Completion Report

Project Number: 36437-013
Loan Number: 2428
Grant Number: 0194
August 2019

People's Republic of China: Integrated Ecosystem and Water Resources Management in the Baiyangdian Basin Project

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Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – yuan (CNY)

		At Appraisal (15 May 2008)	At Project Completion (31 July 2017)
CNY1.00	=	$0.14285	$0.14852
$1.00	=	CNY7.00	CNY6.73

ABBREVIATIONS

ADB	–	Asian Development Bank
APCF	–	Asia Pacific Carbon Fund
BDRC	–	Baoding Development and Reform Commission
BMG	–	Baoding municipal government
BPMO	–	Baoding project management office
COD	–	chemical oxygen demand
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EMP	–	environmental management plan
FIRR	–	financial internal rate of return
FSR	–	feasibility study report
FYEPP	–	Five-Year Environmental Protection Plan
GEF	–	Global Environment Facility
IEM	–	integrated ecosystem management
IWRM	–	integrated water resources management
PIU	–	project implementation unit
PRC	–	People's Republic of China
SEIA	–	summary environmental impact assessment
TA	–	technical assistance
WACC	–	weighted average cost of capital
WSS	–	water supply system
WWTP	–	wastewater treatment plant

WEIGHTS AND MEASURES

CO_2	–	carbon dioxide
CO_{2e}	–	carbon dioxide equivalent
ha	–	hectare
km^2	–	square kilometer
m^2	–	square meter
m^3	–	cubic meter

NOTES

In this report, "$" refers to United States dollars.

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BASIC DATA

A. Loan and Grant Identification

1.	Country	People's Republic of China
2.	Loan/grant numbers and financing sources	2428 OCR/0194 GEF
3.	Project title	Integrated Ecosystem and Water Resources Management in the Baiyangdian Basin Project
4.	Borrower	People's Republic of China
5.	Executing agency	Baoding Municipal Government
6.	Amount of loan	$100 million
	Amount of grant	$2.975 million
7.	Financing modality	Loan and grant

B. Loan and Grant Data

1.	Appraisal	
	– Date started	5 June 2007
	– Date completed	13 June 2007
2.	Loan negotiations	
	– Date started	1 April 2008
	– Date completed	2 April 2008
3.	Date of Board approval	24 June 2008
4.	Date of loan agreement	27 November 2008
5.	Date of loan effectiveness	
	– In loan agreement	25 February 2009
	– Actual	27 March 2009
	– Number of extensions	1
6.	Project completion date	
	– Appraisal	30 September 2013
	– Actual	31 July 2017
7.	Loan closing date	
	– In loan agreement	31 March 2014
	– Actual	31 July 2017
	– Number of extensions	3
8.	Financial closing date	
	– Actual	5 March 2018
9.	Terms of loan	
	– Interest rate	London interbank offered rate-based
	– Maturity (number of years)	25 years
	– Grace period (number of years)	5 years
10.	Terms of relending (if any)	
	– Interest rate	London interbank offered rate-based
	– Maturity (number of years)	25 years
	– Grace period (number of years)	5 years
	– Second-step borrower	Hebei Provincial Government
	– Interest rate	London interbank offered rate-based
	– Maturity (number of years)	25 years
	– Grace period (number of years)	5 years

– Tertiary-step borrower Baoding Municipal Government

11. GEF co-financing

– GEF Council Approval	28 July 2008
– GEF CEO endorsement	23 February 2010
– Date of financing agreement	23 June 2010
– Closing date in financing agreement	31 March 2014
– Actual closing date	31 July 2017
– Number of extensions	3
– Actual financial closing date	7 March 2018

12. Disbursements

a. Dates - Loan

Initial Disbursement	**Final Disbursement**	**Time Interval**
15 June 2009	9 November 2017	101 months
Effective Date	**Actual Closing Date**	**Time Interval**
27 March 2009	31 July 2017	100 months

b. Dates – GEF Grant

Initial Disbursement	**Final Disbursement**	**Time Interval**
11 May 2011	18 July 2012	14 months
Effective Date	**Actual Closing Date**	**Time Interval**
23 June 2010	31 July 2017	85 months

c. Loan amount ($ million)

No.	Category Name	Original Allocation	Changes during Implementation	Last Revised Allocation	Amount Disbursed	Undisbursed Balance
01	Works	48,000,000.00	(4,687,975.21)	43,312,024.79	38,439,943.69	4,872,081.10
02	Equipment	35,520,000.00	16,534,929.92	52,054,929.92	44,631,982.46	7,422,947.46
03	Consultants	1,750,000.00	350,000.00	2,100,000.00	1,143,919.95	956,080.05
04	Training, study tours, conferences & workshops	500,000.00	0	500,000.00	1,885.27	498,114.73
05	Interest & Commitment Charge	12,000,000.00	(9,966,954.71)	2,033,045.29	2,033,045.29	0
06	Unallocated	2,230,000.00	(2,230,000.00)	0	0	0
Total		**100,000,000.00**		**100,000,000.00**	**86,250,776.66**	**13,749,223.34**

d. Grant Amount ($)

Number	Category Name	Original Allocation	Disbursed Amount	Undisbursed Balance
1	Works	360,000.00	0	360,000.00
2	Equipment, Vehicles and Furniture	113,000.00	55,319.78	57,680.22
3	Others	753,000.00	7,122.40	745,877.60
4	Consulting Services	1,749,000.00	168,625.07	1,580,374.93
	TOTAL	**2,975,000.00**	**231,067.25**	**2,743,932.75**

C. Project Data

1. Project cost ($ million)

Cost	Appraisal Estimate	Actual
Foreign exchange cost	103.0	86.5
Local currency cost	170.4	114.3
Total	**273.4**	**200.8**

2. Financing plan ($ million)

Source	Appraisal Estimate	Actual
Asian Development Bank	100.0	86.3
Global Environment Facility	3.0	0.2
Borrower Financed	168.6	114.3
Asia Pacific Carbon Fund	1.8	0.0
Total	**273.4**	**200.8**

3. Cost breakdown by project component ($ million)

Item	Cost Category	Appraisal Estimates	Actual
A.	**Base Cost**		
1	Subproject Investments	226.1	196.5
2	Biodiversity Conservation / Institutional Strengthening	4.5	0.9
3	Project Management Support	10.5	1.4
	Subtotal (A)	**241.1**	**198.8**
B.	**Contingencies**	**19.5**	-
C.	**Finance Charges During Implementation**	**12.8**	**2.0**
	Total (A+B+C)	**273.4**	**200.8**

4. Project schedule

Item	Appraisal Estimate	Actual
Date of contract with consultants	September 2009	October 2009
Civil works contract		
Date of award	September 2010	April 2009
Completion of work	March 2014	30 June 2017
Equipment and supplies		
First procurement	April 2009	March 2009
Last procurement	September 2010	October 2016
Completion of equipment installation	March 2014	31 March 2017
Start of operations		
Completion of tests and commissioning	September 2013	30 June 2017
Beginning of start-up	March 2014	30 June 2017

5. Project performance report ratings

Implementation Period	Ratings	
	Development Objectives	**Implementation Progress**
From 28 March 2009 to 31 December 2009	Satisfactory	Satisfactory
From 1 January 2010 to 31 December 2010	Satisfactory	Satisfactory
	Single Project Rating	
From 1 January 2011 to 31 March 2013	On-track	
From 1 April 2013 to 30 June 2013	Potential problem	
From 1 July 2013 to 30 September 2013	Actual Problem	
From 1 October 2013 to 30 September 2017	On-track	
From 1 October 2017 to 31 December 2017	Potential Problem	
From 1 January 2018 to 5 March 2018	On-track	

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members
Fact-finding	6-16 March 2007	5	40	a, b, c, d, e
Appraisal	6-13 June 2007	4	28	a, e, f, h
Carbon Market Initiative	15-19 October 2007	3	12	a, h, i
Post-Appraisal 1	13-17 November 2007	3	12	a, j, k
Post-Appraisal 2	25-28 January 2008	1	3	a
Negotiation	1-3 April 2008	3	6	a, f, g
Inception	8-11 December 2009	4	12	a, g, h, k
Handover	1-2 March 2010	2	4	a, g
Review 1	19-27 September 2010	5	20	g, k, l, m, o,
Review 2	27 June-2 July 2011	6	15	e, g, k, n, p, q,
Review 3	23-30 November 2011	2	14	g, h
Review 4	5-9 November 2012	5	15	i, g, n, k, r
Mid-term Review	17-25 June 2013	3	17	g, k, m
Review 5	14-18 July 2014	3	12	g, n, s
Review 6	22-25 December 2015	1	3	g
Review 7	24-31 May 2016	1	7	g
Project completion review	18-27 November 2017	4	20	g, k, l, n

a = economist, b = resettlement specialist, c = project specialist, d = gender specialist, e = sector specialist, f = counsel, g = project officer, h = international consultant, i = national consultant, j = procurement officer, k = project analyst, l = resettlement officer, m = head, portfolio management unit, n = environment officer, o = portfolio management officer, p = financial control analyst, q = procurement specialist, r = deputy country director, s = environment specialist

I. PROJECT DESCRIPTION

1. Baoding Municipality lies in the central part of Hebei Province, 125 kilometers (km) from the provincial capital of Shijiazhuang in the south and 140 km from Beijing in the north. It covers about 85% of 31,500 square kilometers (km^2) of the Baiyangdian Basin. Baiyangdian Lake is the largest remaining semi-closed freshwater body in northern People's Republic of China (PRC). It lies in the middle reaches of Daqing River Basin and ultimately discharges into Bohai Gulf, Yellow Sea. The lake has a surface area of 366 km^2 and consists of a series of natural low-lying depressions and reed marshes. The vast majority of the lake body is located in Anxin and Xiong counties of Baoding Municipality. The lake and its upper watershed in the Taihang mountains support significant biodiversity of regional and global significance.

2. The PRC achieved an unprecedented rate of economic growth between 1986 and 2005. One of the unintended consequences was severe degradation of the environment, especially the pollution of water bodies. The government's plans to contain water pollution had not kept pace with the rate of agricultural, industrial, and urban growth. Furthermore, the trend in ecological degradation persisted. Under the 11th Five-Year Plan (2006–2010), to address the poor environmental performance, the government gave priority to (i) the protection and rehabilitation of valued ecosystems, (ii) better pollution control, (iii) the improvement of natural resource management, and (iv) sustainable utilization of marine and water resources.

3. The Integrated Ecosystem and Water Resources Management in the Baiyangdian Basin Project sought to support a goal of the 11th Five-Year Plan to build "a resource-efficient and environmental-friendly society." The project also contributed to the initiatives of the Baiyangdian Ecosystem Rehabilitation Master Plan (2005–2015), which called for an integrated effort to reduce pollution loads into Baiyangdian Lake and rehabilitate the ecosystem of the basin. As part of the first phase of the master plan, the project would have a demonstration effect for future undertakings and would enable Baoding municipal government (BMG) to achieve, in part, its wastewater management objectives set for 2010.

4. The Asian Development Bank (ADB) approved a loan of $100 million from its ordinary capital resources for the project on 24 June 2008. The Chief Executive Officer of Global Environment Facility (GEF) endorsed a grant of $2.975 million on 23 February 2010 to finance a portion of the costs relating to biodiversity conservation. At appraisal, the project's intended impacts were improved quality of life, a sustainable ecosystem, and biodiversity conservation in Baiyangdian Basin. The project's outcome was integrated ecosystem and water resources management, and improved environmental conditions in Baiyangdian Basin. The project comprised four components: (i) subproject investments—22 subprojects in seven categories (13 wastewater treatment plants (WWTPs); 3 water supply systems (WSSs); 2 subprojects for reforestation; and one each for integrated water management, urban flood management, solid waste management, and clean energy development); (ii) biodiversity conservation to support the GEF-financed activities; (iii) institutional strengthening through a range of activities; and (iv) project management support.

II. DESIGN AND IMPLEMENTATION

A. Project Design and Formulation

5. At the time of appraisal, the project was consistent with ADB's country partnership strategy (2008–2010), which aimed to help the country achieve economic growth in an efficient, equitable, and sustainable manner, and support the PRC's contribution to protecting regional and global

public goods.[1] It was also in line with the ADB's strategy for the agriculture and natural resources sector, which was to support the country's transition to sustainable agriculture and natural resources management and rural growth. One of the goals was to reduce rural poverty by (i) providing infrastructure for rural development; and (ii) addressing environmental issues such as integrated water resources management, efficient water use and conservation, pollution control, and promoting sound natural resources management. At completion, the project remains relevant to ADB's country strategy. The project was also in line with the GEF's strategic objectives and contributed to the global environmental benefits of biodiversity conservation.

6. On the domestic side, the project was highly relevant to the 11th Five-Year Plan and the Baiyangdian Ecosystem Rehabilitation Master Plan (paras. 2–3).[2] In particular, the project was consistent with the BMG's 11th Five-Year Environmental Protection Plan (FYEPP), 2006–2010. The FYEPP aimed to treat all urban sewage in Baoding City and about 60% county sewage (from 0%) by 2010. The WWTP, solid waste, clean energy, and WSS subprojects to be jointly financed by ADB under the project would contribute significantly to the FYEPP. At project completion, the state council approved the Master Plan for Xiongan New Area (2018–2035), which plans to strengthen the overall ecological restoration of the Baiyangdian ecosystem and systematically resolve some of the associated environmental pollution issues in northern PRC.[3]

7. The project adopted an integrated water resources management (IWRM) and ecosystem management (IEM) approach to address the persistent environmental pollution and ecosystem degradation issue at Baiyangdian Basin. IWRM/IEM was a relatively new concept in the PRC during project processing, and this was ADB's first project in the PRC to adopt this approach. The project loan modality was considered appropriate and a thorough assessment of each subproject was conducted. A participatory approach for project design was adopted, with consultations being carried out at various levels, including the potential beneficiaries. Lessons from other international projects were reviewed and incorporated into the project design. The institutional strengthening component was designed to address inadequate capacity issues identified. Therefore, the formulation process was adequate.

8. Despite the merit of the IWRM/IEM approach and the awareness of implementation challenges for the executing agency and implementation agencies, it became evident that (i) the capacity gap for a third-tier municipality like Baoding to implement such a complex international project could not be easily closed by the existing project arrangements; and (ii) strong action for ecological conservation was beyond Baoding municipality's economic development status during the initial implementation period of November 2008 to March 2014, as Baoding's financial budget was tight and the government was still focusing its resources on pollution treatment. In addition, during project processing, feasibility study reports (FSRs) and environmental impact assessments (EIAs) were approved only for the subprojects. No FSR or EIA following domestic procedures was prepared for the GEF component. This deficiency affected the implementation of GEF activities, which involved some civil works, albeit on a small scale.

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[1] ADB. 2008. *Country Partnership Strategy: People's Republic of China, 2008–2010.* Manila.

[2] The Baiyangdian Ecosystem Rehabilitation Master Plan (2005–2015) with a planned investment of over $1.0 billion could not be fully implemented because the Baoding government intended to rely on the central government to close its substantial funding gap but could not fully secure the funds during implementation.

[3] In April 2017, the PRC announced the establishment of the Xiongan New Area, initially spanning three counties (Xiong, Rongcheng, and Anxin counties) in Hebei Province about 100 km southwest of Beijing. Xiongan will be the location for many of Beijing's non-capital functions and relocated population.

9. A minor change of project scope was approved in 2015. The removal of nine subprojects was caused by a pressing domestic schedule and changes in local conditions.[4] Among four new subprojects, one sludge treatment subproject was added to address the emerging issue of secondary pollution from the sludge of urban WWTPs and demonstrate sound sludge treatment. The change in scope boosted the project outcome. Table 1 summarizes the scope change.

Table 1: Original and Revised Project Scope

Categories	Original Scope	Revised Scope		
	No. of Subprojects	Removed	New	Final
1. Wastewater Treatment	13	(3)	2	12
2. Water Supply	3	(1)		2
3. Forestation	2	(2)	1	1
4. Water Management	1			1
5. Flood Management	1	(1)		
6. Solid Waste Management	1	(1)		
7. Clean Energy	1	(1)		
8. Sludge Treatment			1	1
	7 Categories, 22 Subprojects	**5 Categories, 17 Subprojects**		

Source: Asian Development Bank.

B. Project Outputs

10. Generally, the project outputs were successfully delivered. Out of 14 output indicators, 11 were achieved, 2 were substantially achieved, and 1 was partially achieved. Appendix 1 presents the details of achievements against indicator targets at appraisal and updated after the change in scope.

1. Component A: Loan Investment Subprojects

11. **Wastewater Treatment Plants**. At completion, 12 WWTPs with a total treatment capacity of 325,000 cubic meters per day (m^3/day), together with sewer collection systems of about 184 km, were completed in 9 counties or cities, serving about 1.24 million people. The WWTPs are able to remove 36,400 tons of chemical oxygen demand (COD) annually. All WWTP effluent meets Class 1A quality.[5] As three WWTPs were removed from the project scope because they had been completed with government funding, two new WWTPs were added to the project; the output target was revised from 365,000 m^3/day to 325,000 m^3/day, which was fully achieved at project completion.

12. **Water Supply System.** One new water supply system was developed, while one existing water supply system was rehabilitated and expanded.[6] Two subprojects with a total water supply capacity of 80,000 m^3/day and 101.2 km of distribution pipelines benefit 224,000 people.

13. **Sludge Treatment Center**. The Baoding Centralized Sludge Treatment subproject was included for ADB financing as a scope change to treat sludge generated by existing WWTPs in Baoding City and thus avoid secondary pollution from sludge and sustain the effective operation

[4] Five of these subprojects were completed using government funds, the clean energy subproject was completed using commercial funds and a different implementing agency, and three subprojects were completed later by the government after a major change of design.

[5] Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002).

[6] ADB financing for Yi WSS subproject was limited to the rehabilitation and expansion of the distribution networks, while protection of the water source area, source water supply, and water treatment expansion were financed by counterpart funds.

of the WWTPs. The sludge treatment facility with a capacity of 300 tons/day was established and resolved the sludge disposal issue of three urban WWTPs (320,000 m3/day treatment capacity).

14. **Afforestation**. The Baiyangdian Upstream Afforestation subproject was included to replace two original reforestation subprojects, with the target being revised from reforestation of 20,300 hectares (ha) to afforestation of 866 ha. At completion, the revised target was achieved through the establishment of walnut plantations and shelterbelts in the upper reach of the Baiyangdian Basin, which includes 5 townships in Laishui County and 3 townships in Shunping County.

15. **Integrated Water Management**. The link canal to connect Wangkuai Reservoir to Xidayang Reservoir was newly constructed, and the existing Tang aqueduct downstream of Xidayang Reservoir, which discharges into Baiyangdian Lake, was upgraded. The two reservoirs are able to release 200 million m^3/year of water to replenish the Baiyangdian Lake, and as a result of this subproject, about 64% of the released water can reach the lake. With the recharging site constructed, the excess floodwater that cannot be regulated by the two reservoirs is used to recharge the Yimuquan aquifer adjacent to Baoding City. This helps to increase the groundwater resources that the city relies on as its source of drinking water.

2. Component B: Biodiversity Conservation

16. Under the GEF component, (i) Baiyangdian in-lake pollution treatment facilities were constructed and commissioned; (ii) field and office equipment for the two nature reserves were procured, monitoring programs are on-going in the nature reserves, and infrared cameras installed in Jinhuashan-Henglingzi Nature Reserve have recorded brown-eared pheasants; (iii) reed and lotus were planted in the lake, and the net-cage fish culture was stopped to restore the habitat in Baiyangdian Rare Birds Nature Reserve; (iv) grafting of high value walnut and nut-harvest apricot trees in Laishui and cultivation and harvesting of aquatic plants in Baiyangdian were carried out as environmentally-friendly livelihoods; (v) workshops were organized for capacity building on topics such as GEF project implementation and management, biodiversity conservation, environmental education, applications for Ramsar Wetland of International Importance and national nature reserve, and private and public partnerships for pollution control; (vi) a reader for a conservation education curriculum has been developed and used for teaching in local schools; and (vii) a photo album for fauna and flora and leaflets raising environmental awareness were compiled and distributed to government agencies, local schools, and tourists.

17. All output indicators of the component were achieved except for the sustainable livelihood indicator, which was partially achieved. The sustainable livelihood pilot program was tested and expanded through the training of 230 households and the establishment of 20 new sustainable businesses, while the target was to train 1,000 households and establish 100 businesses. Given the parallel skills and start-up training under domestic programs, the government considered the pilot training to be sufficient.

