Document of The World Bank

Report No: ICR2980

IMPLEMENTATION COMPLETION AND RESULTS REPORT (IBRD-48520 TF-56948)

ON A

LOAN IN THE AMOUNT OF US\$ 147 MILLION

AND A

GLOBAL ENVIRONMENTAL FACILITY GRANT

IN THE AMOUNT OF US\$ 5 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

SECOND SHANDONG ENVIRONMENT PROJECT

June 19, 2014

China and Mongolia Sustainable Development Unit China and Mongolia Country Management Unit East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective January 1, 2014)

Currency Unit = Renminbi Yuan (RMB) US1.00 = US6.1RMB 1.00 = US0.16

FISCAL YEAR

[January 1 – December 31]

ABBREVIATIONS AND ACRONYMS

AP	Affected Persons
BOD	Biochemical Oxygen Demand
BOT	Build Oprerate and Transfer
COD	Chemical Oxygen Demand
CPS	Country Partnership Strategy
EA	Environmental Assessment
EDZ	Economic Development Zone
EIA	Environment Impact Assessment
EMP	Environment Management Plan
EOP	End of Project
EPB	Environment Protection Bureau
GEF	Global Environment Facility
GIS	Geographic Information System
GWSC	Gaomi Water Supply Company
IBRD	International Bank for Reconstruction and Development
ICB	International Competitive Bidding
IMO	International Maritime Organization
IMS	Information Management System
LME	Large Marine Ecosystems
MIS	Management Information System
MoF	Ministry of Finance
NPV	Net Present Value
NRW	Non Revenue Water
O&M	Operation and Maintenance
PAD	Project Appraisal Document
PDO	Project Development Objective
QAG	Quality Assurance Group
QALP	Quality Assessment of Lending Portfolio
QER	Quality at Entry Review
QWC	Qixia Wastewater Company
RAP	Resettlement Action Plan
RCR	Resettlement Completion Report
RP	Resettled Persons
RUEC	Rizhao Urban Environment Company
SEP	Shandong Environment Project
SEP II	Second Shandong Environment Project
SDS-SEA	Sustainable Development Strategy for the Seas of East Asia

SPG	Shandong Provincial Government
SPFB	Shandong Province Finance Bureau
SPPMO	Shandong Provincial Project Management Office
UNDP	United Nations Development Programme
WTP	Water Treatment Plant
WWGC	Weifeng Wastewater Group Company
WWTP	Wastewater Treatment Plant

Vice President:	Axel van Trotsenburg, EAPVP
Country Director:	Klaus Rohland, EACCF
Sector Manager:	Abhas Kumar Jha, EASIN
Project Team Leader:	Guangming Yan, EASCS
ICR Team Leader:	Guangming Yan, EASCS

CHINA Second Shandong Environment Project

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A. Basic Informatio	on			
Country:	China	Project Name:	SECOND SHANDONG ENVIRONMENT PROJECT	
Project ID:	P077752,P090377	L/C/TF Number(s):	IBRD-48520,TF-56948	
ICR Date:	06/19/2014	ICR Type:	Core ICR	
Lending Instrument:	SIL,SIL	Borrower:	PEOPLE'S REPUBLIC OF CHINA	
Original Total Commitment:	USD 147.00M, USD 5.00M	Disbursed Amount:	USD 136.09M, USD 5.00M	
Environmental Category: A Focal Area: I				
Implementing Agencies: Shandong Provincial Project Management Office Yantai Municipality				
Cofinanciers and Other External Partners: None				

DATA SHEET

B. Key Dates

SECOND SHANDONG ENVIRONMENT PROJECT - P077752					
Process	Date	Process	Original Date	Revised / Actual Date(s)	
Concept Review:	10/26/2005	Effectiveness:	06/07/2007	06/07/2007	
Appraisal:	04/17/2006	Restructuring(s):		01/22/2010	
Approval:	02/27/2007	Mid-term Review:	12/01/2009	03/30/2009	
		Closing:	12/31/2013	12/31/2013	

		Closing:	12/31/2013	12/31/2013
CN-GEF-Second	Shandong Enviro	nment Project - P09	00377	
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	10/26/2005	Effectiveness:		06/07/2007
Appraisal:	04/17/2006	Restructuring(s):		
Approval:	02/27/2007	Mid-term Review:	12/07/2009	03/30/2009
		Closing:	12/31/2013	12/31/2013

C. Ratings Summary			
C.1 Performance Rating by ICR			
Outcomes	Moderately Satisfactory		
GEO Outcomes	Moderately Satisfactory		
Risk to Development Outcome	Low or Negligible		
Risk to GEO Outcome	Low or Negligible		
Bank Performance	Satisfactory		
Borrower Performance Satisfactory			

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)				
Bank	Ratings	Borrower	Ratings	
Quality at Entry	Satisfactory	Government:	Satisfactory	
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory	
Overall Bank Performance	Satisfactory	Overall Borrower Performance	Satisfactory	

C.3 Quality at Entry and Implementation Performance Indicators				
SECOND SHANDONG ENVIRONMENT PROJECT - P077752				
Implementation PerformanceIndicatorsQAG Assessments (if any)Rating:				
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None	
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA)	None	
DO rating before Closing/Inactive status	Satisfactory			

CN-GEF-Second Shandong Environment Project - P090377					
Implementation Performance	Indicators	QAG Assessments (if any)	Rating:		
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA)	None		
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA)	None		
GEO rating before Closing/Inactive Status	Satisfactory				

D. Sector and Theme Codes SECOND SHANDONG ENVIRONMENT PROJECT - P077752				
Sector Code (as % of total Bank financing)				
Sanitation	77	79		
Solid waste management	9	9		
Sub-national government administration	1	1		
Water supply	13	11		
Theme Code (as % of total Bank financing)				
Pollution management and environmental health	67	70		
Water resource management	33	30		

CN-GEF-Second Shandong Environment Project - P090377				
	Original	Actual		
Sector Code (as % of total Bank financing)				
Sanitation	100	100		
Theme Code (as % of total Bank financing)				
City-wide Infrastructure and Service Delivery	33	33		
Pollution management and environmental health	67	67		

E. Bank Staff					
SECOND SHANDONG ENVIRONMENT PROJECT - P077752					
Positions	At ICR	At Approval			
Vice President:	Axel van Trotsenburg	James W. Adams			
Country Director:	Klaus Rohland	David R. Dollar			
Sector Manager:	Abhas Kumar Jha	Keshav Varma			
Project Team Leader:	Guangming Yan	Shenhua Wang			
ICR Team Leader:	Guangming Yan				
ICR Primary Author:	Guangming Yan				

CN-GEF-Second Shando	ng Environment Project - P090)377
Positions	At ICR	At Approval
Vice President:	Axel van Trotsenburg	James W. Adams
Country Director:	Klaus Rohland	David R. Dollar
Sector Manager:	Abhas Kumar Jha	Keshav Varma
Project Team Leader:	Guangming Yan	Shenhua Wang
ICR Team Leader:	Guangming Yan	
ICR Primary Author:	Guangming Yan	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)

The development objective is to improve the environmental conditions in participating municipalities/counties through a package of priority interventions, including upgrading and development of wastewater collection and treatment facilities, river embankment rehabilitation, solid waste management, water supply improvements, industrial pollution monitoring, and enhancement of the financial performance and efficiency of key urban environmental service agencies.

Revised Project Development Objectives (as approved by original approving authority)

Global Environment Objectives (from Project Appraisal Document)

The Global Environment Objective of the GEF activity is to reduce land-based pollution along the Yantai coast and the Bohai Sea through development of a pilot septic-tank management system in Yantai and dissemination of the Yantai model in Shandong Province and in other parts of China.

