital Costs

2. Capital costs were based on costs incurred by the enterprises for the subprojects. Excluded were major additional investments being planned by the enterprises for making future renovations, improving project facilities, and restructuring the product mix to produce higher-priced products that are in greater demand. Although the enterprises are considering investments to improve the use of the project facilities, energy, and raw materials that will strengthen the sustainability of the subprojects, these were not included in the projections due to the lack of reliable information on cost estimates and future benefits.

C. Revenues and Production Costs

3. Incremental revenues from the subprojects were considered from the start of operations of the project facilities until 2002. The projected revenues were computed on the basis of full capacity operation of the project facilities, commencing in 2003 in the case of three subprojects and gradually over the next 4 years in the case of Guiyang Steel Mills (GSM). Other products that the enterprises have been producing or will produce to improve their profitability, but are not directly associated with the project facilities, were not included in the analysis. The product prices prevailing in 2003 were used in the calculations and were assumed to remain constant from 2003 onward. The projections assumed the current level of production costs. The deviations in the treatment of the "without project" scenario at project completion compared to the approach at appraisal as explained in paras. 4 and 5 of Appendix 12 hold true for the financial evaluation.

D. Financial Internal Rate of Return

4. The FIRRs of the four subprojects were recalculated at 10.0% for Huaxin Cement Co., Ltd. (HCCL), 11.5% for the Jinxi General Chemical Factory (JGCF), 8.8% for Tianjin Soda Plant (TSP), and 8.5% for GSM. These are lower compared with the FIRRs estimated at appraisal of 11.6%, 12.8%, 10.5%, and 12.4% for HCCL, JGCF, TSP, and GSM, respectively. The reduced FIRRs are mainly due to the lower price of the main products, the result of weaker-than-expected demand and stronger-than-anticipated competition. The low prices of the main outputs and the higher production costs have resulted in financial losses in the initial years of operations, which have threatened the financial viability of two subprojects, TSP and GSM. Implementing measures to improve profitability is crucial to ensure the subprojects' sustainability. These measures include improvements in the prices of the main products,

diversification of the product mix to produce higher-value and more saleable products, and changes in the production process to bring down production costs.

5. The FIRRs of the subprojects are still higher than their weighted average cost of capital (WACC). The overall FIRR of 9.5 % is higher than the 4.7% WACC for the whole Project.

E. Weighted Average Costs of Capital

6. The estimated WACC for the subprojects, after taxes and in real terms, was derived following the methodology in the *Guidelines for the Financial Government and Management of Investment Projects Financed by the ADB* using the actual capital mix and costs of funds. The real interest costs of loan funds were considered, while the cost of equity was assumed to be 10%. Actual income tax rates were assumed. The standard income tax rate in the People's Republic of China (PRC) is 33%, although preferential rates are given in some inland provinces. Domestic inflation is assumed at 3% per year.

7. The recalculated WACCs are 4.3% for HCCL, 4.5% for JGCF, 4.9% for TSP, and 5.1% for GSM. The WACCs calculated at appraisal assumed higher costs of debt and equity as well as higher inflation rates, and a different methodology was used in the calculation.

Table A11: Financial Internal Rates of Return
(CNY million)