3. Component C: Institutional Strengthening

18. Twelve technical and project management training programs were delivered to staff for the loan component, covering IEM, IWRM, WWTP operation, project implementation and management, the project performance management system, social and environmental safeguards, financial management and audit, procurement and disbursement, and project completion preparation. Sixteen technical training programs were delivered to nature reserve staff and local government officials for the grant component. Four international study tours and 8

national study tours were undertaken to learn good practices. Nature reserve staff received on-the-job training on bird monitoring and biodiversity conservation. The output indicator was substantially achieved, except that nobody from the nature reserves applied for the fellowship.

4. Component D: Project Management Support

19. The Baoding project management office (BPMO) with 15 staff was set up in October 2007 for project implementation. Project implementation units (PIUs) were established for the original and new subprojects, with staff being assigned as required. The budget resources for project management were allocated annually by the finance bureau. BPMO and PIUs were equipped with office equipment and vehicles. Consulting firms and individual consultants (a total of 401 person-month), funded by ADB, GEF, and the government, were recruited to support the BPMO and implementing agencies with project management and technical services.

C. Project Costs and Financing

20. The project cost estimate at appraisal was $273.423 million, including an ADB loan of $100.0 million (36.6% of the total financing), a GEF grant of $2.975 million (1.1% of the total financing), Asia Pacific Carbon Fund (APCF) financing of $1.790 million (0.7% of total financing), and domestic counterpart funding of $168.657 million (61.7% of the total financing). At completion, the total project cost was $200.816 million—$72.606 million less than the cost at appraisal. The lower project cost at completion was mainly due to (i) the land acquisition cost being $47.469 million lower as a result of the withdrawal of six subprojects with a high land acquisition cost; (ii) the savings from lower priced contracts; and (iii) reduced financial charges by $10.720 million. Loan savings of $13.749 million were cancelled, although the revised scope of the project was completed.[7] The counterpart funds at completion were $114.334 million, coming from government grant, national bonds, and an equity investment.

21. The GEF grant of $2.975 million was originally approved for the biodiversity conservation component and part of the institutional strengthening component. However, only $0.23 million was utilized, mainly for capacity building and consulting services. This was because most of the activities were completed by counterpart funds, with the grant serving as a catalyst. The BPMO and two implementing agencies were very cautious about procedural compliance and the cost-efficiency of consulting services. APCF was for clean development mechanism, but was not used as the clean energy development subproject was dropped (Appendix 2).

D. Disbursements

22. Loan disbursements were made from 15 June 2009 to 9 November 2017. Final liquidation of the loan advance account was on 1 December 2017, and the unutilized advance was refunded to ADB on 12 January 2018. The loan was financially closed on 5 March 2018. Of the total loan amount of $100 million, $86.3 million was disbursed. Of the disbursements, $38.4 million was for works, $44.6 million for equipment, $1.1 million for consulting services, training and study tours, and $2.0 million for interest and commitment charges during construction.

23. The first disbursement of the GEF grant was on 11 May 2011 and the grant account was financially closed on 7 March 2018 after the unutilized advance was refunded to ADB on 6 March 2018. Of the total GEF grant of $2.975 million, $231,000 was disbursed, consisting of $55,000 for

[7] The loan cancellation request was approved by ADB on 23 January 2018.

equipment and vehicles, $7,000 for pilot projects, and $169,000 for consulting services, training, and study tours.

24. Disbursements were made mainly through the advance account, though reimbursement and direct payment procedures were also used. ADB performed a sample review of the use of statement of expenditure procedures and it was found to be acceptable. Retroactive financing was applied to one contract out of the four procured in advance contracting under the loan. The projected and actual disbursements are in Appendix 3. The actual disbursements were slower than projected, mainly due to the cancellation of some original subprojects and the time taken for the selection and preparation of new subprojects.

E. Project Schedule

25. The loan was approved on 24 June 2008, with the loan agreement being signed on 27 November 2008 and becoming effective on 27 March 2009. The GEF grant was endorsed by the Chief Executive Officer of GEF on 23 February 2010, with the financing agreement being signed and becoming effective on 23 June 2010. The project was implemented from March 2009 to July 2017, with the first withdrawal application for advance payment being disbursed on 8 September 2009. Except for retroactive financing contracts, the first contract was signed on 3 April 2009 and awarded by ADB on 15 May 2009. The loan consulting services commenced in October 2009. The midterm review was fielded in June 2013, with the government requesting scope changes in October 2013. A new deputy director of the Baoding Development and Reform Commission (BDRC) was assigned as the BPMO director in mid-2014, and he subsequently appointed an experienced full-time project manager. BMG then resumed the preparation of four new subprojects for ADB's due diligence review, and, as part of the scope change, they were approved in May 2015.

26. The project was completed by 31 July 2017. The final liquidation of advance accounts was completed by November 2017 and the project was financially closed in March 2018. Three loan extensions were requested, and actual implementation took 40 months longer than planned. The first extension of 15 months was requested for completion of two original subprojects since their implementation had been delayed by a change in government plans and the availability of counterpart funds. The second extension was approved together with the scope change for an additional 12 months to complete four new subprojects. The third extension was requested for 13 months as the procurement of goods and works under the new subprojects experienced difficulties and the construction was interrupted by a construction ban in the Beijing-Tianjin-Hebei area to mitigate severe air quality problems in the region.

F. Implementation Arrangements

27. BMG, acting through BDRC, was the executing agency for the project. BDRC set up the BPMO with 15 staff to implement the project in October 2007. A Deputy Director of BDRC was appointed as the BPMO director. To coordinate the project activities among line bureaus and implementing agencies, a project leading group was set up, headed by the Baoding Deputy Mayor and comprising of the Directors General of relevant bureaus. During project implementation, the BPMO personnel underwent four rounds of changes resulting from BDRC's personnel adjustments. These instabilities made the project implementation even more challenging and affected the functioning of the BPMO. Finally, the BDRC appointed an experienced section chief as the full-time BPMO manager in the middle of 2014 and assigned five staff. With the strong commitment of this last manager and full delegation of daily decisions by the Deputy Director of BDRC, BPMO became much more effective in coordination and more efficient in making project

management decisions, even though the size of BPMO was much smaller than at inception. The pending issues facing the project were tackled one by one including the processing of new subprojects.

28. Originally, the 22 loan subprojects in seven categories and the GEF component were to be implemented in 14 counties by 24 implementing agencies. Each county set up a PIU at their respective development and reform bureau for project coordination and subproject management. After the project scope changed, the number of subprojects was reduced to 17 in five categories, while the GEF component remained the same. The project was implemented in 13 counties by 19 implementing agencies.

G. Technical Assistance

29. The project preparatory technical assistance (TA) to PRC for preparing this project was approved on 9 August 2005 through a grant of $500,000 from ADB's TA funding program. The TA consultant commenced work in May 2006. However, the intended funding from GEF for the TA only became available in March 2007 due to the transition between the 3rd and 4th GEF replenishment and the decision on re-pipelining all projects by the GEF council. This led to a delay in detailed preparation of the GEF component. The project preparatory TA assisted the government in (i) technical, financial, economic, and safeguard due diligence of the project; (ii) social impact assessment and public consultation; (iii) institutional analysis and assessment; (iv) assessment of the baseline scenario and formulation of the GEF alternative scenario for biodiversity conservation in the Baiyangdian Basin; and (v) the design of the detailed activities of the GEF component.

H. Consultant Recruitment and Procurement

30. The procurement of all contracts financed by ADB and GEF followed the procurement plan. In total, 67 packages were financed by ADB. Civil works were mainly procured through national competitive bidding, and equipment and goods were largely procured through international and national competitive bidding. The methods used for the recruitment of consultants were quality- and cost-based selection, consultants' qualifications selection, and individual consultant selection. For the GEF component, a consulting firm was recruited through the quality- and cost-based selection procedure, while the rest of the contracts were small and procured through shopping procedures. The drop-out of subprojects and processing of new subprojects caused delays in awarding contracts.

31. The performance of contractors and suppliers was generally satisfactory. Performance issues were encountered in two consulting firm contracts to support BDRC in loan and grant implementation. They were procured followed the quality- and cost-based selection method (80:20) in accordance with ADB's *Guidelines on the Use of Consultants* (2010, as amended from time to time). For package A, the ADB-financed consulting services contract was terminated by BDRC because of the firm's repeated failure to fulfill the terms of reference under the contract and its non-responsiveness to requests for inputs, in spite of constant dialogue between the firm and BDRC. This affected BDRC's preparations for the midterm review. Individual consultants were recruited later to continue the support to BDRC. For package B, the GEF-financed consulting services contract, the firm and BDRC agreed to terminate the contract because of the time taken to identify qualified replacements for some key positions and the substandard reports produced by the consultant. This is one of the factors that caused the delay in the implementation of the GEF component. The ADB project team, individual consultants, and training organizations supported BDRC with implementation of the GEF component and capacity building.

I. Safeguards

32. **Environment**. The project was classified as environment category A because of the expected impacts of the IWRM and solid waste management subprojects. EIAs were prepared for these two subprojects and initial environmental examinations for the other 20 subprojects. Based on these analyses, a consolidated summary environmental impact assessment (SEIA) was prepared and uploaded to the ADB website on 1 June 2007. Adjustment was made during project implementation to reflect minor changes in the project scope and the original SEIA was updated and disclosed on the ADB project website in January 2015. Both the original and updated SEIA concluded that the anticipated adverse environmental impacts of the project would be minimized to acceptable levels by implementing credible and timely environmental mitigation and monitoring programs as stipulated in the environmental management plan (EMP).

33. Based on the available evidence, environmental management for the project was satisfactory. The institutional setting and arrangements were appropriate and a range of good engineering practices incorporating environmental protection measures were implemented. The adverse environmental impacts of the project were localized and temporary. None of the subprojects reported any significant negative environmental impact, or noncompliance with the safeguard documents. No complaints were received. Findings during selected field visits confirmed that impacts were limited to localized and temporary impacts. All WWTPs have met the water quality standards that apply to urban wastewater plants' effluent discharge. Real-time monitoring facilities are installed at inlets and outlets to record and report water quality to the provincial wastewater monitoring system. A safeguards review mission from headquarters also concluded that the project complied with the EMP and safeguards policy.

34. **Land acquisition and resettlement** was implemented based on resettlement plans or updated resettlement plans, ADB's policy on Involuntary Resettlement (1995), and relevant PRC laws and regulations. During project preparation, 17 resettlement plans were prepared for the 17 subprojects that would have land acquisition and resettlement impacts. During project implementation, six plans were not implemented, two were updated, and a resettlement due diligence report for four subprojects was submitted because of scope changes. Land acquisition and resettlement activities for 11 subprojects were well implemented and largely completed by end-2013. A total of 929.6 *mu* of land was acquired permanently, accounting for 97.9% of the 949.2 *mu* in the resettlement plans and updated resettlement plans; 756.1 *mu* were occupied temporarily, an increase of 1.2% from the 747.3 mu in the plans; and 1,671 square meters (m^2) of residential housing and 2,867 m^2 of non-residential housing were demolished, affecting 7 households and 6 entities.[8] According to BPMO, land acquisition and resettlement cost CNY58.7314 million, which was 4.54% more than the CNY56.1794 million in the resettlement plans and updated resettlement plans. This increase is mainly due to higher compensation rates for permanent land acquisition in some subprojects. Local governments and affected villages formulated land compensation arrangements and implemented an income restoration plan based on consultations with the affected people. Based on a sampling survey on income restoration conducted by an external monitor, the per capita net income of the households in the sample grew on average by 65.8% from 2006 to 2016, excluding inflation.

35. BPMO adopted an internal monitoring mechanism to examine the resettlement implementation activities and kept records in project progress reports. External monitoring has been undertaken by the National Research Center for Resettlement at Hohai University since

[8] A *mu* is a Chinese unit of measurement (1 *mu*=666.67 m^2).

2008. Seven external monitoring reports were prepared and submitted to ADB in a timely manner. The external monitoring reports indicated that the income restoration of affected households has been achieved.

J. Monitoring and Reporting

36. Appendix 6 presents the status of compliance with legal covenants at completion. All the legal covenants except two have been complied with at project completion. One of these is the current ratio covenant, which requires each implementing agency to maintain a ratio of current assets to current liabilities of not less than 1.2:1. Some WWTPs could not meet the minimum ratio of 1.2, mainly because of the low wastewater tariff and/or inadequate sewers. However, this did not affect the subloan repayment and the normal operation of WWTPs in those subprojects. Given that they are public utilities, local governments have been providing subsidies to these county or township WWTPs as needed. The current ratio will improve when the tariff rate or operation capacity is increased. The second covenant not complied with is the revenue transfer relating to the clean development mechanism. As the clean energy subproject intended for earning carbon credits was removed from the project scope, the covenant became invalid. All grant covenants were complied with.

37. Environmental, resettlement, project progress, project performance monitoring and evaluation, and social monitoring reports were submitted, as well as the borrower's project completion report. ADB uploaded various safeguards reports to its website. The overall financial management was generally satisfactory. Through each subproject PIU, BPMO maintained separate project financial statements and records for all expenditures incurred in the project in accordance with financial reporting standards acceptable to ADB. BPMO consolidated project financial statements annually in accordance with applicable guidance and regulations, which were generally consistent with internationally recognized accounting principles and practices. Hebei Audit Office audited the detailed consolidated project accounts in accordance with the auditing standards and regulations of the PRC. Except for the submission of two audit reports with qualified opinion, which were delayed for about 1 month, BPMO submitted the other reports with unqualified opinion on time. Two project counties rectified the false statement issues that had given rise to the qualified opinion, and the auditor confirmed that the issues were adequately corrected. Relevant files were uploaded to eOps. The project team paid close attention to issues raised in all audit reports, especially the follow-up actions recommended by the financial officer. BPMO also organized financial management and audit training for all implementing agencies to improve their capacity and understanding. There is no pending issue.

III. EVALUATION OF PERFORMANCE

A. Relevance

38. The project is rated *relevant*. The intended project outcome, integrated ecosystem and water resources management and improved environmental conditions in Baiyangdian, was fully aligned with the government's strategy to address the environmental deterioration in the basin through an integrated ecosystem and water resources management approach. It was also aligned with the government's five-year plans and long-term development goals both at the time of appraisal and at completion. The project was also consistent with ADB's agriculture and natural resources sector operation plan and its country strategic priorities that called for the promotion of sustainable ecosystem and water resources management. The project also contributed to the achievement of Baoding's 11th and 12th Five-Year Environmental Protection Plan, which involved a series of pollution control and ecological rehabilitation programs. The scope change made

during project implementation strengthened the project's relevance to the local government's strategic demands and boosted the project outcome. With the project's support, the first centralized sludge treatment plant was built in Baoding Municipality, which BMG showcased as an environmentally friendly and sustainable approach to managing sludge from the existing urban WWTPs (paras. 5-9).

B. Effectiveness

39. The project is rated *effective* in achieving the expected outcome. The outcome indicators were substantially achieved: five indicators were achieved or surpassed, and one indicator was partially achieved. The IWRM/IEM approach to address lake pollution and restore the Baiyangdian ecosystem was introduced and applied during project preparation, practiced during project implementation, and applied beyond the project scope and the implementation period.

40. The project greatly reduced the point source pollution in the catchment of the Baiyangdian Basin. Twelve WWTPs with a total treatment capacity of 325,000 m^3/day financed under the project accounted for 24% of total WWTP treatment capacity in Baoding Municipality by 2018. The WWTPs can reduce point source pollution loading of COD in the Baiyangdian Basin by 36,400 tons/year, though the average reduction effect was 62% of the target by 2016. The centralized sludge treatment subproject eliminates soil and water contamination risk through hazard-free treatment of 250 tons/day of sludge generated by three urban WWTPs, and sustains the effective operation of 320,000 m^3/day wastewater treatment facilities. Meanwhile 5,900 cubic meters (m^3) of biogas and 75 tons of residual soil as land conditioner or landfill cover are generated as side products, demonstrating a good practice of the circular economy. Hygiene for 1.24 million people in the project area of 9 counties improved because they had access to wastewater services. In addition, 224,000 people in Dingzhou and Yi Counites were supplied with safe tap water.

41. The project assured and increased water availability for Baiyangdian Lake and Baoding City. The IWRM subproject enabled water transfer from Wangkuai and Xidayang Reservoirs to the lake to recharge ecological waters, while the excess floodwater that cannot be regulated by the two reservoirs is used to recharge the aquifer to restore groundwater resources. The average water level of Baiyangdian increased from 6.5 meters in 2005 and remained at a sustainable level of around 8 meters during 2015–2017.

42. The Baiyangdian Lake communities took up eco-friendly alternative livelihoods rather than conducting high pollution activities. Lake cultural tours, canoeing and rafting, edible wild herb meals, and scenic tours to see birds and lotus flowers generate sustainable incomes for the community. The project also improved considerably the awareness and capacity of government officials, nature reserve personnel, students, tourists, and local communities regarding biodiversity conservation. Local stakeholders also received advanced training on ecotourism industry development.

C. Efficiency

43. The project is rated *less than efficient*. The economic viability of the project was reevaluated following the same methodology used at appraisal (Appendix 7). The economic internal rate of return (EIRR) of individual subprojects at completion ranged from 10.5% to 20.5%, compared with 12.0% to 18.9% at appraisal. The consolidated EIRR for the overall project was 13.7% at completion, compared with 16.9% at appraisal. The reevaluated results show that the project investment is still economically viable at completion. The sensitivity analysis shows that

12 subprojects and the overall project would remain higher than ADB's minimum required EIRR of 9% in any scenarios. Considering that the other indirect economic benefits were not quantified, the economic viability of all the subprojects were generally robust at project completion.

44. However, the process efficiency of the project could have been improved through a streamlined decision-making process for new subproject selection, better coordination among the executing agency, implementing agencies, and project consultants, the assignment of more competent staff to BPMO, and lower staff turnover. Considering the 40-month loan extension, the project is rated *less than efficient*.

D. Sustainability

45. The project is rated *most likely sustainable*. The financial internal rate of return (FIRR) was recalculated for each of the 16 revenue-generating subprojects based on actual investment costs, the initial operation situation, and the projected operation situation for the remaining years. The recalculated FIRRs ranged from 2.1% to 11.1% at completion, compared with 5.1% to 11.4% at appraisal. FIRRs for the 11 WWTP and 2 WSS subprojects were considerably lower at completion than at appraisal. This derives principally from the lower tariff than that anticipated at appraisal, higher actual investment costs incurred by some subprojects during implementation than the estimates made at appraisal, the operating efficiency being lower than the designed capacity, and the longer construction periods for WSS subprojects. The financial viability of all 16 revenue-generating subprojects was confirmed, as the recalculated FIRRs are higher than the weighted average cost of capital (WACC) of 0.6%–3.1% (Appendix 7).

46. The local governments have been conservative in increasing tariffs, given the financial pressure on county households and the public consultation feedback. The tariff rates in the rural counties of Baoding are lower than in PRC's developed counties. Given the public utility nature of these WWTP and WSS subprojects, the government has been providing subsidies as needed to ensure their effective operation and maintenance. The project facilities were constructed in accordance with the required engineering standards and specifications; and are considered to be of sufficient quality to meet the design service life. Experienced personnel are operating and maintaining the facilities. All WWTPs were installed with online metering and closed-circuit television systems to monitor the real-time volume and water quality at the plant. The monitoring systems are connected to the central supervision system in the provincial environment protection bureau to ensure consistent effective operation of WWTPs. Given the above, the operation and maintenance of these public utilities is considered sustainable.

47. The environmental improvement in the Baiyangdian Basin and the restoration of the Baiyangdian Lake ecosystem are showing an upward trend. The IWRM/IEM approach introduced in the project has been recognized and adopted by the Baiyangdian Ecological Environment Management and Protection Plan (2018-2035) and approved by the state council. This comprehensive IEM framework will guide long-term efforts for environmental and ecological improvement of the lake ecosystem. For lake basin management and decision-making, big data of ecology and environment will be collected and used. Eight inflow rivers and the lake will be managed as a whole to control the pollution. Following the launch of the Beijing-Tianjin-Hebei integrated development and the establishment of the Xiongan New Area as key national strategies, the restoration of the basin's ecological services function to support the region's sustainable development has become a priority. National and provincial financial, institutional, and intellectual resources are being mobilized to expedite pollution reduction in the basin. Ecotourism in the Baiyangdian Basin is continuing, generating income for the local farmers. Public awareness raising continues in the local government and communities. Leading national level

academic research institutes and ecosystem research agencies have become involved, starting a research program for wildlife species protection in the basin financed by the government. Therefore, the project outcome is *most likely sustainable*.