Revised Global Environment Objectives (as approved by original approving authority)

(a) PDO Indicator(s)

Indicator	Baseline Value	Baseline Value Original Target Values (from approval documents)		Actual Value Achieved at Completion or Target Years
Indicator 1 :	Citizens' satisfaction wit in participating cities/con	h wastewater, solid unties	l waste and wa	iter supply services
Value (quantitative or Qualitative)	66%	92%		97%
Date achieved	12/30/2005	12/31/2013		12/31/2013
Comments	Achieved. End-of-project	t survey indicates	citizen's satis	sfaction with water

(incl. % achievement)	supply, wastewater and solid waste services is 99%, 94% and 98%, respectively.				
Indicator 2 :	Improvement of water a	uality in cities/cou	nties from Cla	ss V to Class IV	
Value	<u>r</u> 1				
(quantitative or Qualitative)	0	148km		129.5km	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Indicator is problematic. Achievement is based on the assumption that river water quality improved in the sections of river courses where untreated wastewater flows were intercepted through project-financed interceptor sewers, but no methodology is provided				
Indicator 3 :	Percentage of population	connected to WW	/TPs		
Value (quantitative or Qualitative)	58%	85%		90.7%	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Achieved.				
Indicator 4 :	Percentage of treated eff	luent reuse			
Value (quantitative or Qualitative)	0.2%	21%		18.2%	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Achievement reported by SPPMO cannot be verified. The project did not finance any tertiary treatment plant (for effluent re-use), largley to replenish rivers for aesthetic purposes. As no definition on data collection and method was provided in the PAD, the accuracy of the data provided is questionable. Treated effluent was used only in Zaozhuang to replenish Dongsha River.				
Indicator 5 :	Rate of compliance of co	nnected industries	with the disch	arge standards.	
(quantitative or Qualitative)	60%	90%		98.2%	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Achieved.				
Indicator 6 :	Percentage of population	n provided with sol	id waste servic	es	
Value (quantitative or Qualitative)	84%	95%		95%	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Achieved. Solid waste so identified at project apprai	ervices now cover isal.	all the origina	al city beneficiaries	

(b) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years	
Indicator 1 :	Pollution discharge to Bohai Sea reduced (BOD ton/year)				
Value (quantitative or Qualitative)	0	1,700 806.4		806.4	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Achievement is based on the corrected number of septic tanks (1,056 rather 1,700) in the Pilot Area, and the verified volume of septic tanks (24 m3 instead of 44 m3). It can be concluded that BOD reduction was in line with original target if the number of septic tanks and sizes are corrected. (<i>Note: Measurement unit is tons/year; coincidentally, the baseline target is the same as the number of septic tanks assumed at appraisal</i>)				

(c) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years	
Indicator 1 :	Volume of wastewater tr	eated (million cub	oic m/year)		
Value (quantitative or Qualitative)	103	226		239.6	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Achieved The project financed only two WWTPs. However, the networks expanded under the project conveyed wastewater to the existing WWTPs in project cities and the two WWTPs constructed under the project				
Indicator 2 :	Rate of wastewater treated in the cities/counties (%)				
Value (quantitative or Qualitative)	65	80		91.9	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Exceeded.				
Indicator 3 :	Reduction of pollution lo	ad reaching the re	cipient rivers (ton COD/year)	
Value (quantitative or Qualitative)	9,400	28,000		37,125	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. %	Exceeded.				

achievement)					
Indicator 4 :	Municipal solid waste collected and transferred to sanitary landfill (tons/year)				
Value (quantitative or Qualitative)	293,460	450,775		351,660	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Final achievement is 78% 191,400 tons/yr in Rizhao overestimation of waste minimization facility in He	of target (comprisin). The lower achiev generation at ap eze.	ng 160,260 tons ement assumed opraisal, includ	yr in Heze. and to be due to an ling the waste	
Indicator 5 :	Population with access to	o water supply serv	vices (%)		
Value (quantitative or Qualitative)	84	97		99	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Achieved, measured for Gaomi only. Even though Huantai water investments were deleted, there was a significant expansion of the distribution networks in the fluoride-affected areas in Gaomi to serve over 340,000 people. (21km of transmission and 403km distribution mains installed under project).				
Indicator 6 :	Water production (a) Total Million cubic m/year; (b) Ground water /Total water production; (c) Liters/capital/day				
Value (quantitative or Qualitative)	(a) 46.72; (b) 85%; (c) 101	(a) 104.03; (b) 39%; (c) 127		(a) 70.72; (b) 0; (c) 100	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	Based on original project (including Huantai), total water production target was not achieved. Based on Gaomi only, the target was achieved. The zero value for end-of-project target for use of groundwater is the result of Gaomi action to terminate use of ground water in November 2012, formalized through an October 16, 2013 Provincial regulation prohibiting the use of groundwater in urban areas. Achievement of 100 lpcd represents average water use in urban and rural area, whereas 127 lpcd was for Goami urban area only.				
Indicator 7 :	Non-revenue water in %	of water produced	l (%)		
Value (quantitative or Qualitative)	25	20 10		10	
Date achieved	12/30/2005	12/31/2013		12/31/2013	
Comments (incl. % achievement)	The indicator is not relevant to project activities. Achievement claimed cannot be verified as the project did not finance any non-revenue water (NRW) reduction activities.				
Indicator 8 :	Cost recovery ratio of (a)) wastewater mana	gement operat	ions; (b) solid	
Value	(a) 2.5; (b) 1.0; (c) 1.6	(a) 1.2; (b)1.4; (c)	ippiy managen	(a)	

(quantitative or Qualitative)		1.2		0.46/1.07/1.5; (b)0.55(c) 1.23		
Date achieved	12/30/2013	12/31/2013		12/31/2013		
Comments (incl. % achievement)	Baseline data appears to be for the entire sector(s), while the targets appear to refer to the performance of utility companies funded under the project with covenanted targets. As some of the utility companies have been provided funds other than revenue to meet operating costs, the cost recovery ratio in some instances result in a value below 1.0. The cost recovery ratio for Weihai, Yantai and Gaomi wastewater companies is 0.46, 1.07 and 1.5 respectively, for Rizaho solid waste company is 0.55 and for Gaomi water is 1.23.					
Indicator 9 :	Numbers of installation of online automatic monitoring stations at industrial discharge sites					
Value (quantitative or Qualitative)	366	800		810		
Date achieved	12/30/2005	12/31/2013		12/31/2013		
Comments (incl. % achievement)	Achieved, representing the number of industries with online monitoring stations with a direct connection to the Provincial Environmental Protection Bureau monitoring network Public disclosure of the status of compliance of major pollution					
indicator iv:	enterprises					
Value (quantitative or Qualitative)	Annual Report	Monthly Report		Real time online monitoring		
Date achieved	12/30/2005	12/31/2013		12/31/2013		
Comments (incl. % achievement)	Complied. SPEPB publicly discloses online automatic monitoring information on its website (http://58.56.98.78:8801/webgis_wry/webgis/#) for the major industries.					

Note: The source of all target data, indicated against the indicators in the table above, was provided by the Shandong Province Project Management Office, which monitored performance throughout project, implementation and reported in the borrower's semi-annual progress reports.

-						
No.	No. Date ISR	Date ISR DO	GEO	IP	Actual Disbursements (USD millions)	
					Project 1	Project 2
1	03/21/2008	S	S	S	28.19	0.50
2	06/25/2009	S	S	S	65.48	1.07
3	06/26/2010	S	S	S	78.37	1.78
4	03/06/2011	S	MS	S	86.89	3.31
5	03/03/2012	S	MS	S	110.89	4.09
6	11/26/2012	S	MS	S	118.58	4.29
7	06/07/2013	S	MS	S	119.77	4.29
8	12/16/2013	S	S	S	128.35	4.63

G. Ratings of Project Performance in ISRs

H. Restructuring (if any)

Restructuring	Board A	Approved	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions		Reason for Restructuring & Key	
Date(s)	PDO Change	GEO Change	DO	GEO	IP	Project1	Project 2	Changes Made
01/22/2010	N		S		S	74.94		To substitute a city for one that dropped out, and correct a drafting error in the legal agreement: (i) Zhoucun was substituted for Huantai that dropped out of the project; and (ii) the disbursement % for civil works for Zaozhuang was corrected to 100%.

I. Disbursement Profile





P090377



1. Project Context, Project Development and Global Environment Objectives, and Design

1.1 Context at Appraisal

At the time of project appraisal, Shandong Province had a population of 92 million, with 40% living in urban areas. It has a 3,000-km coastline with the Bohai and Yellow Seas, both of which drain a major part of the province. Shandong Province was one of the fastest growing provinces in China in 2005. Infrastructure deficiencies in Shandong's fast growing smaller cities included: (a) poor quality and intermittent drinking water supply, due to inadequate water resources and unsafe fluoride-affected ground water; (b) lack of proper solid waste management systems; (c) recurrent flooding and waterlogging due to inadequate protection; and (d) poor environmental conditions, including insufficient drainage and wastewater treatment and serious pollution of rivers, and pollution discharges the Bohai Sea. Environmental services managed by municipal departments were supply-driven, inefficient and lacked adequate cost recovery.

Shandong Provincial Government (SPG) policies called for: accelerated restoration of ground water resources and surface resources through enhancing the treatment and water re-use; increased collection and treatment of wastewater to achieve 65 percent of treatment in municipal cities; and development adequate solid waste treatment and disposal facilities to handle 70% of solid wastes from municipalities. Shandong was also a signatory to the Memorandum of Agreement initiated by the United Nations Development Program/Global Environment Facility/International Maritime Organization (UNDP/GEF/IMO) Regional Program to manage the pollution of rivers and reduce land-based discharges into the Bohai Sea.