Year Ending December 31		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010—
Huaxin Cement Company Limited (HCCL)																
Capital Investment		(44.96)	(332.91)	(194.23)	(93.92)	(16.16)	(4.13)									
Incremental Revenue					202.86	326.19	329.54	394.68	443.30	443.30	443.30	443.30	443.30	443.30	443.30	443.30
Incremental Cost					153.22	239.49	228.35	277.68	308.39	308.39	308.39	308.39	308.39	308.39	308.39	308.39
Net Cash Flow After Tax		(44.96)	(332.91)	(194.23)	(44.28)	59.48	81.10	95.96	107.96	107.96	107.96	107.96	107.96	107.96	107.96	107.96
FIRR	**9.99%**															
WACC	**4.34%**															
Jinxi General Chemical Factory (JGCF)																
Capital Investment		(24.89)	(114.68)	(150.82)	(29.68)	(27.85)	(39.94)									
Incremental Revenue				64.64	249.30	272.96	198.04	191.04	245.47	254.28	254.28	254.28	254.28	254.28	254.28	254.28
Incremental Cost				37.86	169.66	169.04	132.47	141.30	198.01	204.97	204.97	204.97	204.97	204.97	204.97	204.97
Net Cash Flow After Tax		(24.89)	(114.68)	(124.03)	33.21	51.27	13.41	42.82	41.30	42.54	42.54	42.54	42.54	42.54	42.54	42.54
FIRR	**11.47%**															
WACC	**4.50%**															
Tianjin Soda Plant (TSP)																
Capital Investment		(19.07)	(123.38)	(169.75)	(53.67)	(38.20)	(2.90)	(2.07)								
Incremental Revenue					74.65	163.57	203.51	256.62	256.62	256.62	256.62	256.62	256.62	256.62	256.62	256.62
Incremental Cost					57.64	121.60	140.38	190.06	190.06	190.06	190.06	190.06	190.06	190.06	190.06	190.06
Net Cash Flow After Tax		(19.07)	(123.38)	(169.75)	(36.66)	0.24	49.64	52.85	54.92	54.92	54.92	54.92	54.92	54.92	54.92	54.92
FIRR	**8.79%**															
WACC	**4.90%**															
Guiyang Steel Mills (GSM)																
Capital Investment		(32.68)	(190.71)	(171.93)	(32.26)	(65.93)	(71.90)									
Incremental Revenue						121.02	235.87	104.70	472.03	590.93	655.27	715.38	755.24	755.24	755.24	755.24
Incremental Cost						99.47	187.30	83.54	388.10	485.60	539.11	592.62	627.78	627.78	627.78	627.78
Net Cash Flow After Tax		(32.68)	(190.71)	(171.93)	(32.26)	(44.33)	(26.05)	21.17	69.43	83.77	91.03	95.45	98.60	98.60	98.60	98.60
FIRR	**8.46%**															
WACC	**5.07%**															
Overall																
Capital Investment		(121.60)	(761.68)	(686.73)	(209.53)	(148.14)	(118.87)	(2.07)								
Incremental Revenue				64.64	526.81	883.74	966.95	947.04	1,417.41	1,545.13	1,609.47	1,669.57	1,709.44	1,709.44	1,709.44	1,709.44
Incremental Cost				37.86	380.52	629.60	688.50	692.59	1,084.56	1,189.02	1,242.53	1,296.04	1,331.20	1,331.20	1,331.20	1,331.20
Net Cash Flow After Tax		(121.60)	(761.68)	(659.95)	(79.99)	66.66	118.10	212.81	273.62	289.19	296.45	300.87	304.02	304.02	304.02	304.02
FIRR	**9.49%**															
WACC	**4.68%**															

FIRR = financial internal rate of return, WACC = weighted average cost of capital.

ECONOMIC EVALUATION

A. General

1. An economic evaluation was carried out for each subproject. Incremental costs and benefits were determined for each subproject to determine the net benefit stream. The economic life of the Project was assumed to be 15 years after full commercial operations. The residual value at the end of the economic life was assumed to be zero. All prices and costs are expressed in 2002 values.

B. Capital Costs, Incremental Benefits, and Costs

2. The economic capital costs of the subprojects were derived from the actual financial investments, which were converted to their economic values by applying the conversion factors[1] commonly used for projects in the People's Republic of China. Taxes, import duties, and all financial charges, including interest during construction, have been excluded.

3. At appraisal, the economic benefits were identified as (i) energy savings through the adoption of energy conservation measures, (ii) enhanced economic efficiency and cost-effectiveness of production from modifications in the processes, and (iii) improvements in product quality through the introduction of appropriate advanced technology. At project completion, the same economic benefits were realized. However, these are not separately valued, but rather integrated by way of a reduction in production and operating costs, decreases in energy consumption, lesser environment mitigation cost, and, to some extent, better product prices. The outputs of each subproject, except for cement, are import-substitute traded goods and, therefore, are valued at their cost, insurance and freight (CIF) prices plus the local handling and transportation costs. As the PRC exports cement, the economic price for cement produced by Huaxin Cement Corporation, Ltd. (HCCL) is valued at its free on board (FOB) price less transportation and port handling costs.