E. Development Impact

1. Environment Impacts

48. The project generated significant environmental benefits through wastewater treatment, water supply, sludge treatment, afforestation, and IWRM/IEM to improve the quality of life, sustain the ecosystem, and conserve biodiversity in Baiyangdian Basin.

49. The average water level in Baiyangdian Lake rose to 8.11 meters over 2014–2017 from 6.5 meters in 2005, well above the minimum requirement of 7.3 meters. Compared with 2007, the eutrophication status of the lake was mitigated from severe eutrophication to light eutrophication; and the water quality was restored from worse than Class V to Class IV in 2018. The biodiversity of the Baiyangdian ecosystem has been on a recovering trend. Compared with 2007, the number of fish species has recovered from 27 to 54; the number of hydrophyte species from 39 to 47; and bird species monitored from 195 to 203 in 2017 including Aythya baeri, which is a newly observed migratory bird of global biodiversity significance.

50. The 12 project WWTPs, accounting for 24% of total WWTP treatment capacity in Baoding Municipality, can remove annually 36,400 tons of COD, 3,187 tons of ammonia nitrogen (NH3-N), and 332 tons of total phosphorous. The WWTP subprojects improved sanitation for the residents within the sewerage service area (about 1.24 million people) and residents near the rivers and the lake; while the WSS subprojects improved hygiene for 224,000 people by providing clean water. The upstream afforestation subproject can prevent soil erosion (estimated at 12,990 tons/year) and sequester carbon (estimated at 133,771 tons/year). The sludge treatment subproject can avoid secondary pollution from 300 tons/day of sludge and sustain the effective operation of three urban WWTPs of 320,000 m^3/day.

2. Social Impact and Poverty Reduction

51. The project contributed to regional social development and poverty reduction, including (i) strengthened wastewater management and reduced water pollution to improve the quality of people's lives in the project area, (ii) reduced incidence of waterborne diseases, (iii) job creation during project construction and operation to generate income for local workers, and (iv) improvements in ecosystem management, which have reduced the burden on women and given them priority in employment and training opportunities.

52. At project completion, the project has benefited 12 counties or cities, covering 6.566 million beneficiaries, including 3.636 million urban residents and 2.930 million people in rural areas. The environmental and poverty reduction benefits extend to the entire basin population of over 10 million. The statistics show that the average incidence of waterborne diseases in the project counties has declined by 24% from 1.47/1,000 persons in 2006 to 1.12 /1,000 persons in 2016.

53. A labor force of 4,729 persons was employed during project construction, of which 33% came from poor families. Since the project became operational, 1,226 jobs have been created,

including 407 temporary jobs and 819 permanent jobs, of which 349 jobs (28.5%) were offered to poor people.

54. Ecosystem degradation and environmental pollution contribute to gender inequities in income-generating opportunities and workload. Improvements in ecosystem management, particularly improved wastewater and water supply services, have reduced the burden on women. A total of 1,103 women (23.3%) were employed during project construction and 363 jobs (29.6%) have been provided to women since the project became operational. Female employees enjoyed wages equivalent to those of male employees for similar jobs. Meanwhile, women have also received priority consideration for training and other capacity building activities under the project. A total of 801 women (29.3%) received training during project implementation.

F. Performance of the Borrower and the Executing Agency

55. The overall performance of the borrower and the executing agency was *satisfactory*. The borrower and the executing agency fulfilled their obligations during project implementation. The Ministry of Finance was supportive to the minor change in project scope and responsive to the GEF issues brought by ADB to their attention. The Hebei Provincial Finance Department managed the advance account and processed fund withdrawal applications in a timely manner. It also provided good guidance and support to the project based on their experience with international projects. BMG provided sufficient counterpart funds for the project. BDRC demonstrated good coordination with the national and provincial development and reform commissions for the approval of new subprojects and adjustments to existing subprojects; however, it lacked experience in engineering projects and international project management. BPMO actively visited ADB's resident mission to discuss the issues they encountered; and was conscientious about the cost effectiveness of the consulting services. BPMO went through a learning process to improve project management effectiveness and efficiency, and eventually overcame various issues and difficulties.

G. Performance of the Asian Development Bank

56. ADB's performance is rated *satisfactory*. The project was administered and supervised by the resident mission after the handover from ADB headquarters in 2010. ADB provided capacity building and support throughout project implementation through training and day-to-day close communication. This helped BPMO build up its capacity and cope with rounds of personnel changes. ADB also provided strong knowledge support for biodiversity conservation, sustainable livelihood development, and integrated ecosystem management, which guided implementation of the GEF component. BPMO viewed ADB's review and supervision of project implementation as adequate. They appreciated ADB's prompt and constructive advice and cooperation in resolving implementation issues, except for the inflexibility in GEF consulting services. BMG especially appreciated ADB's acceptance of the request to adjust the project scope to reflect the actual situation in the project area following various developments. ADB conducted 11 missions during implementation, including the midterm and project completion review missions.

H. Overall Assessment

57. Overall, the project is rated *successful*. It is deemed *relevant,* because the intended project impact and outcome were fully aligned with the PRC government's strategy and ADB's country partnership strategy. The project was considered *effective* based on the substantial achievement of project outcomes and outputs. However, it was *less efficient* considering the three extensions of the closing date because of delays in implementing some existing subprojects and adding new

subprojects. The project is *most likely sustainable* as the IWRM/IEM approach introduced in the project has been recognized and adopted by the Baiyangdian Ecological Environment Management and Protection Plan (2018-2035), and approved by the state council; continued environment pollution control in the basin and restoration of the Baiyangdian ecosystem are also required by the national strategy for the Xiongan New Area; the reevaluated FIRRs of revenue generating subprojects are higher than the WACC; and the completed project facilities are well operated and maintained.

Table 2: Overall Ratings

Criteria	Rating
Relevance	Relevant
Effectiveness	Effective
Efficiency	Less than efficient
Sustainability	Most likely sustainable
Overall Assessment	Successful
Development impact	Satisfactory
Borrower and executing agency	Satisfactory
Performance of Asian Development Bank	Satisfactory

Source: Asian Development Bank.

IV. ISSUES, LESSONS, AND RECOMMENDATIONS

A. Issues and Lessons

58. **Optimistic project targets.** The project was excessively optimistic about its impact on water quality improvement in Baiyangdian Lake and anticipated that the water quality would be restored to class III at project completion. The water pollution issue of the lake is far more complex and challenging, given its long-accumulated pollution, dense in-lake population, and the economic activities in the basin.[9] Similarly, the target for the reduction of pollutants by the WWTPs was set too high, an issue that exists in other projects too.[10] More realistic targets are required in future.

59. **Project design.** The project was originally designed to be implemented by 24 implementing agencies in 14 counties. The 22 subprojects fell into 7 categories, and the GEF component involved many activities. Such complexity was challenging even for an experienced project management office. It was overwhelming for the newly established BPMO. All the implementing agencies and BPMO needed to go through a learning curve regarding ADB policies and guidelines. In addition, the language barrier was an issue for most of the staff, and the initial BPMO staff and manager had not had similar project management experience before. The discrepancy between the complicated design of the project and BMG's capacity to implement such a complex project was a challenge right from the beginning of project implementation.

60. **Domestic procedures.** Government projects are guided by standardized management procedures, and those procedures are applicable to international projects as well. However, for

[9] Although the project contributed to 24% of wastewater treatment capacity in Baoding Municipality through the subprojects, the massive in-lake pollution from small enterprises and households located in the in-lake villages was only slightly touched upon by the GEF component. Other important aspects, such as the accumulated pollutants in river courses, the ecological zoning and restructuring of economic activities in the basin, were not addressed by the project at all. The project should have been practical in the estimation of project impact. The Baiyangdian Ecological Environment Management and Protection Plan (2018-2035) approved by the state council as the top design only aimed at achieving effective comprehensive management and restoration of lake water quality to class III-IV by 2035.

[10] The target was calculated assuming the pollutants' intensity of wastewater inflow and outflow would be the same as the design parameter, and the WWTPs would operate at 90% of the design capacity throughout the year. But the inflow intensity of pollutants is often much lower in the PRC and the wastewater load takes time to reach the design capacity.

the GEF component, a parallel domestic process for the GEF component was not initiated during the project preparatory TA, nor was any budget provision made for it during project implementation. Therefore, a number of GEF activities that needed to comply with domestic procedures were only implemented as parts of bigger government projects where the domestic procedures were complete.

61. **Competent and committed project manager.** In the past, the government usually set up a special division within its organization for the implementation of international projects. Nowadays, however, project management is often assigned to an existing functional division, which is already busy with its routine work. In such cases, appointing a competent and committed project manager from the agency to lead the day-to-day operations of the project management office is critical. With sufficient delegation of authority, the manager is also instrumental in internal and cross-agency coordination. A combination of contractual staff and/or junior staff with a busy division director often causes low efficiency and delays in decision-making during project implementation. The contrast in the project was significant, with implementation moving forward at a satisfactory rate only after the appointment of a committed project manager.

B. Recommendations

1. Project Related

62. **Tariff and institutional reform.** The project was implemented during the transition period from government-dominated wastewater investment to ongoing market-oriented wastewater sector reform at the county level. BMG should examine WWTPs in terms of operation efficiency, tariff increases, and corporate structure and governance, to gradually achieve full cost recovery in county WWTP operations and turn them into fully autonomous entities.

63. **Biodiversity conservation in Taihang mountain range.** The Jinhuashan-Henglingzi Provincial Nature Reserve is adjacent to Baihuashan National Nature Reserve and Xiaowutaishan National Nature Reserve. It is suggested adjusting the boundary of the provincial nature reserve to remove the gaps between these protected areas and strengthen the technical interchange between them. This will improve the connectivity of the habitat for the globally threatened brown-eared pheasant in the Taihang mountain range and increase the management capacity of the Jinhuashan-Henglingzi Provincial Nature Reserve.

64. **Timing of the project performance evaluation report.** It is recommended that the project performance evaluation be conducted in 2022. By that time, the new subprojects will be in full operation, and the overall project impact and sustainability can be better assessed.

2. General

65. **Sludge treatment.** As demonstrated under the project, sound sludge treatment is ensuring the sustainable operation of major WWTPs in Baoding. It is recommended that, in future wastewater sector operations in the PRC, ADB incorporate a suitable design for the sludge resource utilization and harmless disposal.

66. **Focused efforts.** Development issues are often complicated and occur for multiple reasons. However, ADB's intervention can be concentrated on the critical gaps and major mechanisms rather than spreading the investment across many different activities in dispersed locations. This minimizes distractions from the main objective by complex implementation tasks. In terms of lending modality, results-based lending could be a good option to better focus on system improvement and program results rather than specific transactions.

PROJECT DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators		Project Achievements
	Original[a]	Revised[b]	
Impact Improved quality of life, sustainable ecosystem, and biodiversity conservation in Baiyangdian Basin.	• Water quality in Baiyangdian Lake restored from class V and VI in 2007 to class III by 2015	• Water quality in Baiyangdian Lake restored from class V and VI in 2007 to class III by 2017	• Partially achieved. Overall water quality of Baiyangdian Lake was slightly improved from worse than class V in 2007 to class IV in 2018, while the eutrophication status has been improved from severe eutrophication to light eutrophication.
	• Habitat for migratory birds maintained/ enhanced	• Habitat for migratory birds maintained/ enhanced	• Achieved. Wetland area at BPNR was increased by farm-to-wetland restoration and raising of lake water levels. Habitat enhancement activities were also carried out. Bird species monitored in BYD increased from 195 in 2007 to 203 in 2018 including Aythya baeri (CR, IUCN) as a migratory bird of global biodiversity significance newly observed since 2017.
	• Population of endangered resident species maintained or increased	• Population of endangered resident species maintained or increased	• Likely achieved. Neither baseline estimates nor quantitative monitoring data were available to enable pre- vs post-project comparisons. Local villagers and JHPNR personnel reported that numbers of brown-eared pheasant, as endangered resident species, were increasing due to reduced exploitation and enhanced habitat quality. Camera-trap results tend to confirm increasingly abundant wildlife at JHPNR.
	• Reduced incidence of waterborne diseases from 2/1,000 persons in 2006 to 1.5/ 1,000 by 2015; and respiratory diseases from 1.6/1,000 in 2006 to 1.3/1,000 by 2015	• Reduced incidence of waterborne diseases from 2/1,000 persons in 2006 to 1.5/ 1,000 by 2017; and respiratory diseases from 1.6/1,000 in 2006 to 1.3/1,000 by 2017	• Achieved. Incidence of waterborne diseases was reduced to 1.1/1,000 persons in 2016, and the incidence of respiratory diseases was reduced to 0.9/1,000 in 2016.
	• Household income of Baiyangdian Lake communities increased by	• Household income of Baiyangdian Lake communities increased by	• Achieved. Per capita annual income of Baiyangdian Lake communities increased to CNY17,820 in 2016.

Design Summary	Performance Targets and Indicators		Project Achievements
	Original[a]	**Revised**[b]	
	reducing direct pollution loading to the lake	reducing direct pollution loading to the lake	
Outcome Integrated ecosystem and water management and improved environmental conditions in Baiyangdian Basin	• Reduced point-source water pollution loading COD in Baiyangdian Basin by 28% or 38,000 tons/year by 2011 from the 2007 level of 137,989 tons/year	• Reduced point-source water pollution loading COD in Baiyangdian Basin by 36,400 tons/year by 2016 from the 2007 level of 137,989 tons/year	• Partially Achieved. All 12 WWTPs were built with a total treatment capacity of 325,000 m^3/day to reduce point-source water pollution loading. It can reduce COD by 36,400 tons/year based on the estimation method used at appraisal. However, the actual COD intensity of inflow wastewater was much lower than the design estimation, and the wastewater treated was also less than the design capacity. Based on the multiple-year monitoring data the average COD reduction was only 62% of the target while the wastewater treated was 78% of the design capacity. While the wastewater load is increasing, the COD inflow intensity won't reach the designed level.
		• Safe disposal of 250 tons WWTPs' sludge per day by 2016 to avoid soil and water contamination	• Achieved. The sludge treatment center was constructed, and safely handles 250t sludge per day.
	• Improved sanitation and hygiene for 1.12 million people by 2011 who did not have access to wastewater treatment in 2007	• Improved sanitation and hygiene for 1.03 million people by 2016 who did not have access to wastewater treatment in 2007	• Achieved. Improved sanitation and hygiene for 1.24 million people or about 0.35 million households who did not have access to wastewater treatment in 2007.[c]
	• Clean water supply for 260,000 people by 2011 who did not have access in 2007	• Clean water supply for 221,000 people by 2016 who did not have access in 2007	• Achieved. Clean water supply for 224,000 people or about 63,500 households who did not have access in 2007.[c]
	• Reduced TSP in Baoding City by 2,500 tons/year • Reduced SO_2 by1,000 tons/year by 2011 • Reduced CO_2 by 149,000 tons/year by 2015	• Removed. • Removed. • Removed.	

Design Summary	Performance Targets and Indicators		Project Achievements
	Original[a]	**Revised**[b]	
	• Enhanced flood protection for 51,000 people by 2011 who did not have protection in 2007	• Removed.	
	• Baiyangdian Lake communities take up eco-friendly alternative livelihoods by 2010	• Baiyangdian Lake communities take up eco-friendly alternative livelihoods by 2016	• Achieved. Baiyangdian Lake community take up eco-friendly alternative livelihoods such as tourism programs of lake culture tour, canoe and raft boating, farmers' home stay, lake products meal, edible wild herbs meal, and scenic tour of birds and lotus. New products were also developed such as lotus tea and lotus leave filled pillow.
	• Water in Baiyangdian Lake is maintained at sustainable level of 7–9 meters by 2015 from the average of 6.5 meters in 2005	• Water in Baiyangdian Lake is maintained at sustainable level of 7–9 meters by 2015 from the average of 6.5 meters in 2005	• Achieved. The average water level of Baiyangdian was 7.86 meters in 2015, 8.08 meters in 2016 and 8.12 meters in 2017 between the sustainable level of 7-9 meters increased from the average of 6.5 meters in 2005.
Outputs **Component A**			
1. Wastewater treatment capacity increased	• 13 plants increase wastewater treatment capacity by 365,000 m^3/day by end of 2010	• 12 plants increase wastewater treatment capacity by 325,000 m^3/day by end of 2016	• Achieved. 12 WWTPs were built and increased treatment capacity by 325,000 m^3/day.[c]
		• The effective operation of 3 Baoding WWTPs with total capacity of 320,000 m3/day is sustained by 2016	• Achieved. Effective operation of three Baoding WWTPs with total capacity of 320,000 m^3/day is sustained as the sludge disposal issue was resolved by the new sludge treatment center.
2. Efficient domestic water supply system demonstrated	• Three model systems increase domestic water supply by 106,600 m^3/day by 2010	• Two model systems increase domestic water supply by 80,000 m^3/day by 2016	• Achieved. Two water supply subprojects were supported by ADB loan, increased domestic water supply capacity by 80,000 m^3/day, and 94.2 km of pipes were installed or upgraded.[c]

Design Summary	Performance Targets and Indicators		Project Achievements
	Original[a]	**Revised**[b]	
	• Three model systems avert leakage and improve water supply efficiency by at least 25%	• Two model systems avert leakage and improve water supply efficiency by at least 25%	• Achieved. Two water supply systems avert leakage and improve water supply efficiency by about 25.4%
3. Watershed rehabilitation through reforestation undertaken	• 20,300 ha of land reforested by 2013	• 866 ha of land forested by 2016	• Achieved. 866 ha of land in Laishui and Shunping were forested by walnut trees and shelter belt.
4. Clean energy developed	• 1.65 million m^2 of floor area in residential and public buildings heated with geothermal energy by 2010	• Removed.	
	• 50% of potential carbon credit revenues allocated for poverty reduction in Xiong County	• Removed.	
5. Solid waste management and pollution cleanup undertaken	• 0.6 million tons of solid waste disposed of in sanitary landfill	• Removed.	
	• 2 million tons of fly ash safely disposed of; 13 ha eco-theme park established by 2011	• Removed.	
6. Improved urban flood management provided	• 14.31 square kilometers (km^2) of urban areas protected by 2010	• Removed.	
7. Assured and increased water availability for Baiyangdian Lake and Baoding City	• 200 million m^3/year of water transferred, of which128 million m3 reaches Baiyangdian Lake by 2011	• 200 million m^3/year of water transferred, of which128 million m^3 reaches Baiyangdian Lake by 2016	• Achieved. Water has been transferred to BYD based on ecological water need. 180 million m^3 water reached Baiyangdian Lake in 2016, and 90 million m^3 in 2017, 172 million m^3 in 2018.
Component B			
1. Integrated ecosystem management and biodiversity conservation measures implemented	• 500 people trained; awareness in 1,000 communities raised; 10 demonstration projects carried out; biodiversity management and monitoring programs established in 2 provincial nature reserves;	• 500 people trained; awareness in 1,000 communities raised; 10 demonstration projects carried out; biodiversity management and monitoring programs established in 2 provincial nature reserves;	• Achieved. More than 500 people were trained on biodiversity conservation, sustainable development, and integrated ecosystem management. Awareness of all communities in Anxin and Laishui Counties and the

Design Summary	Performance Targets and Indicators		Project Achievements
	Original[a]	**Revised**[b]	
	sustainable financing of environmental management mechanisms set up by 2012	sustainable financing of environmental management mechanisms set up by 2016	tourists were raised in biodiversity conservation and environmental protection through training of trainers, school curriculum, training of tourism operators, mobile outreach program, public events, NR website, photo album for fauna and flora of Baiyangdian, leaflets, signage, and local media. Biodiversity conservation and wildlife monitoring programs were established in both nature reserves. More than 10 measures were taken for habitat enhancement and rehabilitation. An entrance fee is charged to all tourists visiting Baiyangdian Lake and the fee is reallocated by the Anxin government for various lake related activities including the conservation cost of NR.
2. Sustainable livelihood program pilot-tested and expanded	• Income-generating pilots implemented (i.e., ecotourism and non-timber forest products)	• Income-generating pilots implemented (i.e., ecotourism and non-timber forest products)	• Achieved. Income-generating pilots were implemented, such as scenic tour of birds and lotus, canoe and raft boating, grafting and harvesting of high value walnut and nut-harvest apricot.
	• 1,000 households trained for alternative livelihoods; 100 new sustainable businesses established; 100 staff trained on project, financial, and environmental management; 12 study tours arranged; mechanisms for stakeholder coordination set up by 2012	• 1,000 households trained for alternative livelihoods; 100 new sustainable businesses established; 100 staff trained on project, financial, and environmental management; 12 study tours arranged; mechanisms for stakeholder coordination set up by 2016	• Partially achieved. Training was provided to about 230 households for alternative livelihoods such as grafting of high value walnut and nut-harvest apricot, cage rabbit rearing to replace husbandry of free-ranging goats, natural experiences and education, and forest therapy, etc.. 20 new sustainable businesses established. About 150 staff trained on project management, PPMS, procurement, disbursement, financial management, audit, resettlement, environmental, and project completion report preparation. Twelve study tours were organized. Hebei Baiyangdian development and construction coordination and management committee

Design Summary	Performance Targets and Indicators		Project Achievements
	Original[a]	Revised[b]	
			was established at provincial level before the project for coordinated management of water environmental issue of BYD. The stakeholder coordination mechanism was strengthened under the Beijing-Tianjin-Hebei integrated development strategy and following the establishment of Xiong-An New Area.
Component C Ecosystem and water management institutions strengthened	• 12 staff training programs designed by 2009; 6 study tours carried out by 2010; and 8 fellowships awarded by 2010; on-the-job training program undertaken continually until 2012	• 12 staff training programs designed by 2016; 6 study tours carried out by 2016; and 8 fellowships awarded by 2015; on-the-job training program undertaken continually until 2016	• Substantially achieved. Twelve technical and project management training programs were delivered to staff for the loan component, and 16 technical training programs were delivered to nature reserve staff and local government officials for the grant component. Four international study tours and 8 national study tours were carried out. Nobody applied for fellowships. Nature reserve staff got on-the-job training on bird monitoring and biodiversity conservation.
Component D Project management support provided	• PMO with 15 staff and PIUs with 3 staff established and operational by fourth quarter (Q4) 2007	• PMO with 15 staff and PIUs with 3 staff established and operational by fourth quarter (Q4) 2007	• Achieved. PMO with 15 staff and PIUs with 3 staff were established and operational in 2007 during project preparation.
	• Adequate budgetary resources allocated	• Adequate budgetary resources allocated	• Achieved. Project management budget was allocated by Baoding Finance Bureau annually following domestic procedure.
	• Office equipment and vehicles procured by the Q1 2009	• Office equipment and vehicles procured by the Q1 2009	• Achieved. Office equipment and vehicles were procured before project inception mission.