Rationale for Bank Involvement. The project was consistent with the Provincial Government's 11th Five Year Plan focus in addressing increased wastewater collection and treatment, reuse of treated effluent, protection of ground water resources, and supported Government priorities for sustainable improvement of environmental conditions through investments for improved water supply, wastewater, solid waste management, and reduced land-based pollution discharges to the Bohai Sea, with a GEF-supported pilot to demonstrate a lower cost technology to manage the pervasive pollution discharges from non-functioning septic tanks. The project provided the opportunity for the World Bank to continue the long association with the Province, and share its global experience for the new initiatives addressed in the project.

1.2 Original Project Development Objectives (PDO) and Key Indicators (as approved)

The development objective was to improve the environmental conditions in participating municipalities/counties through a package of priority interventions, including upgrading and development of wastewater collection and treatment facilities, river embankment rehabilitation, solid waste management, water supply improvements, industrial pollution monitoring, and enhancement of the financial performance and efficiency of key urban environmental service agencies. Key indicators, as approved, are set out in the Data Sheet above.

1.3 Original Global Environment Objectives (GEO) and Key Indicators (as approved)

The Global Environment Objective of the GEF-supported component was to reduce land-based pollution along the Yantai coast and the Bohai Sea through development of a pilot septic-tank management system in Yantai, and dissemination of the Yantai model in Shandong Province and

in other parts of China. The key GEO indicator, as approved, was 'pollution discharge to Bohai Sea reduced (BOD ton/year)'.

1.4 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification. Not applicable.

1.5 Revised GEO (as approved by original approving authority) and Key Indicators, and reasons/justification. Not applicable.

1.6 Main Beneficiaries.

The primary beneficiaries of the project were originally estimated at 3,500,000. At the end of the project, the total beneficiaries amounted to 4,169,000, including 340,000 people in fluoride-affected areas, about 300,000 beneficiaries under the GEF component, and participating government agencies, i.e., Shandong Provincial Finance Bureau, municipalities of Heze, Rizhao, Gaomi, Yantai, Weihai, Weifeng, Zhoucun, Qixia and Zaozhuang, and the Provincial Environmental Protection Bureau (EPB).

1.7 Original Components (as approved);

The original project components included: (i) wastewater collection networks and treatment facilities in Gaomi, Huantai, Qixia, Weifang, Weihai, Yantai and Zaozhuang, with associated river embankment rehabilitation in Qixia, Weifang and Zaozhuang, and a GEF pilot septic tank management system in Yantai, including a fleet of septic tank emptying vehicles, and regulations for septic tank management; (ii) solid waste management in Heze and Rizhao; (iii) water supply improvements in Gaomi and Huantai; and (iv) institutional development and capacity building for utility companies, Environmental Protection Bureau (EPB), and decision-makers. A detailed component description is available in the Project Appraisal Document (PAD).

1.8 Revised Components

Huantai (Zibo Municipality), which had water supply and wastewater investment, dropped out of the project in 2010 yielding Loan savings of US\$19.2 million. Zhoucun district of the same municipality was substituted for Huantai. The new subcomponent, with a total cost of US\$ 30 million financed 131 km of wastewater collection networks, and 23.2 km of km of river embankment improvements to control flooding. The collection networks also conveyed wastewater from the neighboring district upstream (Zouping), under a formal cost sharing agreement with Zhoucun, promoting inter-municipal cooperation.

1.9 Other significant changes

Project Restructuring. The Loan Agreement was amended in January 2010 to: (i) delete Huantai and substitute Zhoucun as described above; and (ii) correct a drafting error in the legal agreement, to increase the civil works disbursement percentage for Zaozhuang from 70% to 100%.

Baseline Data of the Pilot Area of the GEF Component. The original number and estimated volumes of septic tanks in the pilot area in Yantai were found to be incorrect, when tank emptying commenced. The number of septic tanks was found to be 1,056, instead of 1,700, and the average volume of a septic tank was found to be about 24 m3, instead of the figure of 44 m3 estimated during the baseline survey. These discoveries impacted on the performance targets for

the subcomponent. During implementation, the Yantai Septic Tank Management Office expanded the number of septic tanks covered by including an additional 520 septic tanks from outside the pilot area.

Cancellation of Loan Savings. The original plan was to pre-treat wastewater intercepted from Weifang city in constructed wetlands downstream along the Bailang River. Due to the Government mandate that required new municipal WWTPs be upgraded to Class 1A discharge standards by 2015, the Weifeng Municipal Government decided to delete the pre-treatment and construct a new WWTP under a BOT contract. Up to Loan closure, the Weifeng Municipal Government and SPG was not able to formulate alternative proposals to utilize Loan savings, resulting in a total Loan saving of about US\$ 11 million, which was canceled at Loan closure.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Project Preparation

Soundness of Background Analysis. The Bank task team ensured that adequate background information on national policies and guidelines, past experience of similar projects in China, and specific background conditions in the Province, Bank policies and practices, and lessons learned were reviewed and analyzed early in the preparation. The terms of reference agreed for preparation of the project feasibility studies (by the client) also required that collection and analysis of the comprehensive background information.

Consistency with Provincial Strategy and Goals. Project preparation was aligned with the Shandong Province's environmental management strategy that included: (i) accelerated restoration of the ground resources; improved river water quality; discontinuation of ground water use by industries; (ii) increased collection and treatment of wastewater to reach 65% in municipalities; re-use of the treated effluent; (iii) improved efficiency, and financial viability of wastewater services in line with central government policy directives sustainability of sector agencies.

Incorporation of Lessons Learned. Project design incorporated lessons learned from previous operations, e.g., lack of borrower ownership, insufficient investments in environmental infrastructure, need for financial reforms, over design, etc.

Design and Quality at Entry

Project Development Objectives. The PDO was consistent with the Province's commitment to environmental improvement and sustainability objectives, and alleviating infrastructure deficiencies in cities that were urbanizing at a rapid pace. The GEO was also consistent with the Province's commitment to the UNDP/GEF/IMO Regional Program for protect large marine ecosystems (LME) in the Bohai Sea.

Project Design. Project design was consistent with the PDO, and addressed Borrower's priorities including: (i) increased wastewater collection and treatment, improved river water quality, reduced land-based pollution discharges to the Bohai Sea, and enhanced wastewater management by industries; (ii) safe drinking water quality, including limitations on ground water abstraction;

(iii) improved solid waste management including waste separation, recycling and eco-friendly disposal; and (iv) improved financial performance of utility companies.

Risk Assessment and Mitigation Measures. The overall risk of the project and components were correctly assessed as 'modest'. The risks of delay in tariff setting and low user fees for wastewater and solid waste management services were assessed as 'substantial' at appraisal, which was somewhat overly conservative because, at the time of project appraisal, Shandong Province had formulated guidelines for minimum municipal wastewater and solid waste tariffs.

The mitigation measure adopted for the delayed revision of utility tariffs was the definition of total revenue as the 'total operating revenue and non-operating income' in the Project Agreement. This measure was realistic and appropriate, specifically, in the early years of development of the wastewater sector in China. The mitigation measure adopted for solid waste tariff reform was a covenant requiring a study, recommendations and implementation of a tariff, which was appropriate in a climate where levy of direct solid waste charges is relatively new in China.

Performance Indicators. As discussed in Section 2.3, the design of several indicators was weak in their definition, link to project activities, monitoring methods and targets.

Adequacy of Government Commitment. Through past Bank-financed projects, Shandong Province had demonstrated its commitment to sound environmental management. The Province had formulated policies and guidelines to support sustainable operations of its utility agencies, including minimum municipal tariffs for water supply, wastewater and solid waste services. The Province had already signed Memorandum of Agreement of the UNDP/GEF/IMO Regional Program committing to reduction of land-based pollution to the Bohai Sea. and the Yellow Sea. The Province also designated the highly experienced Shanding Provincial Project Management Office (SPPMO) to manage project preparation, coordinate project activities, including close attention to social and environmental safeguards.

QAG Quality at Entry Rating. A quality at entry review was not carried out by the Quality Assurance Group (QAG) at project appraisal. However, a Quality Assessment of Lending Portfolio (QALP) conducted in June 2010, judged the overall QAE as satisfactory, and this review agrees with the assessment.