4. In the case of Jinxi General Chemical Factory (JGCF) and Guiyang Steel Mills (GSM), since the old production facilities were shut down, the new capacity represents replacement, and the entire output from the newly built production lines was considered in determining the incremental revenue and cost. The same treatment was made for Huaxin Cement Co., Ltd. (HCCL), although the shutdown of the three old wet process kilns was postponed until 2007 with some investments made for an upgrade. For the Tianjin Soda Plant (TSP), where the capital investments were used to upgrade the old facilities by replacing major equipment and adding other accessory facilities, incremental revenue and cost were derived from the increase in output beyond the production level before the commissioning of the new facility.

5. The basic methodology adopted at appraisal, where the “without project” and “with project” scenarios were compared, was maintained for determining incremental benefits at project completion. But it deviated by reflecting the “without project” scenario where the old facilities were considered to continue operating as assumed at appraisal. This was due to the prevailing situation of the old facilities at project completion, which would (i) make them very uneconomical to maintain due to high operating cost and poor product quality, and (ii) cause high levels of environmental pollution, forcing the enterprises to shut down their operations. In

[1] The conversion factors used in this evaluation are 1.1 for civil works, 1.1 for local machinery, and 0.93 for others.

the case of GSM, the benefits at appraisal were shown in terms of the total savings in unit cost per unit of output.

6. The Project has also resulted in substantial environmental benefits (Appendix 14) through the reduction of air and water emissions. There are also environmental benefits from the reductions in emissions of chlorine, asbestos, and mercury. However, these benefits were not valued and, to this extent, the estimated economic benefits are understated.

7. All production inputs are locally produced and purchased, and are valued at their domestic prices. The price of coal is expressed in cost, insurance, and freight price to the project site. Other cost components are translated into economic costs by applying the standard conversion factor to their financial costs.

C. Economic Internal Rates of Return

8. The economic internal rate of return (EIRR) is recalculated at 12.7% for HCCL, 18.5% for JGCF, 12.3% for TSP, and 12.2% for GSM. The overall EIRR for the whole project is 13.2%. The EIRRs estimated at appraisal were 13.2%, 20.2%, 14.1%, and 16.0% for the HCCL, JGCF, TSP, and GSM, respectively. The below-forecast EIRRs are due primarily to the reduced benefits as a result of lower-than-expected prices of the products and higher-than-expected input costs. Nevertheless, the EIRR of the individual subprojects, and of the overall Project, is still higher than the economic opportunity cost of capital of 12%.

Table A12: Economic Internal Rates of Return

(CNY million)

Year Ending December 31		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010—
Huaxin Cement Company Limited (HCCL)																
Capital Investment		(48.38)	(358.23)	(209.00)	(101.07)	(17.39)	(4.45)									
Incremental Benefit					191.71	311.89	319.22	379.28	422.33	422.33	422.33	422.33	422.33	422.33	422.33	422.33
Incremental Cost					139.51	218.04	207.88	252.80	280.77	280.77	280.77	280.77	280.77	280.77	280.77	280.77
Net Benefits		(48.38)	(358.23)	(209.00)	(48.87)	76.46	106.90	126.48	141.56	141.56	141.56	141.56	141.56	141.56	141.56	141.56
EIRR	**12.72%**															
Jinxi General Chemical Factory (JGCF)																
Capital Investment		(26.14)	(120.40)	(158.34)	(31.16)	(29.24)	(41.94)									
Incremental Benefit				64.73	248.26	275.08	200.64	192.51	238.18	247.74	247.74	247.74	247.74	247.74	247.74	247.74
Incremental Cost				34.93	156.58	155.95	122.19	130.33	182.50	188.91	188.91	188.91	188.91	188.91	188.91	188.91
Net Benefits		(26.14)	(120.40)	(128.54)	60.52	89.89	36.52	62.18	55.67	58.83	58.83	58.83	58.83	58.83	58.83	58.83
EIRR	**18.47%**															
Tianjin Soda Plant (TSP)																
Capital Investment		(20.03)	(129.61)	(178.32)	(56.38)	(40.13)	(3.04)	(2.17)								
Incremental Benefit					74.65	163.57	203.51	256.62	256.62	256.62	256.62	256.62	256.62	256.62	256.62	256.62
Incremental Cost					55.35	116.69	134.72	182.40	182.40	182.40	182.40	182.40	182.40	182.40	182.40	182.40
Net Benefits		(20.03)	(129.61)	(178.32)	(37.08)	6.75	65.75	72.05	74.22	74.22	74.22	74.22	74.22	74.22	74.22	74.22
EIRR	**12.30%**															
Guiyang Steel Mills (GSM)																
Capital Investment		(34.70)	(202.49)	(182.55)	(34.25)	(70.00)	(76.34)									
Incremental Benefit						121.02	235.87	104.70	472.03	590.93	655.27	715.38	755.24	755.24	755.24	755.24
Incremental Cost						96.34	181.47	80.84	375.96	470.35	522.26	574.18	608.24	608.24	608.24	608.24
Net Benefits		(34.70)	(202.49)	(182.55)	(34.25)	(45.33)	(21.94)	23.86	96.07	120.58	133.01	141.19	147.00	147.00	147.00	147.00
EIRR	**12.17%**															
Overall																
Capital Investment		(129.24)	(810.73)	(728.21)	(222.87)	(156.76)	(125.77)	(2.17)								
Incremental Benefit				256.45	634.80	878.89	1,019.30	976.16	1,389.16	1,517.62	1,581.96	1,642.06	1,681.93	1,681.93	1,681.93	1,681.93
Incremental Cost				174.44	429.96	576.86	691.17	674.34	1,021.64	1,122.43	1,174.34	1,226.26	1,260.32	1,260.32	1,260.32	1,260.32
Net Benefits		(129.24)	(810.73)	(698.41)	(59.68)	127.78	187.22	284.57	367.52	395.19	407.61	415.80	421.61	421.61	421.61	421.61
EIRR	**13.23%**															