Design Summary	Performance Targets and Indicators		Project Achievements
	Original[a]	Revised[b]	
	• 416 person-months of consulting services provided through 2013	• 416 person-months of consulting services provided through 2017	• Substantially achieved. 401 person-months of consulting services provided through 2017.

BPNR=Baiyangdian Provincial Nature Reserve, BYD=Baiyangdian, CO_2=carbon dioxide, CR=Critically Endangered, COD=chemical oxygen demand, ha= hectares, IUCN= International Union for Conservation of Nature, JHPNR=Jinhuashan-Henglingzi Provincial Nature Reserve, m^3/day=cubic meters/day, NR= nature reserve, PIUs=project implementation units, PMO=project management office, PPMS= project performance management system, SO_2=sulfur dioxide, t/day=ton/day, TSP=total suspended particulates, WWTPs=wastewater treatment plants.

[a] The performance targets and indicators as approved originally during processing.

[b] The performance targets and indicators were revised consistent with scope change approved in May 2015.

[c] These achievements contributed to ADB level 2 result framework. The details of core operational results can be found in ADB's Results Framework Indicator Definitions (2017).

Sources: Asian Development Bank and Baoding Project Management Office.

PROJECT COST AND FINANCING

Table A2.1: Detailed Project Cost at Appraisal

($ million)

No.	Cost Category	ADB		GEF		APCF		Domestic Funds		Total
		Amount	%	Amount	%	Amount	%	Amount	%	
		(A)	(A/E)	(B)	(B/E)	(C)	(C/E)	(D)	(A/E)	(E)
A.	**Investment Cost**									
1	Civil Works									
a	Subprojects Investment	49.2	46.5					56.7	53.5	105.9
b	Biodiversity Conservation / Institutional Strengthening							0.3	100.0	0.3
c	Project Management	0.0	93.8					0.0	6.3	0.0
	Subtotal	***49.3***	***46.4***	***-***		***-***		***57.0***	***53.6***	***106.2***
2	Equipment									
a	Subprojects Investment	35.5	52.9			0.9	1.3	30.8	45.8	67.1
b	Biodiversity Conservation / Institutional Strengthening			0.3	89.8			0.0	10.2	0.3
c	Project Management	1.0	93.6					0.1	6.4	1.0
	Subtotal	***36.4***	***53.2***	***0.3***	***0.4***	***0.9***	***1.3***	***30.9***	***45.1***	***68.5***
3	Land Acquisition and Resettlement							56.2	100.0	56.2
4	Surveys and Design					0.9	8.6	9.5	91.4	10.4
5	GEF Financed Other Activities			1.3	92.2			0.1	7.8	1.4
6	Consulting Service, Training, Workshops/Study Tours									
a	ADB Loan Financed	2.3	95.9					0.1	4.1	2.4
b	GEF Grant Financed			1.4	19.2			5.9	80.8	7.3
	Subtotal	***2.3***	***23.6***	***1.4***	***14.5***	***0.0***	***0.0***	***6.0***	***61.9***	***9.7***
Subtotal (A)		**88.0**	**34.9**	**3.0**	**1.2**	**1.8**	**0.7**	**159.7**	**63.3**	**252.4**
B.	Recurrent Costs			0.0	0.2			8.3	99.8	8.3
C.	Financial Charges	12.0	94.1					0.8	5.9	12.8
	Total Project Cost (A+B+C)	**100.0**	**36.6**	**3.0**	**1.1**	**1.8**	**0.7**	**168.7**	**61.7**	**273.4**

ADB=Asian Development Bank, GEF=Global Environment Facility.
Note: Numbers may not sum precisely because of rounding.
Source: Asian Development Bank estimates.

Table A2.2: Detailed Project Cost at Completion

($ million)

No.	Cost Category	ADB		GEF		Domestic Funds		Total
		Amount	%	Amount	%	Amount	%	Amount
		(A)	(A/D)	(B)	(B/D)	(C)	(C/D)	(D)
A.	**Investment Cost**							
1	Civil Works							
a	Subprojects Investment	38.4	36.4			67.2	63.6	105.6
b	Biodiversity Conservation / Institutional Strengthening					0.1	100.0	0.1
c	Project Management							
	Subtotal	***38.4***	***36.3***			***67.3***	***63.7***	***105.8***
2	Equipment							
a	Subprojects Investment	44.6	68.2			20.8	31.8	65.4
b	Biodiversity Conservation / Institutional Strengthening			0.1	55.0	0.0	45.0	0.1
c	Project Management					0.1	100.0	0.1
	Subtotal	***44.6***	***68.0***	***0.1***	***0.1***	***20.9***	***31.9***	***65.6***
3	Land Acquisition and Resettlement					8.7	*100.0*	8.7
4	Surveys and Design					16.7	*100.0*	16.7
5	GEF Financed Other Activities			0.0	4.5	0.1	95.5	0.2
6	Consulting Service, Training, Workshops/Study Tours							
a	ADB Loan Financed	1.1	96.9			0.0	3.1	1.2
b	GEF Grant Financed			0.2	65.5	0.1	34.5	0.3
	Subtotal	***1.1***	***79.5***	***0.2***	***11.7***	***0.1***	***8.7***	***1.4***
Subtotal (A)		**84.2**	**42.4**	**0.2**	**0.1**	**114.0**	**57.4**	**198.4**
B.	**Recurrent Costs**					0.4	100.0	0.4
C.	**Financial Charges**	2.0	100.0					2.0
	Total Project Cost (A+B+C)	**86.3**	**43.0**	**0.2**	**0.1**	**114.3**	**56.9**	**200.8**

ADB=Asian Development Bank, GEF=Global Environment Facility.
Note: Numbers may not sum precisely because of rounding.
Sources: Asian Development Bank and Baoding Project Management Office.

Table A2.3: Financing Plan

($ million)

Source	At Appraisal		At Completion	
	Total	**%**	**Total**	**%**
Asian Development Bank	100.0	36.6	86.3	43.0
Global Environment Facility [a]	3.0	1.1	0.2	0.1
Borrower Financed	168.6	61.7	114.3	56.9
Asia Pacific Carbon Fund [b]	1.8	0.6	0.0	0.0
Total	**273.4**	**100.0**	**200.8**	**100.0**

Note: Numbers may not sum precisely because of rounding.

[a] An additional amount of $0.2 million has been utilized for project preparation.

[b] This fund is managed by the Asian Development Bank and provides upfront payments for Clean Development Mechanism projects in exchange for revenues from Certified Emission Reductions.

Sources: Asian Development Bank and Baoding Project Management Office.

PROJECTED AND ACTUAL CONTRACT AWARDS AND DISBURSEMENTS

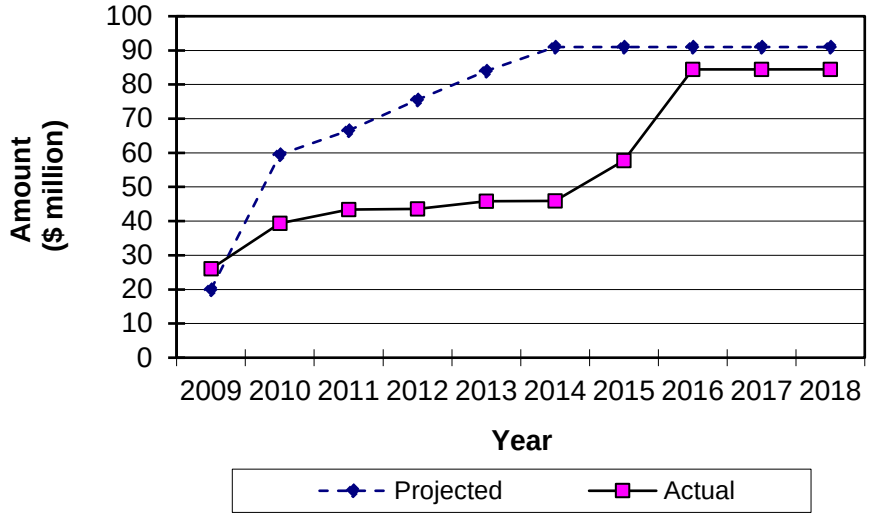
Table A3.1: Cumulative Contract Awards and Disbursements
($ million)

Year	Contract Awards [a]		Disbursement [a]	
	Projected	Actual	Projected	Actual
2009	20.00	26.04	8.00	6.15
2010	59.46	39.34	24.26	24.26
2011	66.50	43.38	35.26	32.88
2012	75.50	43.55	46.26	40.05
2013	83.98	45.87	75.26	47.34
2014	90.98	45.90	102.98	51.24
2015	90.98	57.68	102.98	57.50
2016	90.98	84.40	102.98	74.28
2017	90.98	84.45	102.98	89.28
2018	90.98	84.45	102.98	86.49
Total	**90.98**	**84.45**	**102.98**	**86.49**

[a] Figures shown are cumulative.

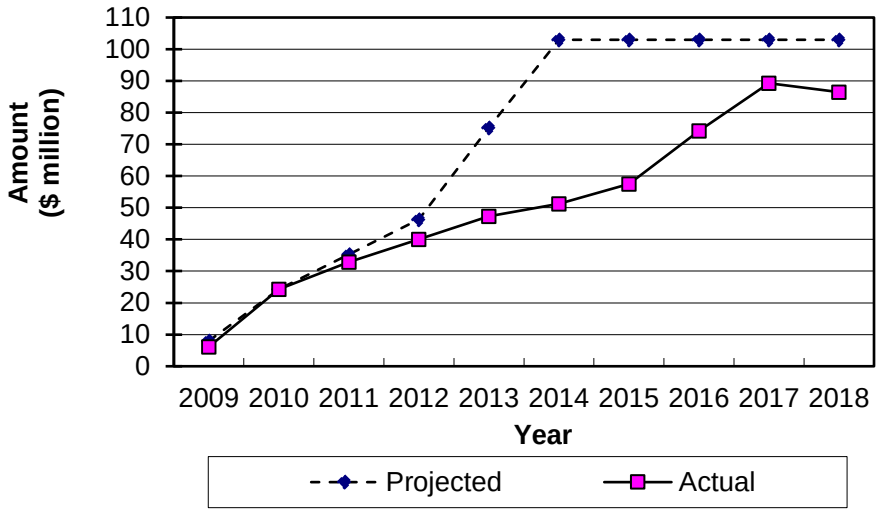
Source: Asian Development Bank Loan and Financial Information System and eOperations.

Figure A3.1: Projected and Actual Contract Awards



Source: Asian Development Bank.

Figure A3.2: Projected and Actual Disbursements



Source: Asian Development Bank.

ENVIRONMENTAL IMPACT ANALYSIS

A. Project Scope, Environmental Categorization and Due Diligence

1. The Project originally consisted of four components: (i) 22 subprojects of 7 different categories including: 13 wastewater treatment plants (WWTPs); 3 water supply systems (WSSs); 2 reforestation subprojects; 1 urban flood management subproject; 1 integrated water management (IWM) subproject; 1 solid waste management (SWM) subproject; and 1 clean energy development (CED) subproject; (ii) biodiversity conservation to support Global Environment Facility(GEF)-financed activities; (iii) institutional strengthening through GEF-financed activities; and (iv) project management support.

2. The overall project classification was category A because of the expected impacts of the IWM and SWM subprojects. Environmental impact assessment (EIA) for these two and initial environmental examination (IEE) for the other 20 subprojects were prepared. Based on these analyses, a consolidated summary environmental impact assessment (SEIA) was prepared and uploaded to the ADB website on 1 June 2007.

3. During project implementation, the implementing agencies (IAs) of nine subprojects decided to withdraw from the project due to various reasons. Four new subprojects were proposed. All four new subprojects were classified as category B for environment. In response to the scope change, the domestic EIA was prepared by qualified institution and approved by Baoding Environement Protection Bureau in 2014, and the original SEIA was updated and disclosed to the ADB website in January 2015.

4. Domestic environmental review and acceptance has been conducted for all subprojects by 2018 in terms of the domestic regulations, except for the centralized sludge treatment subproject and Li County WWTP II subproject for which the domestic environmental review will be completed by Febuary 2020.[1]

B. Institutional Setup and Responsibilities for Environment Management Plan Implementation and Supervision

5. The Baoding project management office (BPMO) was responsible to ensure compliance with environmental safeguards during implementation. An environmental monitoring unit (EMU) was established in the BPMO/subproject IAs respectively to oversee environmental compliance. Each EMU was adequately staffed and worked in consultation with staff at municipal or county environmental protection bureaus (EPBs), as well as with water conservation bureaus, to monitor compliance. The project provided technical support and training, as well as international/domestic consultants during implementation to assist the BPMO in overseeing the monitoring of environmental impacts and mitigation measures. The consultants helped the BPMO undertake its own environmental monitoring and institute required mitigation measures. Training was also provided to the subproject IAs/contractors/ construction supervision companies to raise environmental awareness and implement environmental mitigation measures.

C. Environmental Mitigation Measures Implemented

6. The responsible parties carried out all mitigation measures needed to reduce adverse environmental impacts in accordance with the SEIA.

[1] The sludge treatment subproject and Li County WWTP II subproject took longer time to become operational comparing with the others.

Construction phase	
Water quality	(i) Sediment fences were installed to minimize runoff; (ii) wastewater was treated using septic tanks; and (iii) all construction equipment washdown areas were fitted with water collection basins with oil separators and sediment traps.
Soil erosion	Temporary soil stockpiles were covered, stockpile trenches re-compacted, and disturbed surfaces re-vegetated to minimize erosion.
Air quality	Transportation routes and material handling sites were sprayed with water, and materials were covered during transportation. Local EPBs confirmed that the air quality of subproject construction sites met the Class II of *Air Quality Standard (GB3095-2012).*
Noise	Construction-related noise from vehicles and construction machinery did not exceed noise levels in the *Emission Standard of Environmental Noise for Boundary of Construction Site (GB12523-2011)*. Construction works were prohibited between 8 pm. to 8 am.
Operation phase	
WWTPs /WSSs	The plant sites are located more than 300 meters away from residential areas, and ventilation for sludge dewatering room was to minimize the emission of odors from the plants. Odor removal facility is installed in coarse screen, fine screen and sludge dewatering houses. The plants comply with the *Technical Specification of Sludge Treatment for the Wastewater Treatment (CJJ131-2008)*, and operational manuals are prepared and implemented for proper sludge disposal. Equipment with relatively high noise was installed indoors. Noise insulation and vibration attenuation measures were taken. Reinforce daily management, equipment maintenance and staff on-job training were provided to ensure stable operation and treated wastewater to meet the standard. Dust removers were installed for heating boilers so that emissions meet *Emission Standard of Air Pollutants for Boiler (GB 13271-2014, MEP, 2014).* To avoid chlorine gas disinfection leak accident, alarm device and adsorption facility were installed; storage volume was controlled; workers are equipped with personal protection gear; and environment emergency plans were established.
IWM	Training for environmental management was conducted. Environmental staff were designated. Warning signs and guardrails where the canal was close to the villages were set up. Wastewater and solid waste were properly collected and treated or disposed. The effluent from industrial sources and WWTPs was regularly monitored along the canal to ensure compliance. The irrigation plan was developed and implemented to ensure water availability.
Forestation	O&M good practices on water saving, water and soil conservation, and fertilizers/pesticides use were undertaken.
Centralized Sludge Treatment Center (CSTC)	Air quality: Methane boiler exhaust was installed with biological deodorization+ stack of 25 meters height Wastewater-filtrate of dewatered sludge and domestic sewage Solid waste-dewatered sludge and garbage sent to landfill Noise-fans and pumps with sound insulation, muffler, damping foundation Anti-corrosive and anti-seepage to prevent sewage from polluting groundwater Ecology-landscaping of 7,600 m^2 Risk prevention for methane explosion and leakage: communication equipment, vehicles, fire extinguisher, burnable gas alarm tester and generator were equipped with.

EPBs= environmental protection bureaus, IWM= integrated water management, m^2= square meter, O&M= operation and maintenance, WSSs= water supply systems, WWTPs=wastewater treatment plants.

D. Summary of Environmental Monitoring

7. The BPMO/subproject IAs enhanced environmental safeguard monitoring arrangements during project implementation. The environmental safeguard coordinator in the BPMO/subproject

IAs worked closely with the municipal and county EPBs, and water resource bureaus to ensure compliance with domestic and ADB requirements. The BPMO, with oversight by the environmental safeguard coordinator, conducted regular field visits to the project counties for monitoring and supervision. In addition, the 12 WWTPs unde operation were installed with online monitoring devices by which a set of data was available every two hours and connected with local EPBs. In-plant laboratory of the WWTPs also provided monitoring data daily. From 2010, seven environmental monitoring reports (EMR) had been submitted to the ADB and all were uploaded to the ADB website. They included extensive environmental monitoring data. The EMP was implemented effectively, with the monitoring results showing no significant environmental damage during either project construction or operation. The Baoding Muncipal EPB also confirmed that the project did not cause any serious environmental concerns, and that all negative impacts were being mitigated. No complaints on environmental impacts were recorded during project implementation. During the operation stage of the 12 WWTPs, the regular monitoring results show compliance on the effluent, noise and odor at plant boundaries.

E. EMP Implementation Costs

8. The project-wide EMP implementation cost was CNY29.80 million at project completion against CNY31.26 million at appraisal. This includes CNY23.40 million for the implementation of mitigation measures; CNY1.20 million for environmental monitoring; CNY5.20 million for administration, compliance inspection, institutional strengthening, and training.

F. Environmental Benefits

9. The project generated significant environmental benefits by integrated water resource management, wastewater treatment, water supply, sludge treatment, and afforestation to improve quality of life, sustainable ecosystem, and biodiversity conservation in Baiyangdian Basin.