2.2 Implementation

Factors that Contributed to Successful Implementation. All original project components were completed by the original loan closing date of December 31, 2013, except for the pre-treatment facility at Weifeng, and the Huantai subcomponent, which was deleted. The original planned project outputs and actual achievements are described in detail in Annex 2. About US\$ 136.7 million of the Loan and US 5.00 million of the GEF Grant were disbursed, and all covenants were complied with.

Factors that contributed to the successful implementation of the project, on time, and within budget, include: (i) strong SPG ownership of the project; (ii) environmental management policies and framework, and experience in implementing Bank-financed projects; (iii) problem-free procurement performance; (iv) incorporation of SPG priorities, social and environmental targets, realistic implementation period, and achievable project covenants; (v) readiness for implementation, with detailed designs and bid documents completed for the first years' implementation, that enabled early completion of the Weihai, Gaomi, Yantai, Heze and Rizhao components in 2010 and 2011, more than two years before the Loan closing date; (vi) the

flexibility shown by the Bank to accommodate Borrower's requests for design changes, to substitute new components in lieu of a deletion, as in the case of Huantai; (vii) having the Task Team Leader, procurement, financial management and safeguard specialists located in the country office to facilitate early resolution of issues; and (viii) the determination of Yantai Municipality to formulate and implement the GEF-supported pilot septic tank management system with necessary adjustments and establishing a permanent Office for Septic Tank Management, despite the difficulties experienced with: incorrect baseline data; procurement and registration of foreign-manufactured septic tank emptying vehicles; and challenges of emptying septic with highly consolidated settled solids.

Loan Savings from the Weifeng Component. As mentioned in Section 1.9 above, with the Government requirement that all new municipal WWTPs be upgraded to Class 1A discharge standard, Weifeng decided not to implement the pretreatment facility agreed at appraisal, but constructed a 100,000 m3/day WWTP in mid-2013, under a BOT arrangement, to treat the intercepted wastewater from Weifeng city. This decision resulted in a Loan saving of about US\$ 11 million. Shandong was not able to provide alternative proposals for the use of the savings which were then canceled at closure.

Changes in Qixia Component. The original plan to collect and treat wastewater from the Qixia economic development zone (EDZ) did not materialize because sufficient wastewater was not generated from the EDZ to utilize the 20,000 m3/d capacity of the WWTP, due to a change in policy on the type of industries permitted in the EDZ. The WWTP was not operating at Loan closure. However, Qixia Municipality plans to fully utilize the plant capacity through transfer of wastewater from its plant in the city. Accordingly, Qixia financed a new 30 km wastewater trunk main, which is currently 90% completed, and scheduled for completion by mid-2014.

Mid-term Review. During the mid-term review, held in March/April 2009, the Bank agreed to substitute Huantai with Zhoucun, a district in the same municipality, and recognized the need to correct a drafting error in the disbursement percentage for civil works in Zaozhuang. This led to the restructuring of the project in January 2010.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

Design. Several indicators had problems of unclear linkage to project activities, definition monitoring methods, and targets. Specific cases were: (i) improvement of river water quality improvement (from Class V to Class IV) was indicated in kilometers with no explanation of how to measure; (ii) inclusion of a performance indicator for non revenue water even though the project did not finance this activity; (iii) misalignment of the cost recovery ratio indicator (Indicator 8 in datasheet section F); and (iv) incorrect baseline data on the number and volume of septic tanks for the GEF component indicator, which inflated the indicator targets for pollution discharge to the Bohai Sea.

More accurate measurement of improvement of environmental conditions would have been possible had the Results Framework set baseline indicators by sector and by municipality. However, the PAD did include mid-term review (2009) targets, which were helpful to assess project progress.

Monitoring. The SPPMO collated and reported monitoring results covering the full scope of the project, which were satisfactory for their reliability, quality and on-time reporting.

Utilization. Monitoring and evaluation information was used by the project cities, the SPPMO and the Bank to support decisions on change to components. The SPPMO brought to the attention of the Bank the difficulties to interpret and measure some indicators. The specific case of inaccuracies in the baseline data on the number and volume of septic tanks in Yantai came to light only after the septic tank emptying equipment was procured and deployed. Proposals to revise problematic indicators, developed after the mid-term review, were not acted upon because it was too late in the project implementation. The EPB utilized the results of online monitoring to apply sanctions on industries to ensure compliance, including imposition of fines and suspension of operations.

2.4 Safeguard and Fiduciary Compliance

The project triggered three of the Bank's safeguards policies as elaborated below.

Social Safeguards. The project triggered the Bank's operational policy OP 4.12 on Involuntary Resettlement and the safeguard screening category was S2. Resettlement Action Plans were prepared, in consultation with affected persons (AP), and publicly disclosed, complying with World Bank policies and procedures. Resettlement activities were carried out satisfactorily, except in Qixia and Zaozhuang, where implementation delays occurred due to the slow pace of land acquisition and resettlement. External monitoring of safeguard implementation was carried out by the Shandong Construction Development and Research Institute, in accordance with the requirements of the legal agreements. Annual safeguard compliance reports prepared by the project implementing units were submitted regularly. All resettlement was done in accordance with Chinese regulations and Bank policies. The Resettlement Completion Report (RCR) indicates that resettlement implementation was successfully completed with the full participation of the affected persons, and their standards of living improved, and no resettlement issues remained at project closure. More details are provided in Annex 8 (Resettlement Implementation).

Environmental Safeguards. The project was designated as Category A for the purposes of the Bank's Operational Policy 4.01 on Environmental Assessment. The EA and EMP were prepared according to national policies and regulations and the Bank safeguard policies. The EMP was implemented satisfactorily by the SPPMO. As part of the January 2010 restructuring, the Bank conducted an environmental survey of the newly proposed wastewater collection subcomponent in Zhoucun, and confirmed the subcomponent would be classified as Category "B" due its nature and potential impacts. An additional EA and EMP were prepared by the borrower and reviewed by Bank. The final drafts were disclosed locally and in the Infoshop on December 10, 2009.

Dam Safety. The project also triggered the Bank's operational policy on Safety of Dams (OP 4.37). Four existing dams/reservoirs, Bailang River Reservoir, Xiashan Reservoir, Wangwu Reservoir and Anli Reservoir Bailang River Reservoir, Xiashan Reservoir, Wangwu Reservoir and Anli Reservoir, were subjected dam safety requirements. Remedial works of Wangwu Reservoir were satisfactorily completed during 2000 to 2002, and accepted. Remedial works for Bailang River Reservoir were also completed, Remedial works for Anli Reservoir were completed in August, 2011, and the remedial works of the spillway, spillway bridge, and embankment road, completed in 2011 were accepted in May 2012. In summary, dam and reservoir safety requirements were fully complied with.

Procurement. Procurement activities were carried out satisfactorily by all project cities in full compliance with Bank procurement procedures. No particular issues were noted.

Financial Management. The financial management performance, including accounting, budgeting, internal control, funds flow, financial reporting and auditing, was satisfactory. Audit compliance was also satisfactory, without any audit qualifications.

2.5 Post-completion Operation/Next Phase

All project companies are expected to continue using the following reforms introduced under the project: (i) preparation of annual budgets for adequate O&M of the facilities; (ii) preparation of annual financial statements, including projections to facilitate decisions on annual budget allocations including necessary subsidies and/or tariff increases; (iii) continuation of the training plans; and (iv) SPG will continue its policy to promote financial autonomy of wastewater companies.

Gaomi Water Supply Company. The Gaomi Municipality will review the current institutional arrangements for rationalizing the provision of water supply and wastewater services, with the aim of improving the efficiency and cost effectiveness of service delivery.

Solid Waste Companies in Heze and Rizhao. These companies plan to maintain the levels of service, and improve collection to keep cities clean. They will be funded through government budgets, including the cost of operation of the landfills.

Yantai Septic Tank Management. The Yantai Municipal Government will: (i) provide adequate budget to continue the septic tank management program; (ii) make plans to expand the septic tank management program citywide in a phased manner; (iii) incorporate the cost of septic tank management in the wastewater tariff, in the next wastewater tariff revision; and (iv) review the city's building code requirement of a septic tank for each building, irrespective of whether sewers are available.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Objectives. The PDOs were fully consistent with the national government and Shandong Province policies for reducing domestic and industrial pollution discharges, improving water quality in the major rivers, protecting large marine ecosystems, improving environmental management in major cities, improving wastewater treatment rates, improving water supply coverage, and increasing water re-use. The objectives were also consistent with the Bank's Country Partnership Strategy (CPS) of FY2006-FY2010 (Report 46896-CN) with respect to (i) managing resource scarcity and environmental challenges, especially related to water pollution reduction and conservation and observing international environmental conventions; and (ii) promoting balanced urbanization and improving the quality of urban life. The PDO remained well aligned with the new CPS (Report #67566-CN) of FY2013-FY2016. It also remained relevant to the priorities for Shandong Province at the end of the project.