EIRR = economic internal rate of return.

Source: Staff estimates.

ACTUAL INVESTMENT IN ENVIRONMENTAL IMPROVEMENTS
(CNY million)

Plant	Amount of Investment
HCCL	38.20
JGCF	30.50
TSP	11.34
GSM	43.30
Total	**123.34**

GSM = Guiyang Steel Mills, HCCL = Huaxin Cement Company Limited, JGCF = Jinxi General Chemical Factory, TSP = Tianjin Soda Plant.
Source: Huaxin, Jinhua, Tianjin Bohai, and Guiyang Special Steel Company Limited.

ENVIRONMENTAL IMPACT OF THE PROJECT

Table A14.1: Environmental Emissions and Discharges from HCCL

(ton per year)

Pollutant	Before Project	After Project		Reduction	Percent
		Forecast	Actual		(%)
Air Emissions					
Total Particulates (TS)	12,730	1,696	3,545	6,990	36.9
Carbon Monoxide (CO)	4,889	2,727	n.a.	n.a.	n.a.
Sulfur Dioxide (SO_2)	1,432	129	288	1,144	80.0
Nitrogen Oxide (NO_x)	2,081	1,482	1,084	997	47.9
Carbon Dioxide (CO_2)	1,702,000	1,933,000	n.a.	n.a.	n.a.
Water emissions					
Wastewater Discharged	5,526,000	2,812,000	1,100,000	17,426,000	79.9
Suspended Solids (SS)	638	369	303	336	52.6
Chemical Oxygen Demand (COD)	224	56	36	189	84.2
Biological Oxygen Demand (BOD)	36	27	n.a.	n.a.	n.a.
Oil	29	12	10	19	65.2
pH	n.a.	n.a.	8	—	—

n.a. = not available, pH = acidity value.

Source: Huaxin.

Table A14.2: Environmental Emissions and Discharges from JGCF
(ton per year)

Pollutant	Before Project	After Project		Reduction	Percent
		Forecast	Actual		(%)
Mercury	9.5	0	0	9.5	100.0
Asbestos	15.0	0	0	15.0	100.0
Lead	3.2	0	0	3.2	100.0
Graphite	100.0	0	0	100.0	100.0
Chlorine	4.8	0	0.004	4.8	99.9
Asphalt	28.0	0	0	28.0	100.0
Wastewater Discharged	280,000		172,700	107,300	38.3

Source: Jinhua.