10. A total of 12 WWTPs in Baiyangdian basin were constructed providing sewage treatment capacity of 325,000 tons/day. It was estimated that the 12 WWTPs could reduce 36,400 tons/annum of chemical oxygen demand (COD), 3,187 tons/annum of ammonia nitrogen (NH3-N), and 332 tons/annum of total phosphorous (TP). The service population of WWTPs was 1.24 million. The two WSSs provide continuous running water for 224,000 people. Waterborne diseases have been reduced after project completion, i.e Dingzhou City from 1.0/1,000 to 0.94/1,000, and Yi County from 0.4/1,000 to 0.267/1,000. With the plantation completed at Baiyangdian Lake upstream, indirect benefits of forestation include water and soil conservation, sequester carbon and oxygen release. The two afforestation subprojects absorb CO^2 of 133,771 tons/annum.[2] In addition, the two afforestation subprojects reduce soil erosion by 12,990 tons/annum. With the operation of CSTC, the sludge from Xiyuan, Yinding, and Lugang WWTPs are properly treated, and satisfied the standard of accessing sanitation landfill (moisture content less than 60%). It ensured the normal operation of WWTPs in Baoding and avoid the secondary pollution of soil and water.

11. As results, according to the environment quality bulletin of Baoding EPB and Ministry of Ecology and Environment, the eutrophication status of the lake was mitigated from sever eutrophication to light eutrophication; the water quality of the lake was restored from worsen than Class V to Class IV in 2018; the water levels in Baiyangdian Lake was stably raised to 8.11 meters

[2] According to the fourth volume of Agriculture, Forestry and Other Land Use in 2006 IPCC Guidelines for National Greenhouse Gas Inventories, 1 ha forest land can absorb 154.47 tons/annum CO^2.

in average over 2014-2017 from the average of 6.5 meters in 2005, maintaining above the minimum requirement of 7.3 m.[3]

G. Conclusions

12. The project benefits the environment and the health of the people in the project area. The overall environmental impacts of the project were localized and temporary. None of the subproject reported any significant environmental impact, or noncompliance with the safeguard documents. No complaints were received. Findings during selected field visits confirmed that impacts were limited to localized and temporary impacts.

[3] Both the domestic EIA report and the Baiyangdian Lake ecosystem assessment (Hebei Provincial Academy of Environmental Sciences. 2006. *Baiyangdian Lake Ecosystem and Environmental Assessment Report*. Hebei.) conclude that a water level of 7.3 meters is required for sustaining basic ecological functions of the Lake or supporting the reed, aquatic life, culture fishery, and ecotourism activities.

EVALUATION OF LAND ACQUISITION AND RESETTLEMENT IMPLEMENTATION

A. Background

1. During project preparation, a total of 17 resettlement plans were prepared for 17 subprojects which would induce land acquisition and resettlement impacts. During project implementation, six resettlement plans were not implemented, two resettlement plans were updated, and a resettlement due diligence report for four subprojects[1] was submitted due to scope changes. Based on resettlement plans and updated resettlement plans, a total of 921.33 mu (61.42 hectares) of land will be acquired permanently by project, and a total of 833 households will be affected by permanent land acquisition; a total of 4,537.85 square meters of the houses or buildings will be demolished and it will cause the relocation of 7 households and 6 enterprises. In addition, the project construction will acquire about 747.27 mu of temporarily borrowed land for construction purposes. The resettlement cost estimate of CNY 56.18 million was included in the project cost estimates. Land acquisition and resettlement activities for 11 subprojects were well implemented and largely completed by end 2013.

B. Scope of Land Acquisition and Resettlement

2. According to final resettlement monitoring report prepared by the external monitor, a total of 929.61 mu land was acquired permanently, 0.9% more than 921.33 mu in resettlement plans and updated resettlement plans; a total of 756.07 mu land was occupied temporarily, which increased by 1.2% than 747.27 mu in the plans; a total of 1670.67 m^2 residential house and 2867.18 m^2 non-residential house were demolished and affected with 7 households and 6 entities/enterprises. Table A5.1 presents the actual project impacts versus those numbers in resettlement plans and updated resettlement plans. In general, the variation of land acquisition and resettlement impacts is limited.

Table A5.1: Project Land Acquisition and Resettlement Impacts

Item	Unit	Impacts		Variation	
		RPs/ URPs	Actual	Quantity	Percentage
A. Permanent land acquisition	mu	921.33	929.61	8.28	0.9%
B. Temporary land use	mu	747.27	756.07	8.8	1.2%
C. House /structure demolition	m^2	4,537.85	4,537.85	0	0.0%
Of which, residential housing	m^2	1,670.67	1,670.67	0	0.0%
D. Affected HHs by land acquisition	HH	833	839	6	0.7%
E. Affected people by land acquisition	person	3,632	3,644	12	0.3%
F. Affected HHs by house demolition	HHs	7	7	0	0.0%
G. Affected entities/enterprises by structure demolition	Unit	6	6	0	0.0%

HH= Household, m^2 = square meter, mu = 0.07 hectares or 666.67 m^2, RP = resettlement plan, URP = updated resettlement plan.
Sources: resettlement plans, updated resettlement plans, and final resettlement monitoring report.

[1] A due diligence report was prepared for four subprojects, of which due diligence for Li County subproject is detailed, the other three subprojects have no land acquisition and resettlement impacts.

C. Resettlement Policy and Compensation Rates

3. Land acquisition and resettlement was implemented based on resettlement plans or updated resettlement plans, ADB's policy on Involuntary Resettlement (1995), and relevant PRC laws and regulations, including Land Administration Law (2004) and State Council Circular on the Decisions of Deepening Reform and Administrating Land Strictly (No. 28, 2004), and Hebei provincial and Baoding municipal relevant regulations. The compensation rates for permanent land acquisition, consisting land compensation fees, resettlement subsidy and young crops was calculated based on Average Annual Output Value (AAOV) of varied lands and consultation with affected communities. The land occupied temporarily was compensated based on the duration impacts on AAOV. As for Baigou Town wastewater treatment plant (WWTP) and Dingxing County WWTP induced house demolition, the implemented house compensation was composed of house compensation, relocation allowance, and ground attachments compensation. The external monitoring reports showed that all the compensation rates paid for the APs were the same or higher than those in the resettlement plans. See Table A5.2 and Table A5.3.

Table A5.2: Compensation Rates of Permanent Land Acquisition (CNY/mu)

Project Area	RPs/URPs	Actual	Variation	Percentage
Mancheng Town	41,448	45,000	3,552	8.6%
Xiong County	30,000	54,000	24,000	80.0%
Baigou Town	69,300	69,300	0	0.0%
Yi County	35,000	35,000	0	0.0%
Xushui County	24,752	30,000	5,248	21.2%
Dingxing County	27,000	27,000	0	0.0%
Li County	25,600	47,000	21,400	83.6%
Liushi Town	27,200	30,000	2,800	10.3%
Tang County	28,160	28,171	11	0.0%
Xinxing Town	25,600	40,360	14,760	57.7%
Quyang Town	27,200	27,200	0	0.0%
Shunping Town	28,160	28,171	11	0.0%

mu = 0.07 hectares or 666.67 m^2, RP = resettlement plan, URP = updated resettlement plan.
Sources: resettlement plans, updated resettlement plans, and final resettlement monitoring report.

Table A5.3: Compensation Rates of Houses Demolition (CNY/m^2)

Structure	Baigou WWTP		Dingxing WWTP	
	RP	Actual rates	URP	Actual rates
Steel-concrete Structure	700	700	—	—
Brick-concrete Structure	550	550	600	600
Brick-wood Structure	400	400	550	550
Simple Structure	250	250	350	350

m^2 = square meter, — = not available, RP = resettlement plan, URP = updated resettlement plan, WWTP = wastewater treatment plant.
Sources: Baigou resettlement plan, Dingxing updated resettlement plan, and final resettlement monitoring report.

D. Resettlement Costs

4. According to the project management office (PMO), the implementation of land acquisition and resettlement cost a total of CNY 58.7314 million, which increased by 4.54% than CNY56.1794 million in resettlement plans and updated resettlement plans. Such an increase is mainly due to higher compensation rates for permanent land acquisition in some subprojects.

E. Rehabilitation and Income Restoration

5. The amount of houses demolition was limited under the project. A total of seven households were relocated due to project construction, in which 5 affected households were affected by Baigou WWTP and another two households affected by Dingxing WWTP. For the five households in Baigou, they were resettled in a resettlement site to the west of WWTP. Each household was allocated a new apartment with floor space of 230 m^2. For other two households in Dingxing, they were provided a piece of homestead in their village and rebuilt new houses by use of compensation fund. For those affected entities/enterprises, they received full compensation and used them to build new factories or invested in other business. The external monitoring report indicated that the affected households are satisfied with house compensation and resettlement policies.

6. Local governments and affected villages formulated land compensation allocation and implemented income restoration plan based on consultation with affected people, which includes (i) directly paying cash compensation fund to affected households, which includes land compensation, resettlement subsidies, and young crops; (ii) encouraging affected households to invest compensation fund in planting industrial crops, animal husbandry, or other nonagricultural programs; (iii) village committees used collective compensation fund to construct village agricultural facilities so as to improve production conditions, such as motor-pumped wells, pump stations, irrigation pipes, drinking water supply, and access roads; (iv) adjustment of planting and breeding products to improve agriculture productions in apple, grape, strawberry, apricot, walnut, as well as poultry, breeding rabbits, sheep; (v) development of village enterprise on casing for sausage to provide employment opportunities for those surplus labors due to land loss; and (vi) county labor buraus conducted skill training for affected people in sewing, hairdressing and beauty, catering services, etc. Based on sampling survey on income restoration conducted by external monitor, the average growth of per capita net income of those sampling households has achieved 65.8% from 2006 to 2016 excluding inflation. See Table A5.4.

Table A5.4: Income Restoration of Sampling Affected Households
(CNY)

Project area	Average household annual income		Average household annual expenditure		Average household net income		Per capita net income	
	2006	2016	2006	2016	2006	2016	2006	2016
Liushi Town	46,867	65,987	28,623	34,356	18,244	31,631	2,881	4,994
Baigou Town	53,743	69,395	32,383	34,047	21,360	35,349	3,560	5,891
Xushui Town	47,196	54,498	33,435	35,526	13,761	18,972	2,676	3,689
Xinxing Town	41,292	55,540	28,794	32,740	12,498	22,800	2,777	5,067
Yi County	46,733	61,480	31,083	34,559	15,650	26,920	3,826	6,581
Dingxing County	53,081	82,699	34,162	37,344	18,919	45,356	3,784	9,071
Mancheng County	41,276	59,950	30,363	34,268	10,913	25,682	2,585	6,083

Xiong County	52,291	75,075	39,298	33,415	12,993	41,660	2,784	8,927
Tang County	45,181	66,394	26,740	31,073	18,441	35,321	4,391	8,410
Integrated Water resource management	45,054	57,645	28,179	30,895	16,875	26,750	4,219	6,688
Average	**45,266**	**58,776**	**28,919**	**31,681**	**16,347**	**27,095**	**3,943**	**6,536**
Growth rate		**29.9%**		**9.6%**		**65.8%**		**65.8%**

Source: final resettlement monitoring report.

F. Information Disclosure, Consultation, and Participation

7. During project preparation and resettlement implementation stage, local governments and resettlement implementing agencies have conducted participatory approach to disclose resettlement policies, negotiate with affected people, and mobilize affected people's participation in major resettlement activities. A lot of consultation meetings were held in affected communities with the active participation of government agencies. Local communities or villages also held numerous consultations with affected people on the allocation of compensation and income restoration strategies. Furthermore, all resettlement related information was made public through resettlement information handbook publicity, local government internet or communities and villages information disclosure posted up. In addition, the resettlement implementation institutions of each level have set up appeal system including appeal hotline to guarantee a transparent and effective channel. The final resettlement monitoring report indicates that no major complaints have been received during implementation of land acquisition and resettlement.

G. Institutional Arrangement

8. The agencies responsible for land acquisition and resettlement implementation were established at Baoding city and subproject county level, and one staff was assigned to take in charge of social and resettlement activities under each PMO or PIUs. Baoding city PMO took overall responsibility for resettlement management of the projects, subproject PMOs and resettlement implementing agencies were engaged in land acquisition and resettlement activities such as resettlement consultation, implementation, financing and timely delivery of entitlements. In addition, the resettlement specialist recruited by loan consulting service provided substantial guidance and assistant during project implementation stage.

H. Monitoring and Evaluation

9. Baoding PMO adopted an internal monitoring mechanism to examine the resettlement implementation activities and kept records in project progress reports. External monitoring has been undertaken by the National Research Center for Resettlement (NRCR, Hohai University) since 2008. A total of seven external monitoring reports were prepared and submitted to ADB in a timely manner. The external monitoring reports have helped in identifying and addressing outstanding issues so as to improve resettlement implementation. The external monitoring reports also indicated that income restoration of affected households has been achieved.

I. Lessons

10. The lessons learned from the implementation of land acquisition and resettlement may include: (i) great efforts have been made to avoid or minimize scope of land acquisition and resettlement impacts during project preparation and implementation; (ii) experienced resettlement staff were deployed in PMOs and land acquisition and resettlement implementing agencies for

subprojects, strong capacity of PMO and resettlement offices under local land resources bureaus along alignment; (iii) adequate skill trainings and employment measures were provided to affected people due to land acquisition and (iv) application for land use certificates has taken long time due to time-consuming domestic approval procedures. It is suggested to start application for land use certificates at project early stage for future projects.

STATUS OF COMPLIANCE WITH LEGAL COVENANTS

Covenant	Reference in Legal Agreement	Status of Compliance
(a) The Borrower shall cause HPG, BMG and IAs to carry out the Project with due diligence and efficiency and in conformity with sound administrative, financial, engineering, environmental and water resources management practices. (b) In the carrying out of the Project and operation of the project facilities, the Borrower shall perform, or cause to be performed, all obligations set forth in Schedule 5 to this Loan Agreement and the Schedule to the Project Agreement.	LA, Art. IV, Section 4.01	Complied with. Para. 24 (a) of PA schedule, the covenant of current ratio, was partially complied with.
The Borrower shall, through HPG, BMG, Counties, Cities, and Townships make available to the IAs, promptly as needed and on terms and conditions acceptable to ADB, the funds, facilities, services, land and other resources which are required, in addition to the proceeds of the Loan, for the carrying out of the Project.	LA, Art. IV, Section 4.02	Complied with. Compliance was confirmed in progress reports.
The Borrower shall ensure that the activities of its departments and agencies with respect to the carrying out of the Project and operation of the Project facilities are conducted and coordinated in accordance with sound administrative policies and procedures.	LA, Art. IV, Section 4.03	Complied with. Compliance was confirmed in progress reports.
The Borrower shall take all action which shall be necessary on its part to enable each of BMG to perform its obligations under the Project Agreement, and shall not take or permit any action which would interfere with the performance of such obligations.	LA, Art. IV, Section 4.04	Complied with. Compliance was confirmed in progress reports.
(a) The Borrower shall cause HPG and BMG to ensure that concerned County, City, District or Township exercises its rights under the Onlending Agreement in such a manner as to protect the interests of the Borrower and ADB and to accomplish the purposes of the Loan.	LA, Art. IV, Section 4.05	Complied with. Compliance was confirmed in progress reports.
Retroactive Financing Withdrawals from the Loan Account may be made for reimbursement of reasonable eligible expenditures incurred under the Project before the Effective date, but not earlier than 20 months before the date of the Loan Agreement in connection with items to be retroactively financed, subject to a maximum amount equivalent to $3,800,000.	LA, Schedule 3, para. 8	Complied with. Retroactive financing of $0.93 million was made.
Notwithstanding any other provision of this Loan Agreement, no withdrawals shall be made from the Loan Account for the ultimate benefit of any subproject until the Borrower shall have certified to ADB, in form and substance satisfactory to ADB, that the Onlending Agreement related to any such subproject has been entered into between with an IA or PMU, which shall include the terms and conditions as referred to in Section 3.01(d) and (e) of this Loan Agreement, shall have been duly executed and delivered on behalf of relevant County, City, District or Township and the concerned IA or PMU, and shall have become fully effective and binding upon the parties thereto in accordance with its terms.	LA, Schedule 3, para. 9	Complied with. It was certified by the borrower.

Covenant	Reference in Legal Agreement	Status of Compliance
Implementation Arrangements BMG shall be the EA and shall have overall responsibility for execution of the Project.	LA, Schedule 5, para. 1 PA, Schedule, para. 1	Complied with. The BMG fully performed its overall responsibilities.
The subprojects shall be implemented by the following IAs: WWTP subprojects — IA (i) Liushi Town WWTP — Liushi Town Wastewater Treatment Co. (ii) Baigou Town WWTP — Baigou WWTP (iii) Li County WWTP and WWTP II — Li County Wastewater Treatment Plant Company (iv) Xushui County WWTP — Xiushi County Hengxing Municipal Project Co. (v) Xinxing Town WWTP — Xinxing Town Textile City Comprehensive Development Co. of Li County (vi) Yi County WWTP — Yi County Yuquan Urban Construction Development Co. (vii) Dingxing County WWTP — Dingxing County Urban Construction Municipal Co. (viii) Mancheng County WWTP — Mancheng Yuquan Water Services Co. Ltd. (ix) Xiong County WWTP — Xiong County WSC (x) Tang County WWTP — Tang County Real Estate Development Co. under the Tang County Urban Construction Bureau (xi) Qingyuan District WWTP II — Qingyuan District Qingyuan Xiangtai Water Service Co. Ltd. WSS subprojects — IA (xii) Yi County WSS — Yi County Water Supply Company (xiii) Dingzhou City WSS — Dingzhou City Water Supply Company Afforestation, IWM, sludge treatment subprojects — IA (xiv) Baiyangdian Upstream Afforestation — Baoding Forestry Bureau (xv) IWM (Wangkuai-Xidayang Reservoir) — Baoding Water Resource Bureau (xvi) Baoding Centralized — Baoding Xiyuan WWTP"	LA, Schedule 5, para. 2 PA, Schedule, para. 2	Complied with. Compliance was confirmed in progress reports.
The Borrower through HPG shall cause BMG to set up a central PMO with about 15 staff to implement the Project. The PMO shall be headed by a full-time Project Director. The key PMO staff shall have expertise in financial management, civil and mechanical engineering, water resources, environment, ecosystem, project management, social development, and forestry. The PMO shall be responsible for day-to-day coordination and monitoring of all Project activities.	LA, Schedule 5, para. 3 PA, Schedule, para. 3	Complied with. Fifteen staff were recruited in October 2007.

Covenant	Reference in Legal Agreement	Status of Compliance
The Borrower, through HPG and BMG, shall cause each County to set up a PIU at its respective financial bureau. PIUs shall be headed by the Project Coordinators who shall be focal point for all Project related activities with the PMO.	LA, Schedule 5, para. 4 PA, Schedule, para. 4	Complied with. PIUs had been set up at project inception.
To coordinate the Project activities among line bureaus and the IAs, the Borrower shall cause BMG to set up a PLG that shall meet at least quarterly for the first 2 years and semiannually for the remaining Project period or as needed.	LA, Schedule 5, para. 5 PA, Schedule, para. 5	Complied with. PLG had been set up at project inception.
Counterpart Funding The Borrower shall cause HPG and BMG to ensure that (a) all counterpart funding necessary for the Project is provided in a timely manner, and (b) additional counterpart funding is provided in the event of any shortfall of funds or cost overruns to complete the Project.	LA, Schedule 5, para. 6 PA, Schedule, para. 6	Complied with. Counterpart funding was made available to ensure project completion.
Change of Ownership The Borrower shall cause HPG and BMG to ensure that each IA obtains the prior written consent of ADB in the event that any such IA plans to (a) change the ownership structure of any of the Project facilities; (b) sell, transfer or assign any of its shares; or (c) otherwise make any material organizational change, where such change may have an adverse effect on such IA's ability to perform its obligations in respect of the relevant subproject, the Project Agreement or any Onlending Agreement. In the event any such change is approved by ADB, the Borrower shall cause HPG and BMG, through the relevant IA, to ensure that the change in ownership structure is carried out in a transparent manner and does not affect repayment of the Loan made under this Loan Agreement. Depending on the nature of the approved change in ownership structure, ADB shall have the right to modify the repayment terms of the Loan.	LA, Schedule 5, para. 7 PA, Schedule, para. 7	Complied with. Compliance was confirmed in progress reports.
Project Reviews: Midterm Review In addition to regular monitoring, the Project performance shall be reviewed at least once a year jointly by ADB, the Borrower, HPG and BMG. The review shall (a) assess (i) implementation performance, (ii) achievement of progress towards Project outcomes and outputs, and (iii) financial progress; and (b) identify issues and constraints affecting implementation and work out a time-bound action plan for their resolution.	LA, Schedule 5, para. 8 PA, Schedule, para. 28	Complied with. Review missions were conducted at least once a year.
Midterm Review The Borrower, HPG, BMG and ADB shall undertake a comprehensive midterm review to assess implementation status and take appropriate measures, including but not limited to (a) the need for modification of scope and implementation arrangements; and (b) reallocation of the Loan proceeds, as appropriate, to achieve the Project objectives.	LA, Schedule 5, para. 9 PA, Schedule, para. 29	Complied with. The mid-term review was conducted from 17 to 25 June 2013.