Design. Project design, including the blended GEF, correctly identified the crucial issues, and incorporated appropriate and necessary focused interventions for: (i) improved wastewater treatment rate, and water supply coverage; (ii) effective measures for septic tank management to remove a major source of land-based pollution discharge to the Bohai Sea; (iii) solid waste separation, recycling, composting and sanitary disposal; (iv) water supply in fluoride-affected

areas (v) sustainability and realistic cost recovery for water supply and wastewater services; (vi) expansion of online monitoring of industries; and (vii) utility institutional and financial reforms.

Implementation. The project design and implementation arrangements, and the GEF support for project implementation, as described in the Section 2.1 and Section 2.2 above, contributed to achievement of the project objectives.

3.2 Achievement of Project Development Objectives and Global Environment Objectives

Project Development Objective. The projects' environmental investments in the nine mediumsized municipalities supported improvements in wastewater services (100,000 m3/d treatment capacity and 370 km of collection sewers), water supply services (105,000 m3/d treatment capacity and 432 km of distribution networks), and solid waste services (waste separation plant, collection and landfill equipment, and 780 tons/day of landfill capacity), that resulted in substantial environmental improvements and contributed to improved livability in their jurisdictions. The project satisfactorily achieved its objectives, as most performance targets were either met or exceeded. The rate of citizen satisfaction with services in these three sectors, which started at an average of 66%, reached on average 93% by project closing, slightly exceeding the end-of-project target of 92%.

Wastewater Collection and Treatment and River Embankment Works. Outcome indicators for the wastewater component include: (i) volume of wastewater treated reached 239.6 million m3/year versus the end-of-project target of 226 million m3/year; (ii) the rate of wastewater treated in the cities/counties reached 91.9% exceeding the end-of-project target of 80%; (iii) the reduction in COD pollution load reaching the recipient rivers was 37,125 tons/year at end-of-project, compared to only 28,000 tons/year at project start; and (iv) was achievement in "improvement of water quality in the cities/counties from Class V to Class IV", was 129.5 km, compared to the end-of-project target of 148 km (problems with this indicator are discussed in Section 2.3). As seen through these indicators, the works have improved wastewater collection and treatment, and improved water quality of river systems, which contributed to a better environment in project towns. Overall citizen satisfaction with wastewater services stood at 94.8% at project's end.

Water Supply. Outcome indicators for the water supply component include: (i) the percentage of the population with access to improved water supply rose from 84% to 99%, exceeding the target of 97%; (ii) groundwater abstraction, compared to total water production, dropped from 85% at project start to zero at the end-of-project, following provincial regulations prohibiting the use of groundwater in urban areas; and over 730,000 people received improved water supply, including 340,000 people in fluoride-affected areas. The citizen satisfaction level in the final survey was 99% for water supply.

Solid Waste Management. Indicators of success of this component include: (i) municipal solid waste collected and transferred to a sanitary landfill was 293,460 tons/year at appraisal, and reached 351,660 tons/year compared to end-of-project target of 450,775 tons/year, due to an overestimation of future waste generation at appraisal; (ii) the percentage of population provided with solid waste services rose from 84% at appraisal to 99% at project end, meeting the end of project target; and (iii) cleaner cities with waste disposal at landfills. The citizen satisfaction with solid waste services reached 98%.

The financial performance of water supply, wastewater and solid waste companies improved, and they were in compliance with the financial covenants in their subsidiary loan agreements. This achievement was possible through a provision in the legal agreements that defined net revenues to include operating revenue and non-operating income. This provision was particularly appropriate for the relatively new wastewater and solid waste sectors, which are considered still under consolidation.

The capacity of the Provincial Environmental Protection Bureau, for industrial pollution control, was enhanced with expansion of the online monitoring of industries, and the publication of real time monitoring data on its website. It also resulted in increased compliance by industries.

GEO. The outcomes of the GEF intervention are: (i) reduction of pollution discharges to the Bohai Sea; (ii) introduction of a lower cost technology for septic tank management; (iii) introduction of the culture of regular periodic emptying of septic tanks; (iv) establishment of permanent institutional arrangements for septic tank management in Yantai, including development of a GIS-based information management system to track and monitor tanker routes, operational data, and the frequency of emptying; (v) dissemination of the experience within China and abroad; and (vi) commencement of a discussion on septic tank design, and changes to building code requirements for septic tanks. The above achievements were possible, with adjustments made to the monitoring targets to be consistent with the correct baseline data relating to the number and volumes of septic tanks in the pilot area. On the basis of the corrected baseline data, the performance targets for BOD reduction are deemed achieved.

Contributions to Meeting Core Sector Indicators. The project contributed to meeting the Core Sector Indicators as illustrated in the table below:

Indicator	Actual Achieved
Voume(mass) of COD pollution load reduction	37,125 t
achieved under the project	
Number of people in urban areas provided with	730,000
access to Improved Water Sources under the	
project	
Number of water utilities that the project is	1
supporting	
Total Number of project beneficiaries	4,169,000

3.3 Efficiency Rating: Satisfactory

Economic Analysis was carried out, at appraisal, for all wastewater, water and solid waste components. A Cost Effective Analysis guided the selection of priority interventions for the project using least cost methodology. Alternative project designs were identified and evaluated in order to select the least cost solutions for the project. The least cost methodology was applied for all project components and included a financial comparison of the alternatives based on capital investments and cost of O&M. Cost Benefit of the components was quantified by analyzing NPV and EIRR. The results showed returns above 15%.

End of project analysis was carried out to assess the economic return. An incremental approach was used, determining plusses and minuses to the economic return as a result of project changes during implementation. Overall, the analysis shows that project changes during implementation

did not have any significant effect on the economic return, and that all components maintained a satisfactory economic rate of return. Details on the economic analysis are found in Annex 3.

Financial Analysis was carried out at appraisal to determine cost recovery tariffs. The Financial Internal Rate of Return (FIRR) analysis was not carried out, as most of the components were non-revenue-generating. Analysis of the tariff increases showed affordability by low-income households.

During implementation, non-commercial wastewater and solid waste companies were in compliance with the cost recovery ratio covenant. The companies met cash outgoings with the help of Government subsidies. Water supply operations of GWSC complied with the cost recovery ratio covenant until 2011, but will need revision of the water tariff to remain in compliance in the future. GWSC was, however, able to meet cash outgoings. The current tariff level did not allow the water supply operations to be in compliance with the covenant on capital investment needs coverage. The covenanted debt service ratio did not apply to any of the project companies, as they all avoided incurring additional debt.

Apart from Gaomi water tariffs revisions, project cities were only able to revise tariffs to a limited extent since project start. This is consistent with other cities in China where the wastewater tariff, in general, solely covers the direct expenses such as cost of O&M. Comparison of the utility tariff revisions with the overall economic development indicates that these were fully affordable to the beneficiary population. Moreover, the fiscal capacity of the participating municipalities improved during the project as municipal revenue increased significantly since 2005. Additional details on financial analysis are provided in Annex 3.

3.4 Justification of Overall Outcome Rating Rating: Moderately Satisfactory

The **PDO** was relevant at the project start, and remained relevant through to the end of the project. The project development outcomes were achieved, as illustrated by the performance indicators, where many of the 'end of project' targets were exceeded. However, several indicators had problems of unclear linkage to the project activities, definition and monitoring method, causing difficulties in verifying achievements. Efficiency of the investments is satisfactory, per the economic analysis presented. Therefore, the overall outcome rating for the PDO was considered Moderately Satisfactory.

The **GEO** remained relevant throughout implementation because the GEF-supported initiative removed one of the key sources of pollution discharges to the Bohai Sea. Through the dissemination efforts of the component, Yantai city officials and other stakeholders in China and regionally, shared the experience of an efficient low cost technology for septic tank management. However, as mentioned above, the issues with the baseline data on septic tanks inflated the targets for pollution discharge to the Bohai Sea, causing partial achievement of project target. Therefore, the overall outcome rating for the GEO was considered Moderately Satisfactory.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

The project had no specific interventions on poverty reduction, and gender issues. However, it did improve the living environment for the broader population in the project cities, including women and the poor who benefited from improved water supply, better sanitation services, and improved opportunities for income enhancement from the extensive construction activities. The project is aligned with World Bank Group's twin goals of ending extreme poverty and promoting shared prosperity among the population living in small and medium cities and lagging areas of Shandong Province.

(b) Institutional Change/Strengthening

The Yantai Septic Tank Management Office, established as part of the project, will gradually expand its emptying activities to cover much of the 19,000 septic tanks in the city.