Table A14.3: Environmental Emissions from TSP
(ton per year)

Pollutant	Before Project	After Project		Reduction	Percent
		Forecast	Actual		(%)
Air Emissions					
Total Particulates (TS)	1,455	1,241	1,221.1	233.9	16.1
Carbon Monoxide (CO)	697	650	1123	184.7	83.9
Sulfur Dioxide (SO_2)	6,822	6,012	59,894	832.6	12.2
Nitrogen Oxide (NO_x)	4,728	4,463	4478	250	5.3
Carbon Dioxide (CO_2)	1,141,000	1,071,000	978,320	162,680	14.3
Water emissions					
Wastewater Discharged	55,260,000	27,770,000	51,674,000	2,586,000	6.5
Suspended Solids (SS)	2,146	547	558.2	1,588	74.0
Chemical Oxygen Demand (COD)	1,027	312	87.3	677.8	66.0
Ammonia	1,753	438	440	1313	74.9
Oil	90	—	n.a.	—	—

n.a. = not available.

Source: Tianjin Bohai.

Table A14.4: Environmental Emissions and Discharge from GSM
(ton per year)

Pollutant	Baseline	Forecast	Expected Reduction	Actual	Actual Reduction	Percent (%)
Air Emissions						
Total Particulates (TS)	1,095	289	806	56	1079	94.9
Carbon Monoxide (CO)	395	455	(60)	1138	(743)	(188)
Sulfur Dioxide (SO_2)	68	84	(16)	48	20	29.4
Nitrogen Oxide (NO_x)	—	10	—	n.a.	n.a.	n.a.
Carbon Dioxide (CO_2)	120,300	168,700	(48,400)	n.a.	n.a.	n.a.
Wastewater Discharges						
Wastewater Flow	5,700,000	1,500,000	4,200,000	5,167,400	n.a.	n.a.
Suspended Solids (SS)	29	15	14	n.a.	n.a.	n.a.
Chemical Oxygen Demand (COD)	16	2.7	13.3	n.a.	n.a.	n.a.
Oil	2.9	1.5	1.4	n.a.	n.a.	n.a.

n.a. = not available.
Source: Guiyang Special Steel Company Limited.

ENERGY CONSERVATION UNDER THE PROJECT

Plant	Unit	Without the Project	With the Project			
		Energy Consumption	Expected Energy Consumption	Expected Energy Savings	Actual Energy Consumption	Actual Energy Savings
HCCL	coal million tce/yr	214.3	196.2	18.1	133.7	80.6
	kgce/yr	156.5	146.6	49.9	106.8	49.7
	electricity million kWh/yr	204.8	228.9	24.1	182.9	21.9
	kWh/t cement	109.5	105.0	4.5	107.5	2.0
JGCF	coal million tce/yr	26.3	12.5	13.8	26.2	0.1
	electricity million kWh/yr	346.5	275.0	71.5	273.4	73.1
TSP	fuels tce/yr	604,500.0	579,300	30,200	430,615	178,885
	electricity million kWh/yr	250.2	221.0	0.289	n.a.	n.a.
GSM	total, tce/yr	265,000.0	213,500.0	48,000.0	230,120.0	31,380.0

GSM = Guiyang Steel Mills, HCCL = Huaxin Cement Company Limited, JGCF = Jinxi General Chemical Factory, kgce/yr = kilograms of standard coal equivalent per year, kWh/t = kilowatt-hour per ton, kWh/yr = kilowatt-hour per year, tce = tons of standard coal equivalent, TSP = Tianjin Soda Plant.

Source: Data from the environmental protection unit of the respective enterprises.

TRAINING PROVIDED UNDER THE PROJECT
(Technical and Management)

Type	Location	No. of People	No. of Person-Days
Overseas Training			
Huaxin	Germany, France, Denmark, Portugal, Finland, Netherlands	70	975
Jinhua	Japan, Italy	23	380
Tianjin Bohai	—	—	—
GSSC	Italy	37	370
Total		**130**	**1,725**
Local Training			
Huaxin	PRC	46	691
Jinhua	PRC	62	868
Tianjin Bohai	PRC	303	15,659
GSSC	PRC	75	3,557
Total		**504**	**20,775**
Grand Total		**596**	**22,500**

GSSC = Guiyang Special Steel Company Limited, PRC = People's Republic of China.
Source: Huaxin, Jinhua, Tianjin Bohai, and Guiyang Special Steel Company Limited.