Covenant	Reference in Legal Agreement	Status of Compliance
GEF Grant In the event the GEF Grant funding is not approved (i) Component 2; and (ii) the relevant training and consulting activities under Components 3 and 4 shall not be financed under the Project. The Borrower may make other necessary arrangements, acceptable to ADB, to cover the funding shortfall.	LA, Schedule 5, para. 10 PA, Schedule, para. 8	Complied with. Such event did not occur.
Implementation Arrangements (a) HPG and BMG shall, and shall cause the IAs to, carry out the Project with due diligence and efficiency, and in conformity with sound administrative, financial, engineering, environmental and water resources management practices. (b) In the carrying out of the Project and operation of the Project facilities, BMG shall, and shall cause the IAs to, perform all obligations set forth in the Loan Agreement to the extent that they are applicable to BMG and the IAs and all obligations set forth in the Schedule to this Project Agreement.	PA, Art. II, Section 2.01	Complied with. HPG and BMG fully performed all obligations.
HPG and BMG shall make available, and shall cause to be made available, promptly as needed, the funds, facilities, services, equipment, land and other resources which are required, in addition to the proceeds of the Loan, for the carrying out of the Project.	PA, Art. II, Section 2.02	Complied with. Funds, facilities, services, equipment, land and other resources were provided as project progressed.
(a) In the carrying out of the Project, BMG shall, and shall cause the IAs to, employ competent and qualified consultants and contractors, acceptable to ADB, to an extent and upon terms and conditions satisfactory to ADB. (b) Except as ADB may otherwise agree, all Goods, Works and consulting services to be financed out of the proceeds of the Loan shall be procured in accordance with the provisions of Schedule 4 to the Loan Agreement. ADB may refuse to finance a contract where Goods, Works or consulting services have not been procured under procedures substantially in accordance with those agreed between the Borrower and ADB or where the terms and conditions of the contract are not satisfactory to ADB.	PA, Art. II, Section 2.03	Complied with. Consulting firms and individual consultants with ADB, GEF, and government financing were recruited totaling 401 person-months supporting the BPMO and IAs for project management and technical services.
BMG shall, and shall cause the IAs to, carry out the Project in accordance with plans, design standards, specifications, work schedules and construction methods acceptable to ADB. BMG shall furnish, or cause to be furnished, to ADB, promptly after their preparation, such plans, design standards, specifications and work schedules, and any material modifications subsequently made therein, in such detail as ADB shall reasonably request.	PA, Art. II, Section 2.04	Complied with. Compliance was confirmed during review mission and in progress reports.
(a) BMG shall, or shall cause the IAs to, take out and maintain with responsible insurers, or make other arrangements satisfactory to ADB for, insurance of the Project facilities to such extent and against such risks and	PA, Art. II, Section 2.05	Complied with.

Covenant	Reference in Legal Agreement	Status of Compliance
in such amounts as shall be consistent with sound practice. (b) Without limiting the generality of the foregoing, BMG undertakes to insure, or cause to be insured, the Goods to be imported for the Project and to be financed out of the proceeds of the Loan against hazards incident to the acquisition, transportation and delivery thereof to the place of use or installation, and for such insurance any indemnity shall be payable in a currency freely usable to replace or repair such Goods.		Compliance was confirmed in progress reports.
HPG and BMG shall, or cause the IAs to, maintain records and accounts adequate to identify the Goods, Works and consulting services and other items of expenditure financed out of the proceeds of the Loan, to disclose the use thereof in the Project, to record the progress of the Project (including the cost thereof) and to reflect, in accordance with consistently maintained sound accounting principles, its operations and financial condition.	PA, Art. II, Section 2.06	Complied with. Compliance was confirmed during review mission and in progress reports.
(a) ADB, HPG and BMG shall cooperate fully to ensure that the purposes of the Loan will be accomplished, and BMG shall cause the IAs to cooperate with ADB to ensure that the purposes of the Loan will be accomplished. (b) BMG shall, through the PMO, promptly inform ADB of any condition which interferes with, or threatens to interfere with, (i) the progress of the Project; (ii) the performance of its obligations under this Project Agreement; or (iii) the performance of the obligations of any party to the Onlending Agreement; or (iv) the accomplishment of the purposes of the Loan. (c) ADB and BMG shall from time to time, at the request of either party, exchange views through their representatives with regard to any matters relating to the Project, BMG, the IAs and the Loan.	PA, Art. II, Section 2.07	Complied with. Compliance was confirmed during review mission and in progress reports.
(a) BMG shall, through the PMO, and shall cause the IAs to, furnish to ADB all such reports and information as ADB shall reasonably request concerning (i) the Loan and the expenditure of the proceeds thereof; (ii) the Goods, Works and consulting services and other items of expenditure financed out of such proceeds; (iii) the Project; (iv) the administration, operations and financial condition of the IAs; and (v) any other matters relating to the purposes of the Loan. (b) Without limiting the generality of the foregoing, BMG shall, through the PMO, and shall cause the IAs to, furnish to ADB quarterly reports on the execution of the Project and on the operation and management of the Project facilities. Such reports shall be submitted in such form and in such detail and within such a period as ADB shall reasonably request, and shall indicate, among other things, progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and proposed program of activities and expected progress during the following quarter. (c) Promptly after physical completion of the Project, but in any event not later than three (3) months thereafter or such later date as ADB may agree for this purpose, BMG shall, and shall cause each IA to, prepare and furnish to ADB a report, in such form and in such detail as ADB shall reasonably request, on the execution and initial operation of the Project, including its cost, the performance by BMG or any IA of its obligations under this Project Agreement and the accomplishment of the purposes of the Loan.	PA, Art. II, Section 2.08	Complied with. All reports and information were furnished.

Covenant	Reference in Legal Agreement	Status of Compliance
(a) BMG shall, and shall cause each IA and PMU to, (i) maintain separate accounts for the Project and for its overall operations; (ii) have such 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 to ADB, promptly after their preparation but in any event not later than 6 months after the close of the fiscal year to which they relate, certified copies of such audited 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 the Loan Agreement as well as on the use of the procedures for imprest account/statement of expenditures), all in the English language. BMG shall, through the PMO, furnish to ADB such further information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request. (b) BMG shall enable ADB, upon ADB's request, to discuss BMG's or any IA's or PMU's financial statements and financial affairs from time to time with the auditors appointed by BMG or the concerned IA or PMU pursuant to Section 2.09(a) hereabove, and shall authorize and require any representative of such auditors to participate in any such discussions requested by ADB, provided that any such discussion shall be conducted only in the presence of an authorized officer of BMG or the concerned IA or PMU unless BMG or concerned IA or PMU shall otherwise agree.	PA, Art. II, Section 2.09	Complied with. Audit reports were submitted annually. The submission was delayed for about 1 month in 2016 and 2017.
BMG shall enable ADB's representatives to inspect the Project, the Goods and Works financed out of the proceeds of the Loan, all other plants, sites, properties and equipment of the IAs and any relevant records and documents.	PA, Art. II, Section 2.10	Complied with. Access was provided.
(a) BMG shall cause each IA to, promptly as required, takes all action within its powers to maintain its corporate existence, to carry on its operations, and to acquire, maintain and renew all rights, properties, powers, privileges and franchises which are necessary in the carrying out of the Project or in the conduct of its business. (b) BMG shall at all times conduct its operations and activities, and shall cause each IA to, at all times conduct its business in accordance with sound administrative, financial, environmental and water resources management practices, and under the supervision of competent and experienced management and personnel. (c) BMG shall, and shall cause each IA to, at all times operate and maintain its plants, equipment and other property, and from time to time, promptly as needed, make all necessary repairs and renewals thereof, all in accordance with sound administrative, financial, engineering, environmental, water resources management, and maintenance and operational practices.	PA, Art. II, Section 2.11	Complied with. Compliance was confirmed during review mission and in progress reports.
Except as ADB may otherwise agree, BMG shall not, and shall ensure that no IA shall, sell, lease or otherwise dispose of any of its assets which shall be required for the efficient carrying on of its operations or the disposal of which may prejudice its ability to perform satisfactorily any of its obligations under this Project Agreement.	PA, Art. II, Section 2.12	Complied with. Compliance was confirmed in progress reports.

Covenant	Reference in Legal Agreement	Status of Compliance
Except as ADB may otherwise agree, BMG shall, and shall ensure that each IA applies the proceeds of the Loan to the financing of expenditures on the Project in accordance with the provisions of the Loan Agreement and this Project Agreement, and shall ensure that all Goods, Works and consulting services financed out of such proceeds are used exclusively in the carrying out of the Project.	PA, Art. II, Section 2.13	Complied with. Compliance was confirmed in progress reports.
Except as ADB may otherwise agree, HPG and BMG shall ensure that (a) each County, City, Township, IA and PMU duly perform all their respective obligations under the related Onlending Agreement; and (b) each County, City, or Township and concerned IA and PMU do not take, or concur in, any action which would have the effect of assigning, amending, abrogating or waiving any of their respective rights or obligations under any Onlending Agreement.	PA, Art. II, Section 2.14	Complied with. Compliance was confirmed in progress reports.
BMG shall, and shall cause concerned IA to promptly notify ADB of any proposal to amend, suspend or repeal any provision of its Charter and shall afford ADB an adequate opportunity to comment on such proposal prior to taking any action thereon.	PA, Art. II, Section 2.15	Complied with. Compliance was confirmed in progress reports.
Onlending Agreement Except as ADB may otherwise agree, HPG and BMG shall ensure that (a) each of County, City, Township, and concerned IA duly perform all their respective obligations under the related Onlending Agreement and the Project Agreement; and (b) each of County, City, Township, and concerned IA do not take, or concur in, any action which would have the effect of assigning, amending, abrogating or waiving any their respective rights or obligations under the Onlending Agreement.	PA, Art. III, Section 2.14	Complied with. Onlending agreements were followed.
Financing Arrangements Governance, Financial Management and Anticorruption In furtherance of the principles of transparency, participation, accountability and zero-tolerance for corruption, BMG shall enhance and further develop the internet Project website that describes the Project in order to provide the public with information on the Project including setting out (a) a summary of the audited financial statements of the Project, and (b) tracking of procurement contract awards.	PA, Schedule, para. 16	Complied with. The information was disclosed in public websites.
BMG shall ensure that each IA establishes financial control management arrangements compatible with ADB's Guidelines for the Financial Governance and Management of Investment Projects Financed by the ADB and ADB's Loan Disbursement Handbook (2007, as amended from time to time).	PA, Schedule, para. 17	Complied with. IAs were trained in financial control management.
HPG and BMG shall, and shall cause each IA to, comply with ADB's Anticorruption Policy (1998, as amended to date). HPG and BMG agree that ADB reserves the right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive or coercive practices relating to the Project. In particular, HPG and BMG shall (a) ensure that all contracts financed by ADB in connection with the Project include provisions specifying the right of ADB to audit and examine the records and accounts of BMG, the IAs and all contractors, suppliers, consultants and other service providers as they relate to the Project; (b) cooperate fully with and cause each IA to cooperate fully with any such investigation and to extend all necessary assistance, including providing access to all relevant books and records, as may be necessary for the satisfactory completion of any such investigation; (c) engage an international consultant and a national	PA, Schedule, para. 18	Complied with. Anticorruption Policy was followed.

Covenant	Reference in Legal Agreement	Status of Compliance
consultant to advise and assist in the procurement of goods and services, and recruitment of other consultants; (d) introduce a dual signing system in which the civil works contractor awarded the contract will also sign an anticorruption contract with the employer; and (e) cause the PMO to conduct periodical inspection of the contractor's activities related to fund withdrawals and settlements.		
Except as ADB shall otherwise agree, BMG shall ensure that no IA incurs any debt unless (i) a reasonable forecast of the revenues and expenditures of IA shows that the estimated net revenues of the relevant IA for each fiscal year during the term of the debt to be incurred shall be at least 1.2 times the estimated debt service requirements of such IA in such year on all debt of the relevant IA including the debt to be incurred, and (ii) no event has occurred since the date of the forecast which has, or may reasonably be expected in the future to have, a material adverse effect on the financial condition of future operating results of the IA.	PA, Schedule, para. 22 (a)	Complied with. No additional debt was required because of the state bond and counterpart fund provided by the government.
Except as ADB shall otherwise agree, no IA shall incur any debt if after the incurrence of such debt the ratio of debt to equity shall be greater than 70:30.	PA, Schedule, para. 23 (a)	Complied with. No additional debt incurred.
Except as ADB shall otherwise agree, each IA shall maintain a ratio of current assets to current liabilities of not less than 1.2:1.	PA, Schedule, para. 24 (a)	Partially complied with. Current ratios of some subprojects are to be improved. The WWTPs could not meet the minimum ratio of 1.2, mainly because of the low wastewater tariff and/or inadequate sewer.
For purposes of the assurances contained in paragraphs 22 through 24 above, whenever it shall be necessary to value, in terms of the currency of the Borrower, debt payable in another currency, such valuation shall be made on the basis of the prevailing lawful rate of exchange at which such other currency is at the time of such valuation obtainable for the purposes of servicing such debt, or, in the absence of such rate, on the basis of a rate of exchange acceptable to ADB.	PA, Schedule, para. 25	Complied with. Compliance was confirmed in progress reports.
Clean Development Mechanism (CDM) Clean Development Mechanism (CDM) BMG shall ensure that Xiong County transfer 50% of its revenues earned from carbon credits from Clean (Geothermal) Energy subproject to Xiong County Poverty Reduction Agency to expand its activities. This shall be an incremental amount over and above the prevailing budget of Xiong County Poverty Reduction Agency.	PA, Schedule, para. 9	Invalid. ADB financing of this subproject is cancelled at EA's request. This arrangement became invalid.

Covenant	Reference in Legal Agreement	Status of Compliance
Environmental BMG shall each IA to construct, maintain and operate the Project facilities in strict conformity with (i) all applicable national and local environmental laws, regulations and procedures; (ii) ADB's Environment Policy (2002); and (iii) the environmental mitigation and monitoring measures set out in approved EIA, SEIA, IEE and SIEE; and the EMP for the Project.	PA, Schedule, para. 12	Complied with. General compliance was confirmed in environmental monitoring reports.
BMG shall ensure that the IEE and EIA are (i) reviewed and updated following final detailed designs, (ii) approved by ADB prior to undertaking any works, and (ii) updated with all mitigation measures incorporated in the bidding documents and the civil works contracts.	PA, Schedule, para. 13	Complied with. Updated EIA was prepared for four new subprojects.
BMG shall ensure that each IA (i) allocate sufficient resources to implement the EMP; and (ii) provides monitoring reports to the PMO which shall coordinate the preparation of a semiannual environmental report on implementation of the EMP in a format acceptable to ADB, for the duration of the Project.	PA, Schedule, para. 14	Complied with. EMP was implemented in a general satisfactory manner. Seven environmental monitoring reports have been prepared and disclosed on the ADB website.
Resettlement BMG, through the relevant IAs, shall ensure that: (i) all land and rights-of-way required by the Project are made available in a timely manner; (ii) the RPs are implemented efficiently in accordance with their terms, all applicable laws and regulations of the Borrower, and ADB's Involuntary Resettlement Policy (1995); (iii) all those affected are given adequate opportunity to participate in resettlement planning and implementation; (iv) counterpart funds are provided on a timely basis for land acquisition and resettlement activities, any obligations in excess of RP budget estimates are met; (v) compensation and resettlement assistance are given to affected people (AP) prior to dispossession and displacement to ensure those affected are at least well of as they would have been in the absence of the Project; RPs are updated where necessary based on detailed designs and resubmitted to ADB for concurrence prior to commencement of civil works; (vi) during Project implementation, ADB is advised of any significant material changes in Project scope, and such changes or other causes are reflected in an updated RP and submitted to ADB for approval; and the relevant IAs disclose such updated RPs to AP prior to ADB's approval; (vii) adequate staff and resources are committed to resettlement monitoring and supervision, and ADB is provided with quarterly reports on implementation and a resettlement completion report covering all subprojects; (viii) an independent agency, acceptable to ADB, is engaged to monitor resettlement progress through survey updates for the first and second year and in the last year of the Project implementation, the semi-annual progress reports will be prepared by the PMO with assistance of consultant; (ix) external monitoring reports are submitted simultaneously to ADB and the Borrower;	PA, Schedule, para. 10	Complied with. RPs were implemented satisfactorily and 17 resettlement plans were disclosed. Due diligence report for new subprojects was prepared and disclosed. Six external monitoring reports were submitted. One resettlement completion report was prepared and disclosed in April 2017.

Covenant	Reference in Legal Agreement	Status of Compliance
(x) civil works contractor specifications include requirements to comply with the RPs and entitlements for permanent and temporary impacts to AP; and (xi) contractors are supervised to ensure compliance with requirements of the RPs, Borrower's applicable laws and regulations, and ADB's Involuntary Resettlement Policy (1995).		
BMG shall ensure that relevant IAs establish Project land acquisition units for (i) supervising implementation, (ii) continuing public consultation, (iii) responding to grievances in accordance with the grievance redress procedures set forth in the relevant RPs, and (iv) reporting progress. To redress any other grievances, each PIU and PMO shall nominate one staff to receive complaints and arrange provision of appropriate relief in accordance with the Borrower's State Council Decree 431.	PA, Schedule, para. 11	Complied with. Progress reports confirmed compliance.
Labor Standards: Health BMG shall, and shall cause each IA to, comply with all employment and labor standards set forth in the applicable laws, regulations and policies of the Borrower. In particular, BMG shall ensure that all civil works contractors engaged under the Project (a) provide timely payment of wages and safe working conditions for all workers (with such requirement being included in the civil works contracts and monitored by the construction supervision consultants); (b) pay equal wages to the male and female employees for work of equal value, and (c) not employ child labor in the Project activities.	PA, Schedule, para. 19	Complied with. Progress reports confirmed compliance.
BMG shall ensure that each IA, in coordination with the appropriate agencies identified by BMG, cause contractors to disseminate information on the risks of socially and sexually transmitted diseases, including HIV/AIDS, to their employees during Project implementation.	PA, Schedule, para. 20	Complied with. Information was disseminated with support of contractors.
Gender and Development BMG shall cause each IA to (a) take necessary steps to ensure timely and effective implementation of the Project-specific participatory gender and sustainable livelihood plans; (b) carry out awareness-raising campaigns to encourage women in the Project area to participate in the planning and implementation of the Project; (c) set a 30% target for women's employment in construction and/or rehabilitation of the Project infrastructure, operation and maintenance of the Project infrastructure; and (d) monitor the Project's impacts on women during Project implementation by collecting and analyzing gender-disaggregated data and information.	PA, Schedule, para. 21	Complied with. Women were given priority in training and employment opportunities generated by the project.
Fielding of Consultants In the carrying out of the Project, BMG shall, and shall the IAs to, employ competent and qualified consultants and contractors, acceptable to ADB, to an extent upon terms and conditions satisfactory to ADB.	PA, Art. III, Section 2.03 (a)	Complied with. ADB recruitment procedures were followed.
Performance Benefit Monitoring and Evaluation BMG shall ensure that at the Project inception, the PMO establishes and maintains a project performance monitoring system (PPMS) to monitor the progress of the Project in achieving the planned outcome and outputs. The PPMS shall be designed to permit adequate flexibility to adopt remedial action regarding Project design, schedules, activities, and development impacts. The PPMS shall adopt the following agreed indicators:(a) physical progress of subproject implementation;(b) results of capacity development program;(c) water quality and quantity improvements in the Baiyangdian Lake;(d) improvement in biodiversity conservation; and (e) social development. At the Project inception stage, the PMO, in consultation with	PA, Schedule, para. 26 and 27	Complied with. A PPMS was established at project inception. The monitoring and reporting were interrupted by change of consultants.