(c) Other Unintended Outcomes and Impacts (positive or negative)

(a) Unintended Financial Benefit to Qixia Municipality. The inability to utilize the completed Qixia WWTP has resulted in an unintended outcome that will benefit Qixia city. This change has helped accelerate Qixia's plan to relocate the existing WWTP within the city, and realize the opportunity cost of the land currently occupied by it.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

Not applicable

4. Assessment of Risk to Development Outcome and Global Environment Outcome Rating: Low

The risk to development outcomes is low because the Shandong Province environmental management strategy is very much in sync with the PDO. Based on the track record, SPG is very likely to continue its commitment to enhance environmental management in the Province, and improve quality of life to sustain economic development and growth. SPG has formulated minimum tariffs for municipal water supply, wastewater and solid waste services to promote sustainability, ensured tariff revisions about every three years, and has supported increased autonomy in utility companies.

The completed WWTP in Qixia was not operating at project closure due to low flows from the EDZ, which will delay benefits. However, this WWTP will be fully utilized by mid-2014 when the pipeline, under construction, is completed to transfer wastewater from the existing WWTP in Qixia city.

The risk to project investments from climate change is low. Risks to some investments, particularly, the sea outfall in Yantai, is low, because the outfall pipeline is secured at the sea bed, and the incidences of typhoons and earthquakes in this area are low. The risks to operation of WWTPs from potential flooding will be temporary, hence considered low,

The risk that the landfill in Heze will have a life shortened life, though possible, is small. Should the volume of waste transferred to the landfill continue to increase, the operation of the waste separation facility can be enhanced to minimize inorganic waste conveyed to the landfill. In addition, early planning could be done to expand the landfill. The risk to the GEO is low because the Yantai Municipality has established a dedicated permanent office (Septic Tank Management Office), with staff and annual budget allocations, and plans to expand the operation citywide. The septic tank management system is also likely to be replicated in other municipalities in China.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry Rating: Satisfactory

The Bank comprised a sound skill mix of technical staff with very senior environmental and sanitary engineers, a senior financial management specialist, a senior financial analyst, senior social and environmental safeguards specialists, and was headed by a Chinese speaking senior urban specialist. Many key team members were based in Beijing and/or were Chinese speaking, which facilitated communications. The team prepared the project in about one and a half years from Concept Review in October 2005 to Board approval in February 2007, at a cost of US\$502,000.

The PDO and GEO were highly relevant to address the critical issues in Borrower's environmental management strategy and needs. They also conformed to the CPS goals and the Bank's larger objective of protecting large marine ecosystems. Project design (as described above) and implementation arrangements were appropriate for the Borrower's capacity level and satisfactory to achieve the outcomes at the least cost. Project design had realistic goals for sector development, particularly in the wastewater sector where a phased development approach was adopted for cost recovery. Bank performance in ensuring quality at entry is rated 'satisfactory', despite weaknesses in the design of performance indicators.

As indicated earlier, the project was reviewed by QAG under the 2010 Quality Assessment of Lending Portfolio. The ratings from this assessment were: (i) *Objectives*: likely to achieve project objectives; (ii) *Project Design*: Satisfactory; (iii) Results Framework: Moderately Satisfactory; (iv) *Government Commitment*: Highly Satisfactory; (v) *Risk Assessment*: Satisfactory; (vi) *Readiness for Implementation*: Highly Satisfactory; (vii) *Effectiveness of Bank Management During Preparation/Appraisal*: Satisfactory. This review agrees with QAG's ratings.

(b) Quality of Supervision Rating: Satisfactory

Formal Bank supervision of the project twice a year, and the location of the task team leader and all fiduciary and safeguard staff in the country office, helped maintain frequent contact and support to the Borrower, contributed to satisfactory supervision. The Bank's team represented a variety of skills adequate to supervise the project and benefited from expert guidance from Headquarters particularly on the septic tank management component. The average annual supervision budget of US\$60,000 was sufficient to monitor progress and provide sufficient guidance. (See annex 4 for details.)

The Bank was responsive and engaged actively with the Borrower during project implementation. When Huantai County was deleted from the project, Zhoucun district was selected and included into the project in a timely manner which ensured the designed project outcome. A number of recommendations for utilizing the loan savings under the Weifang component were provided to the client, even though these attempts failed due to the disagreement between relevant stakeholders within Shandong Province. The Bank moreover proposed changes to several results indicators with weak linkages with the project but did not manage to revise these accordingly partly due to the failed attempt to carry out the restructuring.

The Bank worked closely with Yantai Municipality to accelerate the implementation of the GEFsupported septic tank management component, which made relatively slow progress initially, which explains the 'moderately satisfactory' rating until late 2012. Generally speaking, the team identified and addressed implementation issues in a timely manner.

The QALP review of 2010 rated the Bank's supervision effort as satisfactory, with a highly satisfactory rating for adequacy of staffing arrangements, skill mix and staff continuity and for oversight of social aspects. The social specialist joined all formal supervision missions and carefully supervised implementation of the RAP as reflected in mission aide-memoires and the excellent resettlement outcomes.

(c) Justification of Rating for Overall Bank Performance Rating: Satisfactory

As discussed above, and in the earlier sections, project design, quality at entry, and supervision were satisfactory, despite some weaknesses in the performance indicators. The overall Bank performance is rated 'satisfactory'.

5.2 Borrower Performance

(a) Government Performance Rating: Satisfactory

The Shandong Provincial Government (SPG) performance is rated satisfactory because SPG: (i) was fully committed to the PDO; (ii) maintained its strong environmental management agenda; (iii) provided high quality project management and coordination of implementation in project cities/counties and supplied sufficient and timely counterpart funds; (iv) maintained its commitment to sustainability through advocating full cost recovery, and setting guidelines for minimum wastewater and solid waste tariffs to be adopted by municipal governments; (v) continued to give priority to industrial pollution control, and enhanced its capacity for online monitoring of industries; and (vi) promoted water conservation through regulatory measures to limit use of groundwater and re-use of treated wastewater.

(b) Implementing Agency or Agencies Performance Rating: Satisfactory

All implementing agencies in the project cities performed satisfactorily in preparation of detailed designs, procurement, contract management, quality control, safeguards implementation and financial management. Some implementing agencies completed their components in about three years from project start. Two project cities completed implementation in 2013, largely due to the difficulties with land acquisition. Unfortunately Weifeng was not able to come up with a satisfactory proposal to use its savings before the Loan closing date, leaving a large undisbursed Loan balance. Qixia was not able to utilize the completed wastewater treatment facility because of inadequate wastewater flows. However, this facility will be put into operation by the middle of

2014. All implementing agencies were in compliance with the financial performance covenants Implementing agency performance is rated satisfactory.

(c) Justification of Rating for Overall Borrower Performance Rating: Satisfactory

In view of the satisfactory performance of both the SPG and implementing agencies, described above, and the over satisfactory outcome of the project, the Borrower performance is rated 'satisfactory'.

6. Lessons Learned

Performance Targets for New Utility Companies. Experience from the project shows the wisdom of not subjecting newly created government-owned companies with no financial autonomy, to loan obligations or covenants they are not able to comply with. While such requirements may be more appropriate for the established water supply sector, they are highly challenging for new wastewater and solid waste sectors which are still developing. Newly set up companies in these sectors do not have an independent revenue stream and are fully dependent on government subsidies.

Financial Autonomy of Utility Companies. Without an independent revenue stream, the wastewater and solid waste companies enjoy limited financial autonomy. Funds for expansion of facilities to meet growing demands, therefore, remain under the control of local authorities. The responsibility for the daily operations and maintenance, however, rests with the utility companies, using funds provided on an annual budget provided by local authorities. The operational and financial performance of utility companies could be improved by giving them increased financial independence through remitting utility service fees directly to the utility companies. This could potentially encourage the utility companies to optimize operations and increase revenue, and provide incentives to connect and service new customers, which would require change of the current 'government fee' to a tariff, the income of which will be subject to tax. A prerequisite for obtaining benefits linked to financial autonomy is, however, that service fees collected reflect the actual costs of providing the service.

Projected Growth of EDZs. The Bank needs to make realistic assessments of growth for establishment of supply-driven economic development zones. China has a number of highly successful economic development zones established under the right conditions. However, EDZs established without the right underlying economic drivers, have slow starts or are not successful. Such was the case in Qixia where wastewater investments were planned on the basis of weak assessments of growth.