Covenant	Reference in Legal Agreement	Status of Compliance
each IA, shall:(i)identify and obtain baseline data, as agreed with ADB; and (ii) develop comprehensive PPMS procedures to systematically generate data on (a) inputs and outputs of the Project activities; and (b) the socioeconomic, health, and environmental indicators to measure Project impacts. BMG shall ensure that not later than 6 months after the Project implementation begins, the PMO:(a) refines the PPMS framework; (b) confirms achievable targets;(c) firms up monitoring and recording arrangements; and(d) establishes PPMS related systems and procedures. Baseline and progress date shall be reported at the requisite time intervals by the IAs to the PMO, including annual reporting on the EMP. The PMO shall be responsible for (a) analyzing and consolidating the reported data through its management information system; and (b) reporting the outcome to ADB through the quarterly progress reports.		
Capacity Building BMG shall ensure that each IA and other relevant stakeholders (i) follow the agreed Project implementation plan; (ii) implement recommendations for capacity building and institutional strengthening; (iii) appoint suitable trainers and training institutions based on a selection criteria; (iv) select staff for training using a transparent and objective methodology; and (v) take such steps as may be reasonable to ensure, that staff who have received training under the Project, remain with the Project throughout its implementation.	PA, Schedule, para. 15	Complied with. Various training was organized to build capacity and cope with staff turnover.
Project Executing Agency BMG shall be responsible for implementation of GEF Grant financed components of the Project.	FA, Schedule 3, para. 1	Complied with. BMG held due responsibilities.
Financial Management Arrangements, Accounting, Auditing and Reporting (a) The Government shall cause, through BMG, the IAs to, (i) maintain separate accounts for the GEF Grant financed components of the Project and for its overall operations; (ii) have such 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 to ADB, promptly after their preparation but in any event not later than six (6) months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditor's opinion on the use of the GEF Grant proceeds and compliance with the covenants of the Financing Agreement as well as on the use of the procedures for imprest account/statement of expenditures) all in the English language. BMG shall furnish to ADB such further information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request. (b) The Government shall cause BMG to enable ADB, upon ADB's request, to discuss BMG's financial statements and its financial affairs from time to time with the auditors appointed by BMG pursuant to paragraph 2(a) hereabove, and shall authorize and require any representative of such auditors to participate in any such discussion requested by ADB, provided that any such discussion shall be conducted only in the presence of an authorized officer of BMG uncles BMG shall otherwise agree.	FA, Schedule 3, para. 2	Complied with. Separate accounts were maintained for the GEF Grant financed components of the Project. Audit report of the Grant financed components were part of the annual audit reports submitted. Hebei Audit Office audited the detailed consolidated project accounts in accordance with the auditing standards and regulations of the PRC. Audit

Covenant	Reference in Legal Agreement	Status of Compliance
		reports were submitted annually.
Anticorruption The Government shall ensure that BMG, shall, and shall cause the IAs to comply with ADB's Anticorruption Policy (1998, as amended to date). BMG agrees that consistent with its commitment to good governance, accountability, and transparency, ADB reserves the right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive, or coercive practices relating to the GEF Grant financed components of the Project. In particular, BMG shall ensure that all contracts financed by ADB in connection with the GEF Grant financed components of the Project include provisions specifying the right of ADB to audit and examine the records and accounts of BMG, the IAs, and all contracts, suppliers, consultants, and other service providers as they relate to the GEF Grant financed components of the Project.	FA, Schedule 3, para. 3	Complied with. Anticorruption Policy was followed by BMG and IAs.

ADB=Asian Development Bank, BMG=Baoding municipal government, BPMO= Baoding project management office, EA= Executing Agency, EIA=environment impact assessment, EMP=environmental management plan, FA=Financing Agreement, GEF= Global Environment Facility, HPG= Hebei Provincial Government, IA=implementing agency, IEE=initial environmental examination, IWM=integrated water management, LA=Loan Agreement, PA= Project Agreement, PIU=project implementing unit, PLG=project leading group, PMU=Portfolio Management Unit, PMO=project ,management office, PPMS=project performance management system, SEIA=summary environment impact assessment, WSS=water supply system, WWTP= wastewater treatment plant,
Sources: Asian Development Bank and Baoding Project Management Office.

FINANCIAL AND ECONOMIC REEVALUATION

1. The Integrated Ecosystem and Water Resources Management in the Baiyangdian Basin Project aimed to improve quality of life in Baiyangdian Basin through sustainable management of its ecosystem and water resources, with the four components including 17 subproject investments, biodiversity conservation, institutional strengthening and project management support. The main project benefits were generated from the 17 subprojects implemented. During the project completion review (PCR), a financial reevaluation was conducted for 16 revenue–generating subprojects including 12 wastewater treatment (WWT) subprojects, 1 sludge treatment subproject, 2 water supply (WS) subprojects and 1 afforestation subproject, while an economic reevaluation was conducted for all the 17 subprojects and the consolidated whole project. The reevaluation focused on the financial and economic viability of the investments in the Baiyangdian basin at the project completion based on the actual project costs and re-valuation of the project financial and economic benefits.

2. Benefits from the interventions under the biodiversity conservation component are derived from improved wildlife and overall environmental conditions in the basin in general and in the provincial nature reserve areas in particular. These benefits are difficult to quantify and, therefore, are not included in the financial and economic analysis.

I. Financial Reevaluation

A. Methodology and Major Assumptions

3. The financial reevaluation for 17 subprojects was carried out by applying the same methodologies and major assumptions as at appraisal or at subprojects preparation. The analysis was performed in accordance with the Guidelines on Financial Management and Analysis of Projects of the Asian Development Bank (ADB). This reevaluation assesses the financial viability of each subproject after project implementation by using the information and data updated at PCR. As at the appraisal, the specific assumptions applied in the analysis are as follows:

(i) The analysis assesses financial viability by calculating individual financial internal rates of return (FIRRs) of each revenue-generating subproject. The weighted average cost of capital (WACC) of each investment subproject re-estimated at PCR based on the actual capital costs and funding sources was used as the benchmark to determine the financial viability and as the discount rate to estimate the financial net present value (FNPV);

(ii) Subproject-specific FIRRs were based on (a) with- and without-project incremental revenues derived from tariff charges for providing services related to wastewater, sludge treatment and water supply and from revenues from sales of walnuts; as well as (b) incremental costs incurred in subproject investment and operation and maintenance. A projection period of 25 years including the construction period was assumed;

(iii) Subprojects cash inflow and outflow projected at appraisal was updated based on the actual capital investments and their operation situations up to PCR;

(iv) The capital investment used for the analysis were derived from the project actual expenditures incurred during the project implementation period. The project costs were expressed in the prices of the year that they were actual incurred. Costs and

revenues after project completion were expressed in constant 2017 prices to exclude inflation, and the data on capital cost, incremental revenue income, and expenditures was provided by PIUs;

(v) Subproject-specific FIRRs are calculated after taxes. The income tax rates were assumed at 25%; and

(vi) Sensitivity analysis has been undertaken to assess the impact of potential adverse changes in key project variables operating costs and revenues.

B. Weighted Average Costs of Capital

4. Each subproject's WACC was estimated in accordance with ADB's Guidelines for the Financial Governance and Management of Investment Projects Financed by the Asian Development Bank, using the relative proportions of each source in total subproject financing and their relative costs. The WACC has been estimated based an assumed return on the equity of 8%, and the cost of ADB borrowing of around 2.76% prevailing at PCR. The resulting WACCs of revenue-generating subprojects are from 0.60% to 3.09%, varying by subproject (presented in Table A7.1), with the aggregated WACC of these subprojects of 1.38% against 2.51% estimated at appraisal. The WACCs for most subprojects estimated at PCR were lower than that estimated at appraisal which was around 2.51% due to much lower ADB loan interest rate and high proportion of grant funding sources compared to that estimated at appraisal.

Table A7.1: WACC Estimate at PCR

Subprojects	At Appraisal	At PCR
	WACC (%)	**WACC** (%)
Wastewater Treatment		
Li County		1.07
Li County-Liushi		1.17
Li County-Xingxin		1.10
Baigou		0.99
Xushui County		2.10
Yi County		2.80
Dingxin City		2.35
Mancheng County		3.09
Xiong County		2.10
Tang County		1.31
Li County-Phase II	1.65	0.60
Qinyuan County-Phase II	1.86	0.84
Water Supply		
Dingzhou		0.85
Yi County		2.77
Sludge Treatment	1.65	0.76
Afforestation		
Laishui	1.81	0.84
Shunping	1.81	0.91
Overall	2.51	1.38

PCR = Project Completion Report, WACC = weighted average cost of capital.
Note: The afforestation component was treated as one subproject at appraisal. At project completion, the reevaluation was conducted separately as two subprojects because the locations of the construction activities were in two counties, and the onlending agreements and project accounts were separately treated at implementation.
Source: Baoding Project Management Office.

C. Results of the Financial Analysis

5. FIRRs were recalculated for each subproject based on actual investment costs at PCR, initial operation situation up to PCR and projected operation situation for the remaining years. The FNPV for each subproject was calculated using the estimated WACC as the discount rate; FIRRs have been subjected to sensitivity analysis by estimating switching values (SVs), which indicate the degree to which two key variables (revenue, and operating costs) would need to fall for the FIRR to the level of the WACC.

6. FIRRs for 11 WWT and 2 WS subprojects were considerably lower at PCR than at appraisal/design. This derives principally from lower tariff prevailing at PCR than that anticipated at appraisal, higher actual investment costs incurred by some subprojects during implementation than the estimates made at appraisal, and the operation efficiency up to the PCR lower than the designed capacity, and longer construction periods for WS subprojects. FIRRs for Qinyuan County II WWT subproject and afforestation subproject at PCR registered slightly lower than that estimated at the design, while FIRR for sludge management subproject was higher than that estimated at the design due to lower operation and maintenance costs incurred than that estimated at the design. Table A7.2 shows the PCR and appraisal FIRR and FNPV for each subproject. Overall, the financial viability of all 16 revenue-generating investment subprojects was confirmed, as the recalculated FIRR is higher than the weighted average cost of capital (WACC).

Table A7.2: FIRRs at Appraisal/Design and at PCR

Subprojects	At Appraisal	At PCR	
	FIRR (%)	**FIRR** (%)	**FNPV** (CNY million)
Wastewater Treatment			
Li County	8.4	5.33	44.13
Li County-Liushi	8.0	5.55	33.54
Li County-Xinxing	8.5	4.48	26.36
Baigou	9.1	3.97	27.94
Xushui County	8.2	4.94	27.60
Yi County	7.9	3.26	3.42
Dingxin City	8.9	4.44	14.42
Mancheng County	9.2	3.35	2.73
Xiong County	9.2	3.19	6.89
Tang County	8.1	2.10	7.04
Li County-Phase II	6.4	2.99	25.04
Qinyuan County-Phase II	5.3	4.68	30.42
Water Supply			
Dingzhou	10.5	8.66	70.67
Yi County	9.4	7.93	20.89
Sludge Treatment	4.5	6.57	96.50
Afforestation			
Laishui	11.4	11.06	101.06
Shunping	11.4	10.42	95.50

FIRR= financial internal rates of return, FNPV= financial net present value, PCR= Project Completion Report.
Source: Baoding Project Management Office.

7. The sensitivity analysis tested the robustness of the financial viability of the 16 subprojects, using three scenarios: (i) a 10% revenue decline, (ii) a 10% operation and maintenance (O&M) cost increase, and (iii) a combination of both. The results (Table A7.3) shows that six subprojects at PCR, including four WWTs subprojects (Li County, Li County-Liushi, Li County Xinxing, and Qinquan County II), sludge treatment subproject and the afforestation subproject, would remain financially viable in any scenarios. The 10% revenue reduction would have a considerable impact on the FIRR for all subprojects. Ten subprojects would register FIRR below WACC in the scenario of both a 10% revenue reduction and a 10% O&M cost increase,

making these subprojects financially inviable. Of these 16 subprojects, Mancheng WWT subproject was the most sensitive to the changes of revenue and O&M costs, in which a 1.24% decline in revenue or a 2.09% increase in O&M costs would make the FIRR below WACC for this subproject.

Table A7.3: Results of the Sensitivity Analysis at PCR

Subprojects	FIRR (%)				Switch Value (%)	
	Base	Revenue -10%	O&M Cost +10%	O&M Cost +10% Revenue -10%	Revenue	O&M Cost
Wastewater Treatment						
Li County	5.33	3.32	4.34	2.24	19.95	40.53
Li County-Liushi	5.55	3.49	4.53	2.38	20.05	40.85
Li County-Xingxin	4.48	2.52	3.49	1.38	16.38	31.57
Baigou	3.97	1.91	2.95	0.76	14.09	27.85
Xushui County	4.94	2.88	4.04	1.89	13.52	30.60
Yi County	3.26	1.38	2.36	0.35	2.59	5.20
Dingxin City	4.44	2.59	3.58	1.61	11.20	23.48
Mancheng County	3.35	1.07	2.04	(0.45)	1.24	2.09
Xiong County	3.19	1.59	2.51	0.83	6.96	15.99
Tang County	2.10	0.28	1.32	(0.59)	4.43	10.11
Li County-Phase II	2.99	1.21	2.46	0.15	10.63	23.96
Qinyuan County-Phase II	4.68	2.60	3.90	1.33	14.98	31.32
Water Supply						
Dingzhou	8.66	(4.29)	(1.09)	N/A	8.03	9.22
Yi County	7.93	7.06	2.18	(6.18)	53.68	9.58
Sludge Treatment	6.57	3.85	5.09	2.08	19.38	34.43
Afforestation						
Laishui	11.06	8.05	9.40	6.01	26.29	48.21
Shunping	10.42	7.50	8.80	5.49	25.39	46.04

FIRR= financial internal rates of return, O&M= operation and maintenance, PCR= Project Completion Report.
Source: Baoding Project Management Office.

II. Economic Reevaluation

A. Methodology and Basic Assumptions

8. The economic analysis was undertaken during the PCR under the same methodologies and major assumptions as at appraisal in accordance with ADB's Guidelines for the Economic Analysis of Project (2017). The analysis was done for all 17 subprojects under the subproject investment component and overall project.

9. To assess each subproject's contribution to the PRC economy, the financial costs were converted into to their economic equivalents. As at appraisal, incremental costs and benefits are estimated by comparing with-project and without- project scenarios for each subproject and the project as a whole. Basic assumptions as at appraisal/design used in the economic analysis include:

(i) The project life is assumed 25 years, including an implementation period of 3-7 years. The residual value at the end of the project life is assumed to be zero. All prices and costs are expressed in 2017 prices and in the domestic currency;

(ii) Transfer payments such as taxes, duties, and subsidies (assuming the tax rates of civil works, equipment, and Land Acquisition and resettlement as 3.59%, 17% and 3%, respectively) are excluded from the economic evaluation of the individual

subprojects and the Project as a whole；

(iii) Economic costs and benefits are derived by adjusting financial costs and benefits by a standard conversion factor of 0.93 used at appraisal. This is consistent with the standard conversion factor used in the ADB projects for the PRC;

(iv) The real opportunity cost of capital employed in the analysis is assumed at 9% per annum, and represents the opportunity cost of capital for the PRC.

B. Economic Benefits

10. WWT subprojects treat the affluent from domestic, industrial, and commercial users and significantly reduce organic pollution loading to the lake as well as improve the water quality in the extensive network of rivers in the basin. WSS subprojects increase the potable water supply, reduce the water loss and improve hygiene among project beneficiaries. Sludge treatment subproject improves the environment by avoiding the secondary pollution from WWT sludge. Afforestation in the upper watershed of Baiyangdian improves the water retention capacity of the watershed and contain soil erosion aside from financial benefit from walnut harvested. The IWM subproject diverts raw water from the Wangkuai to Xidayang reservoir through a new diversion channel to provide an ensured and increased amount of ecological water for the Baiyangdian Lake; recharge subterranean water sources during rainy season, significantly reduce water conveyance losses compared to the alternative route, and improve water supply and quality in and around Baoding City and Li County. These interventions also conserve biodiversity; and improve the ecosystem, living conditions, and livelihoods of the subproject communities. The benefits included in each subproject analysis were limited to direct and quantifiable benefits. Other indirect and unquantifiable benefits that are likely generated by the project were not included in the analysis, such as improved biodiversity and overall environmental conditions in the basin and in the provincial nature reserve areas in particular.

11. **Wastewater Treatment and Water Supply Subprojects.** The main benefits of the WWT subprojects include (i) improved management of wastewater; (ii) reduced soil contamination and river pollution; and (iii) reduced risk of human exposure to waterborne pathogens in surface water. The WSS subprojects reduced the economic cost of obtaining water from existing supply sources and phased out private self-supply water wells serving domestic and non-domestic users (non-incremental demand). The “willingness to pay” approach currently adopted in similar ADB water sector projects in PRC was applied to estimate the benefits of WWT and WS subprojects at PCR rather than the “cost of illness” approach which was adopted at appraisal; as the economic benefits are broader than health effect.[1] The willingness-to-pay was estimated based on the contingent valuation method. Based on social survey, an average household in the project area was willing to pay CNY18.5 per ton (equivalent to CNY1.39 per ton) for wastewater treatment, which is higher than average tariff of CNY0.90-1.31 currently used in the project area, while an average household in the project area was willing to pay CNY35 per ton (equivalent to CNY 2.56 per ton) for drinking water, which is similar to the current water tariff in the project area. Therefore, for the purpose of the economic reevaluation at PCR, willingness-to-pay of CNY 1.39 per ton was used to revalue the economic benefits of WWT subprojects, while willingness-to-pay of CNY2.56 per ton was used to revalue the economic benefits of WSS subprojects.

[1] Shanxi Urban–Rural Water Source Protection and Environmental Demonstration Project (RRP PRC 48274), Jiangxi Pingxiang Integrated Rural-Urban Infrastructure Development Project (RRP PRC 47030) and Hunan Dongjiang Lake Integrated Environmental Protection and Management Project (RRP PRC 47070).

12. **Sludge Treatment Subproject.** The subproject was included in the project after mid-term review. The approach with - and without – project was applied to determine its economic viability. Without the project, the dewatered sludge (80% moisture) from the WWT plants was transported to the existing landfill sites for disposal and caused potential release of nutrients, toxins and other pollutants to the surrounding environment. With project, the 250 tons/day sludge collected and transported from three urban WWT plants would be treated through anaerobic digestion. 5,000m^3 biogas was generated for heating supply and further energy utilization. The residual soil may be used as conditioners for land application, gardening and landscaping or transported to the landfill sites for disposal in case of exceeded heavy mental contents. The main quantifiable economic benefits for the sludge treatment subproject include (i) opportunity cost of land savings computed from the prolonged life of landfills as a result of the reduced amount of sludge disposal; (ii) the beneficial use of the residual as organic soil for tree planting and gardening etc.; (iii) fuel savings from using biogas generated from the digestion for heating; (iv) landfill operation cost savings due to better quality of residual for filling. The annual economic benefits generating from above four aspects were estimated at CNY 28.8 million.

13. **Afforestation Subproject.** The reforestation subprojects originally designed at appraisal were replaced by one new afforestation subproject to establish walnuts plantations at the upper watershed of Baiyangdian basin during the implementation. A total of 866 ha walnut plantations in Laishui and Shunping counties was established by the project to prevent soil erosion while generating income for farmers. As at the design, the economic benefit from walnut sales was re-estimated at PCR. Given the level of competition and limited distortion in the market for walnut products both internationally and nationally, financial market price was assumed to be equal to its economic value. At full development, annual economic benefit from walnut sales is about CNY57,000/ha.[2]

14. **Integrated Water Management Subproject.** The link canal to connect Wangkuai Reservoir to Xidayang Reservoir was newly constructed and the existing Tang aqueduct downstream of Xidayang Reservoir which discharges into Baiyandian Lake was upgraded under the subproject. For recharging ecological water to Baiyangdian Lake, this provided a more efficient water transfer route from Wangkuai and Xidayang Reservoirs to the lake comparing with diverting the water from the two reservoirs through the Sha River course with high infiltration, and the subproject route improves the water conveyance ratio from about 30% to about 64%. It was estimated based on several years of operation that the reduced water losses amount to about 25 million m^3 a year. At an economic price of about CNY1.5/m^3 for raw water, the economic benefit caused by reduction in water losses is about CNY37.5 million/year.

C. Results of the Economic Analysis

15. Economic internal rates of returns (EIRRs) were computed to re-examine the economic viability of the subprojects and the consolidated 17 subprojects at the completion. The overall project economic analysis was based on an aggregation of the economic benefits and economic costs of 17 subprojects. Table A7.4 shows the EIRRs at the capital opportunity cost of 9% for all the subprojects at the completion compared with those at appraisal/design, overall project at the completion and also the results of sensitivity analysis.