Use of Septic Tanks. The experience and knowledge gained from implementing the GEFsupported septic tank management component have demonstrated the need for regular septic tank emptying as well as, and their relatively limited use when cities are fully sewered. They are also expected to influence government policy and building code requirements in the near future, with respect to: (i) the need to intercept and treat pollution discharge that would enter the Bohai Sea; (ii) modification of the building code to require septic tanks only where there are no sewer systems; (iii) regulations to require property owners to empty septic tanks at specified frequencies; and (iv) improvements to septic designs for enhanced BOD removal. **Performance Monitoring Indicators**. Performance indicator design needs to receive careful attention at project appraisal to avoid difficulties during implementation. They need to be focused on the key outcomes of the development objective, and limited in number; indicators need to be clear and measurable; and explanatory notes should be provided where necessary, to explain the intent and method of measurement.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners (a) Borrower/implementing agencies

The Borrower states that the project was very successful with most of its original objectives achieved particularly in terms of the planned physical interventions and it would be worthwhile for local governments and enterprises to learn from the Bank's project appraisal methodologies.

The Borrower also raised the issues listed below:

- a) The monitoring and evaluation framework and associated performance indicators proved to be poorly designed and the established performance baseline were inadequately documented.
- b) The Bank's requirement to on-lend to agencies with no financial capacity to repay, is a repetition of mistakes from other projects.
- c) There were frustrating delays in obtaining some "no objections" where there was no obvious reason for any delay.
- d) The Bank could have shown more flexibility in dealing with the changes proposed in Weifang, leading to a lost opportunity to fully utilize the loan.

Bank Comments: The problems with a few indicators lacking of adequate explanation of the basis for design and the method of measurement of the targets make it difficult to monitor the progress of the project; these should have been addressed during restructuring. The on-lending requirements have been dropped from recent project based on the lessons learned from this and other projects. The Bank team will continue to strive and seek ways to improve its efficiency, although in some cases the delays were the result of issues with format and procedures that were not followed. Finally, the Bank team tried very hard to find ways to use the loan savings as a result of changes proposed in Weifeng, unfortunately no agreement could be reached between different government levels about the use of these funds.

(b) Cofinanciers: Not applicable

(c) Other partners and stakeholders. A summary of the Borrower's ICR is provided in Annex 5, and the full report is available in the project files.

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

ONMENT PROJEC	СТ - Р077752	
Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
8.62	7.13	82.7
13.89	0.00	0.0
9.13	10.36	113.5
66.71	67.98	102.1
15.69	17.62	112.3
23.75	29.92	126.0
44.69	28.15	63.0
0.00	26.18	100.0
182.38	187.33	102.7
13.31	18.10	136.0
7.95	11.15	140.3
21.26	29.25	137.6
14.90	20.40	136.9
15.49	0.00	0.0
30.39	20.40	67.1
4.52	2.57	56.9
4.52	2.57	56.9
238.55		
17.18		
14.60		
270.33	239.55	88.6
7.32		
3.46		
281.11		
	Appraisal Estimate (USD millions) 8.62 13.89 9.13 66.71 15.69 23.75 44.69 0.00 182.38 13.31 7.95 21.26 44.52 4.52 13.31 7.95 21.26 14.90 15.49 30.39 4.52 238.55 17.18 14.60 270.33 7.32 3.46 281.11	Appraisal Estimate (USD millions) Actual/Latest Estimate (USD millions) 8.62 7.13 13.89 0.00 9.13 10.36 66.71 67.98 15.69 17.62 23.75 29.92 44.69 28.15 0.00 26.18 182.38 187.33 13.31 18.10 7.95 11.15 21.26 29.25 44.69 20.40 13.31 18.10 7.95 11.15 21.26 29.25 44.69 2.57 45.2 2.57 45.52 2.57 238.55 17.18 14.60 23.55 17.18 14.60 270.33 239.55 7.32 3.46 281.11 4.52

CN-GEF-Second Shandong Environment Project - P090377						
Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal			
1. Establishment of Septic Tank Institution	0.52	3.49	232.0			
2. Provision of Facilities and Equipment	2.07	2.66	129.0			
3. Project Operations	0.82	0.89	109.0			
4. Joint Sewage-Septage Treatment in Xianhe	0.04	*				
5. Consulting Services	0.98					
6. Project Management, Monitoring, Evaluation	0.77	1.20	39.0			
7. Dissemination and promotion	0.20	0.25	125.0			
Total Pilot Project Costs	5.40	8.49	157.0			

*Included in Item 1

(b) Financing

P077752 - SECOND SHANDONG ENVIRONMENT PROJECT							
Source of Funds	Type of Financing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal			
Borrower	Counterpart	134.11	105.55	78.7			
International Bank for Reconstruction and Development	Loan	147.00	134.69	91.1			
P090377 - CN-GEF-Second Shando	ng Environme	nt Project					
Source of Funds	Type of Financing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal			
Borrower	Counterpart	91.78*	NA				
GLOBAL ENVIRONMENT - Associated IBRD Fund	Loan	109.72*	NA				
Global Environment Facility (GEF)	Grant	5.00	8.49	157%			

*The basis of this allocation could not be found in project documents, Therefore the actual costs are not available (NA)

Annex 2. Project Outputs by Component

The detailed description of the original project components is available in the PAD. The tables below illustrate outputs by component, as originally planned and at the end of the project. Almost all planned outputs have been achieved satisfactorily.

Wastewater and River Embankment Improvements. The works shown below were essential in meeting the PDO of improving environmental conditions in the participating cities/counties. These works lead to achievement of the outcome indicators on volume of wastewater treated, rate of wastewater treated, and reduction of pollution load reaching the recipient rivers, per the Datasheet and Section 3.2 above.

Was	Wastewater Component, and Associated River and Embankment Improvements					
City	Output Description	at Appraisal	Actual Completed			
	Collection sewers (400mm-1000mm)	63.6 km				
	Interceptor sewers (1200mm-1650mm)	8.4 km	72 km			
Gaomi	Sewage pumping stations (1 #)	20,000 m3/d	Completed			
Huantai	Collection sewers (300mm-1200mm)	79.2 km	Deleted			
	Wastewater treatment plant (I #)	70,000 m3/d				
Zhoucun	Collection sewers		131.0 km			
(Substitute	Interceptor sewers					
For Huantai)	River embankment improvements		23.2 km			
Qixia	Primary, secondary and trunk collectors (300mm-800mm).	60 km	22.8 km			
	River bed and embankment improvements	4.9km	4.9 km			
	Wastewater treatment plant	20,000 m3/d	Completed			
	Relocation of a 400,000m ³ open dumping area.	400,000 m3	730,000 m3			
Weifeng	Interceptors along both banks of Bailang River (1.65m x 1.5m to 3.2m x 2.9m)	2 x 16.0 km	29.5km			
	Pre-treatment of intercepted flow in oxidation ponds (constructed wetlands)	360,000 m3	Deleted			
	River bed and embankment improvements	2 x 16.0 km	Completed as planned			
	Extension of sewers (300mm to 1400mm).	62.9 km	55.4 km			
Weihai	Transmission from PS to WWTP (1000mm)	1.65 km				
	Treated effluent rising main (1400mm)	7.0 km	7.2 km			
	Xin'anhe Wastewater treatment plant	80,000 m3/d	80,000 m3/d			
Yantai	Interceptor sewers (400mm-1200mm).	14.1 km	15.7 km			
	Extension of sea outfall (1500mm)	3.2 km	3.13 km			
	Treated effluent supply pipe (300 mm)	1.0 km	Completed			
	Interceptor and combined sewers (600mm- 1500mm) along Dongsha River	13.2 km	13.2 km			
	Trunk mains and sanitary sewers (300mm to 1400mm) along Xisha River	27.6 km	21.2 km			
Zaozhuang	Treated water re-use supply pipelines for	16.4 km	4.9 km			
	Dongsha and Xisha Rivers (350mm and 500mm)		(Dongsha deleted)			
	Xisha River rehabilitation including 5# bridges	10.3 km	8.8 km			

	and landscaping.		
	Dongsha River rehabilitation including 7#	4.9 km	4.9 km
	bridges and landscaping.		
GEF Pilot	(i) Septic tanks in pilot area (Number).	1,700	1,056
Septic Tank	(ii) Septage collection per year (million		
Manageme	m3/year)	150,000	100,020
nt	(iii) Joint treatment of septage and wastewater		
Yantai	(million m3/year)	150,000	100,020
	(iv) Septage collection tankers (Number)	10	10
	(v) Septage mixing facility (m3/day)	7,500	1,080
	(vi) GIS-based database	None	Completed

Water Supply. The water related works improved the quantity and quality of the water supply in Gaomi where citizens had been using groundwater with fluoride to supplement the municipal drinking water supply. These people, some 730,000, now have safe water and their satisfaction rate in a recent survey was 100%.