[2] In addition, it was estimated that the subproject can sequester carbon of 133,771 ton/year (sequestration of 154.47 ton/ha was estimated in line with Guidelines on the IPCC National GHG Inventory in 2006); prevent soil erosion of 12,990 ton/year at full development. ADB recommended marginal damage cost is \$36.3/tCO_2e in 2016 prices. Currently the trading price in the PRC is around CNY30//tCO_2e. These two environmental benefits were not valued for EIRR reevaluation.

16. The EIRRs of the individual subprojects at the completion ranged from 10.5% to 20.5%, and the consolidated EIRR for overall project was 13.7%, showing that the project investment in environment improvement and biodiversity conservation in Baiyangdian basin is still economically viable at PCR. Compared with the EIRRs at appraisal/design, these EIRRs were either better or about the same for four subprojects, and lower for the other 13 subprojects. The EIRR of the overall project was lower than that calculated at appraisal. The gaps between the appraisal and completion EIRRs was due principally to (i) changes in capital costs including higher actual investment costs incurred by subprojects during implementation than the estimates made at appraisal mainly for the original nine wastewater treatment subprojects and integrated water management subproject; (ii) lower capital costs than estimates at the design stage resulting from the competitive biddings; and (iii) changes in economic benefits resulting from the different approach to value the economic benefits.

Table A7.4: Results of Economic Re-evaluation and Sensitivity Analysis

Subprojects	Results of EIRR (%)		Result of Sensitivity Analysis				
	At Appraisal	At PCR	EIRR (%)			Switch Value (%)	
	EIRR	EIRR	O&M +10%	Benefit -10%	O&M+10% Benefit-10%	O&M	Benefit
Wastewater Treatment							
Li County	17.3	14.2	13.2	11.6	10.5	52.1	19.2
Li County-Liushi	17.6	13.8	12.7	11.0	9.8	42.5	16.7
Li County-Xinxing	17.5	12.0	11.1	9.7	8.8	30.6	11.8
Baigou	17.0	15.4	14.6	12.9	12.2	80.7	25.0
Xushui County	18.0	13.2	12.5	10.9	10.1	54.7	17.7
Yi County	18.3	10.5	9.7	8.4	7.6	20.0	7.1
Dingxin City	17.5	18.3	17.5	15.7	14.9	117.3	33.7
Mencheng County	17.4	11.2	10.2	9.0	7.9	22.5	9.9
Xiong County	17.4	12.6	12.1	10.7	10.1	65.9	18.4
Tang County	17.2	12.4	11.6	10.0	9.2	41.0	14.1
Li County-II	14.9	13.1	12.2	10.5	9.5	33.3	12.3
Qinyuan County-II	14.3	13.6	12.6	10.9	9.9	44.4	16.9
Water Supply							
Dingzhou	18.6	20.5	19.5	18.3	17.2	88.2	39.6
Yi County	17.6	11.6	(0.1)	10.5	(1.6)	2.2	22.5
Sludge Treatment	13.4	12.1	10.9	9.4	8.0	23.5	11.5
Afforestation							
Laishui	12.0	16.0	14.7	13.5	12.0	46.3	24.7
Shunping	12.0	15.2	13.9	12.8	11.4	42.9	23.2
Integrated Water Management	18.9	12.8	12.7	11.3	11.3	507.4	25.2
Overall	16.9	13.7	13.0	11.6	10.9	65.1	21.7

EIRR= economic internal rates of return, O&M= operation and maintenance, PCR= Project Completion Report.
Source: Baoding Project Management Office.

17. The sensitivity analysis tested the robustness of the economic viability of the 17 subprojects, using three scenarios: (i) a 10% benefit decline, (ii) a 10% O&M cost increase, and (iii) a combination of both. The results (Table A7.4) shows that 12 subprojects and overall project would remain higher than ADB's minimum required EIRR of 9% in any scenario. The EIRRs of Xinxing WWT, Yi WWT, Mancheng WWT, Yi WS, and sludge treatment subprojects would be lower than the requirement of 9% at a combination of both tests; while Yi WWT subproject was

sensitive to benefit reduction and Yi WSS was sensitive to increase of O&M costs as well. Considering that the other indirect economic benefits were not quantified, the economic viability of all subprojects has proven to be robust in general at the project completion.

SOCIAL IMPACT AND POVERTY REDUCTION

A. Introduction

1. A social and poverty assessment was carried out for project interventions during project preparation. The assessment indicated that the Project will reduce poverty by (i) strengthening wastewater management to address water pollution; (ii) reducing the incidence of waterborne diseases, which are the major causes of rural absolute poverty in the project area; (iii) increasing income by providing alternative livelihoods, especially tourism, by improving the environment; (iv) providing opportunities for forest and ecosystem recovery; and (v) promoting tourism development. In addition, a brief gender assessment was also conducted during project preparation, which concluded that improvements in ecosystem management, particularly improved wastewater and water supply services, will reduce this burden on women. To maximize the project benefits, women will be given priority in the employment opportunities generated by the Project, and women's needs and interests will be represented through membership on customer committees of the wastewater and water supply companies. Meanwhile, women will receive priority consideration for training and other capacity building activities under the Project. Based on above assessment, a gender and social action plan was prepared and implemented to enhance the project benefits to local communities and people in the project area.

B. Project Beneficiaries

2. Based on the RRP, the Project targets 11 counties/cities (Anxin, Baoding, Dingxing, Dingzhou, Gaobeidian City, Li, Mancheng, Tang, Xiong, Xushui, and Yi) and two development zones (Wenquancheng, New and High Tech Development Zone). The direct project area has a population of 1.09 million—620,000 (57%) urban and 470,000 (43%) rural. The environmental and poverty reduction benefits will extend to the entire basin population of over 10 million. After project implementation, the project has benefited 12 counties/cities due to scope changes in 2015, including Gaobeidian, Li, Xushui, Dingxing, Mancheng, Xiong, Tang, Yi, Dingzhou, Quyang, Shunping, Qingyuan, and Baoding. There is a total of 6.566 million project beneficiaries, including 3.636 million urban residents and 2.930 million in rural area (Table A8.1).

Table A8.1: Project Beneficiaries
(person)

No.	Subproject	Project county	Urban	Rural	Total
1	Liushi Town wastewater treatment plant (WWTP)	Li County	36,560	59,550	96,110
2	Baigou Town WWTP	Gaobeidian	27,000	83,500	110,500
3	Li County WWTP	Li County	41,321	41,523	82,844
4	Xushui County WWTP	Xushui County	48,000	62,000	110,000
5	Xinxing Town WWTP	Li County	30,750	57,550	88,300
6	Yi County WWTP	Yi County	69,000	56,000	125,000
7	Dingxing County WWTP	Dingxing County	48,500	39,800	88,300
8	Mancheng City WWTP	Mancheng City	61,000	95,300	156,300
9	Xiong County WWTP	Xiong County	31,000	65,000	96,000
10	Tang County WWTP	Tang County	54,080	52,650	106,730
11	Yi County Water Supply*	Yi County	49,850	51,550	101,400
12	Dingzhou City Water Supply	Dingzhou City	300,000	400	300,400

13	Wangkuai- Xidayang Reservoir Connection	Quyang, Shunping, Mancheng	1,750,000	2,200,000	3,950,000
14	Qingyuan County WWTP II and associated sewer network	Qingyuan County	45,500	58,500	104,000
15	Li County WWTP II	Li County	8,646	28,600	37,246
16	Sludge Treatment Center of Baoding City Urban WWTP	Baoding City	1,085,000	0	1,085,000
17	Forestry Ecological Development Baiyangdian Watershed in Baoding	Baoding City	0	29,902	29,902
	Total		**3,636,357**	**2,930,275**	**6,566,632**

Note: Beneficiaries of Yi County Water Supply are overlapped with those of Yi County WWTP.
Sources: Baoding Project Management Office and Implementing Agencies.

C. Increased Urban/Rural Residents' Income

3. According to statistics of project county governments, the growth of urban residents' per capita disposable incomes ranged from 105.8% to 186.9% in the project area from 2006 to 2016; the growth of rural formers' per capita incomes ranged from 43.4% to 158.2% in the project area from 2006 to 2016 (Table A8.2). Compared with other counties in project area, rural per capita incomes in Tang county and Shunping county are much lower. Those two counties have been designated as National-level Poverty-stricken County (NPC).

Table A8.2: Urban and Rural Income Growth in Project Area
(CNY/person)

No.	Project area	Per capita disposable income of urban residents				Per capita net income of rural residents			
		2006	2016	Growth	Annual Growth	2006	2016	Growth	Annual Growth
1	Dingxing County	9,107	26,130	186.9%	11.1%	4,207	9,011	114.2%	7.9%
2	Dingzhou City	7,125	17,680	148.1%	9.5%	4,015	10,368	158.2%	10.0%
3	Gaobeidian	7,362	18,456	150.7%	9.6%	3,022	6,612	118.8%	8.1%
4	Li County	9,041	21,890	142.1%	9.2%	4,790	10,480	118.8%	8.1%
5	Mancheng City	6,723	18,228	171.1%	10.5%	3,687	11,672	216.6%	12.2%
6	Shunping County	6,000	12,350	105.8%	7.5%	2,371	3,689	55.6%	4.5%
7	Tang County	5,662	13,580	139.8%	9.1%	2,511	3,600	43.4%	3.7%
8	Qingyuan County	9,186	23,500	155.8%	9.8%	4,152	9,968	140.1%	9.2%
9	Quyang County	6,463	15,568	140.9%	9.2%	2,698	4,378	62.3%	5.0%
10	Xiong County	7,956	20,505	157.7%	9.9%	4,070	10,015	146.1%	9.4%
11	Yi County	6,437	16,799	161.0%	10.1%	2,846	5,657	98.8%	7.1%
12	Xushui County	9,717	24,187	148.9%	9.5%	4,369	10,503	140.4%	9.2%

Source: Baoding Government.

D. Poverty Reduction in the project area

4. Poverty incidences have been reduced for both urban and rural in the project area. The Minimal Living Standard (MLS) has been used for evaluation of urban poverty incidence in the PRC. The population below MLS in the project area have declined by 36.7% from 57,344 in 2006 to 36,319 in 2016. Meanwhile, the average MLS line has been increased by 409% from CNY 71.53 per month to CNY 293.05 per month (Table A8.3).

Table A8.3: Urban Poverty Incidence in Project Area

No.	Project area	2006		2016		Decrease	Remarks
		MLS line (CNY/month)	Population	MLS line (CNY/month)	Population		
1	Dingxing County	64.25	5,401	490	1,850	65.7%	
2	Dingzhou City	68.42	8,653	240	7,300	15.6%	
3	Gaobeidian	79.4	4,156	240	2,860	31.2%	
4	Li County	62.05	2,040	241.6	1,353	33.7%	
5	Mancheng City	82.99	5,410	450	2,579	52.3%	
6	Shunping County	70.27	4,511	260	2,845	36.9%	NPC
7	Tang County	83.88	4,918	245	4,600	6.5%	NPC
8	Qingyuan County	69.98	3,864	210	2,879	25.5%	
9	Quyang County	81.25	7,015	190	4,500	35.9%	NPC
10	Xiong County	70.91	2,186	210	1,024	53.2%	
11	Yi County	64.92	6,285	200	4,322	31.2%	NPC
12	Xushui County	60.07	2,905	540	207	92.9%	
	Total/Average	71.53	57,344	293.05	36,319	36.7%	

MLS= Minimal Living Standards; NPC= National-level poverty-stricken county
Source: Baoding Government.

5. Poverty line (PL) has been used for evaluation of rural poverty incidence in the PRC. Given the poverty line was sharply increased from CNY 1,047/person to CNY 2,300/person in 2011, poverty population based on new poverty line has accordingly increased significantly in 2012. Table A8.4 provides comparison on poverty incidences in two phases, i.e. 2006-2012, and 2012 – 2016. The statistics in the phase of 2012-2016 demonstrate that poverty population in project area has declined by 50% from 632,797 to 316,588.

Table A8.4: Rural Poverty Incidence in Project Area

No.	Project area	2006		2012		Decrease* (2006-2012)	2016		Decrease (2012-2016)	Remarks
		PL	Poor	PL	Poor		PL	Poor		
1	Dingxing County	778	26,380	2,300	32,581	-24%	2,322	18,540	43%	
2	Dingzhou City	778	19,810	2,300	30,683	-55%	2,322	16,335	47%	
3	Gaobeidian	778	10,856	2,300	15,562	-43%	2,322	10,552	32%	
4	Li County	778	19,758	2,300	26,757	-35%	2,900	4,519	83%	
5	Mancheng City	778	16,069	2,300	10,270	36%	2,300	8,417	18%	
6	Shunping County	778	55,390	2,300	32,780	41%	2,460	24,024	27%	NPC
7	Tang County	778	92,357	2,300	55,327	40%	2,300	45,200	18%	NPC
8	Qingyuan County	778	7,630	2,300	15,251	-100%	2,460	12,000	21%	

9	Quyang County	778	65,569	2,300	190,300	-190%	2,460	16,040	92%	NPC
10	Xiong County	778	24,193	2,300	38,386	-59%	2,400	34,500	10%	
11	Yi County	778	73,067	2,300	128,000	-75%	2,400	124,000	3%	NPC
12	Xushui County	778	33,474	2,300	56,900	-70%	2,900	2,461	96%	
	Total/average		**444,553**		**632,797**	**-42%**		**316,588**	**50%**	

PL= poverty line (CNY/year per capita); NPC= national-level poverty- stricken county
Note: The variations in the phase of 2006-2012 are not comparable due to sharp increased poverty line and inconsistent exercises in different counties in 2012.
Source: Baoding Government.

E. Public Health Improvement

6. The project health impact was analyzed during project preparation, which indicated that that the Project may reduce incidence of waterborne diseases and improve public health. The statistics show that the average incidences of waterborne diseases in the project counties have been declined by 24% from 1.47‰ in 2006 to 1.12‰ in 2016. (Table A8.5).

Table A8.5: Incidence of Waterborne Diseases in Project Area
Unit: ‰

No.	Project area	Incidence of waterborne diseases				
		2006	2012	2016	2006-2012	2012-2016
1	Dingxing County	1.80	1.30	1.20	0.50	0.10
2	Dingzhou City	1.32	1.03	1.00	0.29	0.03
3	Gaobeidian	2.00	1.80	1.60	0.20	0.20
4	Li County	2.00	1.65	1.60	0.35	0.05
5	Mancheng City	1.64	1.36	1.22	0.28	0.14
6	Shunping County	1.63	1.25	0.80	0.38	0.45
7	Tang County	2.20	1.50	1.30	0.70	0.20
8	Qingyuan County	—	1.80	1.80	—	0.00
9	Quyang County	0.75	0.84	0.80	-0.09	0.04
10	Xiong County	0.45	0.28	0.26	0.17	0.02
11	Yi County	0.60	0.40	0.40	0.20	0.00
12	Xushui County	1.83	1.53	1.50	0.30	0.03
	Average	**1.47**	**1.23**	**1.12**	**0.30**	**0.11**

— = Not available
Source: Baoding Government.

7. The solid waste management component was dropped from ADB financing but eventually completed by use of domestic fund. Closure of open-air ash storage of Baoding Cogeneration Plant has significantly improved the air quality of Baoding city and its surrounding areas and contributed to a reduced incidence of respiratory diseases. The statics show that the average incidences of respiratory diseases in the project counties have been declined by 27% from 1.27‰ in 2006 to 0.92‰ in 2016.

F. Job Creation

8. A total of 4,729 person-times labor force was employed during project construction stage, in which 23.3% went to women and 33% came from poor families (Table A8.6). Since the project entered operation stage, a total of 1,226 jobs have been generated, in which 363 jobs (29.6%) went to women and 349 jobs (28.5%) offered to poor people (Table A8.7). The job opportunities generated by project operation include 407 temporary jobs at average wage of CNY84 per day and 819 regular jobs at average salary of CNY1,980 per month.

Table A8.6: Labor Employment during Construction

No.	Subproject	Labors	in which, female labor	Percent of women	in which, poor labor	Percent of the poor
1	Liushi Town WWTP	110	18	16.4%	20	18.2%
2	Baigou Town WWTP	120	26	21.7%	38	31.7%
3	Li County WWTP	120	18	15.0%	24	20.0%
4	Xushui County WWTP	581	122	21.0%	186	32.0%
5	Xinxing Town WWTP	180	38	21.1%	56	31.1%
6	Yi County WWTP	273	41	15.0%	109	39.9%
7	Dingxing County WWTP	67	11	16.4%	14	20.9%
8	Mancheng City WWTP	62	16	25.8%	21	33.9%
9	Xiong County WWTP	120	36	30.0%	36	30.0%
10	Tang County WWTP	120	26	21.7%	36	30.0%
11	Yi County Water Supply	188	47	25.0%	141	75.0%
12	Dingzhou City Water Supply	115	23	20.0%	46	40.0%
13	Wangkuai- Xidayang Reservoir Connection	2,100	580	27.6%	740	35.2%
14	Qingyuan County WWTP II and sewer network	17	5	29.4%	5	29.4%
15	Li County WWTP II	156	16	10.3%	39	25.0%
16	Sludge Treatment Center of Baoding City Urban WWTP	200	20	10.0%	0	0.0%
17	Forestry Ecological Development Baiyangdian Watershed in Baoding	200	60	30.0%	50	25.0%
	Total	**4,729**	**1,103**	**23.3%**	**1,561**	**33.0%**

Sources: Baoding Project Management Office and Implementing Agencies.

Table A8.7: Jobs Generated during Operation

No.	Subproject	Employment	in which, women	Percent of women	in which, the poor	Percent of the poor
1	Liushi Town WWTP	21	6	28.6%	4	19.0%
2	Baigou Town WWTP	26	7	26.9%	5	19.2%
3	Li County WWTP	24	8	33.3%	7	29.2%
4	Xushui County WWTP	100	30	30.0%	32	32.0%
5	Xinxing Town WWTP	22	0	0.0%	6	27.3%
6	Yi County WWTP	26	6	23.1%	11	42.3%
7	Dingxing County WWTP	67	19	28.4%	17	25.4%

8	Mancheng City WWTP	62	21	33.9%	20	32.3%
9	Xiong County WWTP	24	8	33.3%	9	37.5%
10	Tang County WWTP	22	5	22.7%	7	31.8%
11	Yi County Water Supply	126	52	41.3%	57	45.2%
12	Dingzhou City Water Supply	115	69	60.0%	46	40.0%
13	Wangkuai- Xidayang Reservoir Connection	80	20	25.0%	32	40.0%
14	Qingyuan County WWTP II and sewer network	17	5	29.4%	7	41.2%
15	Li County WWTP II	156	47	30.1%	39	25.0%
16	Sludge Treatment Center of Baoding City Urban WWTP	200	30	15.0%	0	0.0%
17	Forestry Ecological Development Baiyangdian Watershed in Baoding	200	30	15.0%	50	25.0%
	Total	**1,226**	**363**	**29.6%**	**349**	**28.5%**

WWTP=wastewater treatment plant.
Sources: Baoding Project Management Office and Implementing Agencies.

G. Gender Development

9. Ecosystem degradation and environmental pollution contribute to gender inequities in income-generating opportunities and workload. Improvements in ecosystem management, particularly improved wastewater and water supply services have reduced burden on women. To maximize the project benefits, women have been given priority in the employment opportunities generated by the project. A total of 1,103 person-times female labor force was employed during project construction stage, accounting for 23.3% of total labor force employed by project construction; a total of 363 jobs have been provided to women since project operation, accounting for 29.6% of total jobs. Female employees enjoyed wages/salaries equivalent to those of male employees for similar jobs. Meanwhile, women have also received priority consideration for training and other capacity building activities under the project. A total of 801 person-times training was provided for women during project implementation, accounting for 29.3% of total training opportunities.

H. Consultation and Participation

10. Consultation and participation activities with stakeholders, beneficiaries, and project affected communities have been conducted during project preparation and implementation. Around 108 major publicity activities or invited site visits were conducted. A total of 4,727 people participated in those activities or visits for improved awareness and better understanding of WWTPs and water supply systems under the project. In addition, 16 public hearings were held to seek feedback on tariff adjustments and affordability and more than 300 participants attended.

I. Conclusions

11. The project has contributed to regional social development and poverty reduction, including (i) strengthened wastewater management and reduced water pollution to improve people's life quality in the project area, (ii) reduced incidence of waterborne diseases, which is one of major causes of rural absolute poverty in the project area, (iii) jobs creation during project construction and operation to generate income for local labors, and (iv) improvements in

ecosystem management have reduced burden on women, and women have been given priority in employment and training opportunities.