Water Supply Component						
City	Output Description	at Appraisal	Actual Completed			
	New Kanjia waterworks	30,000 m3/d	Completed			
	Raw water transmission main (1000mm)	9.8 km	Completed			
	Treated water transmission main (1000mm and 800mm)	20.8 km	20.0 km			
	Distribution network (125mm -800mm)	93.0 km	403 km			
Gaomi	Expansion of Nanhu water works capacity.	30,000 m3/d to 45,000 m3/d	Completed			
	Expansion of Beihu water works capacity	15,000 m3/d to 30,000 m3/d	Completed			
	Upgrade water supply system, central control room, control of NRW		Completed			
	New waterworks	100,000 m3/d				
	Raw water transmission main (1100mm)	14.9 km	Huantai deleted			
Huantai	Distribution network (100mm - 1100mm)	46.3 km	from project			
	Upgrade water supply system, central control room.					

Solid Waste. This component was delivered as designed and has contributed to improved environmental conditions by collecting and transporting municipal waste from the city centers and depositing it in a sanitary landfill in the case of Heze. Municipal solid waste collected and transferred to a sanitary landfill reached 351,660 tons/year by the end of the project.

Solid Waste Management Component							
City	Output Description at Appraisal Actual Com						
	Waste processing and recycling plant.	660 tons/d	Completed				
Heze	New sanitary landfill (280 tons/d with a 20	2.38 million	Completed				
	year life).	m3					
	Composting plant	304 tons/d	Completed				
	Phase II of sanitary landfill with capacity of	3.24 million	Completed				

	500 tons/d with an 18 year life.	m3	
	Procurement of vehicles and equipment		Completed
	(Construction of 20 waste collection		
Rizhao	stations with capacity of 8 tons per station;		
	20 five-ton waste transport vehicles, 10		
	street cleaning vehicles, 10 street washing		
	vehicles, 10 five-ton construction		
	demolition transport vehicles.)		
	Procurement of vehicles and equipment		Completed
	(3 excavators, waste compactor, 2 earth		
	movers, various loaders, 3 five-ton tip		
	trucks, pesticide application vehicle, five-		
	ton fuel truck, various vehicles, etc.)		

Institutional Development and Capacity Building. Outputs of the component are described below.

- (a) Construction Management and Business Development: Comprehensive project management services and implementation monitoring institutional and financial operational improvements to improve business development to water supply, wastewater and solid waste companies, and the SPPMO. All project companies (i) enhanced their financial management capacity through preparation of annual financial statements with projections; (ii) have well-funded O&M plans that are implemented on time; (iii) prepared and implemented training plans; (iv) are on a solid financial footing, even though there is an over-reliance on government subsidies. No progress was achieved on development of management succession plans and business plans, as they are irrelevant, being state-owned companies where management changes are the responsibility of the government human resources departments.
- (b) Solid Waste Sector Study for reform of technical, regulatory and management policies and programs, improve efforts in the 3Rs, and establish effective tariff, fee or charge structures and collection systems;
- (c) Capacity Strengthening of SPFB through improvement of debt management at the municipal and provincial levels
- (d) *Capacity Strengthening of Provincial EPB* through design and implementation of management information systems, including equipment, to strengthen its capacity for pollution control including industrial pollution at source.
- (e) Capacity Enhancement of Decision-makers and Project Owners through training and study tours for decision-makers.

Annex 3. Economic and Financial Analysis

1. Economic Analysis

At appraisal, cost benefit analysis, including net present value and economic rate of return were calculated to demonstrate the economic justification of each component. The selection of priority interventions for the project was guided by cost effectiveness analysis using least cost methodology. Alternative project designs were identified and evaluated in order to select the least cost solutions. The economic costs of components were determined by making adjustments to the component's financial costs.

1.1 Economic Development of the Project Cities/Counties

The economies of project cities/counties have grown significantly since project appraisal, and the project has definitely contributed to the governments' development objectives of continued sustainable economic growth. Economic output in the project cities has increased from RMB 637 billion in 2005 to RMB 1,993 billion in 2012, an increase averaging 17.7% per annum. The increase in economic output during the period of project implementation is illustrated in the table below.

Municipality	GDP 2005		GDP 2012		Increase	
		Per capita		Per capita	1	Per Capita
	Million RMB	RMB	Million RMB	RMB	%	%
Heze	36,500	4,144	178,700	19,319	390%	366%
Rizhao	38,700	13,723	135,237	46,941	249%	242%
Weifang	124,600	14,647	389,782	45,820	213%	213%
Weihai	100,881	40,614	233,000	91,888	131%	126%
Yantai	163,000	25,200	528,128	87,252	224%	246%
Zaozhuang	50,331	13,786	143,121	39,202	184%	184%
Zibo	123,100	29,686	385,090	92,866	213%	213%

Table 1.1 Economic Development of Project Cities/Counties

Notes: 2012 GDP figures for Zibo and Weifang were not provided and averages of other cities' growth rates are used in order to provide an overall project summary.

1.2 Cost Benefit Analysis: Apart from the overall high growth in GDP and the increased economic benefits achieved, the project has seen changes to the individual components during implementation which, overall, have had an impact on their economic return, including change of scope, changes in capital expenditures, and changes in cost of O&M of components. The analysis at appraisal found that the economic return of individual components was very sensitive to changes in the project costs.

To assess the overall end-of-project economic return of the project, a review of individual project components was carried out. The review was done using an incremental approach, where the effects from project changes to the economic return were analyzed, to establish an overview of the development in economic return during implementation and operation.

1.2.1 Wastewater Management and River Improvement Component. The main economic benefits, identified at appraisal, for the wastewater and river improvement component included: (i) reduction of pollution load to the environment, (ii) land value appreciation, and (iii) reduced cost of damages from floods. The significant economic development in the project cities/counties since project start has undoubtedly had a positive, rather than negative impact on the economic benefits identified. It was

estimated that the benefits are at least at the same level at the end as at entry for subcomponents where the scope remained unchanged.

The main drivers of economic costs of the individual wastewater and river improvement components include: the capital expenditures; and the cost of operation and maintenance. Calculation of the changes in capital expenditures since appraisal was based on actual financial results. Calculation of changes in costs of operation and maintenance were based on estimates.

The impact on the economic return from changes in economic benefits and costs was roughly estimated. The review of the economic return is shown in Table 1.2.

Component	EIRR at entry	Main assumptions for the C	ysis	Conclusion on the Cost Benefit ⁴	
		Benefit Drivers	Cost Dri	ivers Costs of	
Gaomi	18.0%	The economic benefits derives from: a. Reduction of pollution – quantified based on survey b. Additional benefits from treatment The project component's scope has remained unchanged during implementation and all targets set at appraisal were achieved	Appraisal: RMB71 million Implementation: RMB54 million	Appraisal: RMB7.4 million /year Operation ¹ : RMB5.7 million /year	As the scope has remained unchanged during implementation and the capital costs and costs of operations and maintenance has been reduced, the economic return of the component is estimated to reach a level not less than the level expected at appraisal.

Table1.2. Cost Benefit Evaluation - Wastewater and River Improvement Component

Huantai	19.2%	The component was not implemented	Appraisal: RMB114 million	Appraisal: RMB15.4 million/year	NA
Qixia	14.5%	 The economic benefits derives from: a. Improved flood control – reducing damages from flooding. b. Benefits from improved wastewater treatment. The project's scope has remained unchanged and targets are expected to be reached when the treatment plant will commence operation by mid-2014. 	Appraisal: RMB75 million Implementation: RMB79 million	Appraisal: RMB4.5 million /year Operation ¹ : RMB4.8 million /year	The slightly higher capital expenditures and cost of operation and maintenance will solely have marginal effect (app. 1%) on the economic return and thereby still be above a reasonable hurdle rate.
Weifang	12.7%	 The economic benefits derives from: a. Improved flood control – reducing damages from flooding. b. Benefits from relocation of an open dumping area reducing pollution to the surroundings The project's scope was changed marginally by not implementing oxidation ponds for pretreatment of wastewater. The overall value of the deleted subcomponent accounted for less than 15% of the total quantifiable benefits. 	Appraisal: RMB547 million Implementation: RMB519 million	Appraisal: RMB7.2 million /year Operation ¹ : RMB6.8 million /year	Due to the deleted subcomponent together with the slightly lower capital costs and costs of operation and maintenance, the economic return of the component will fall to just below 12%. However, benefits from land value appreciation have not been taken into account leaving the economic value on the safe side of a reasonable hurdle rate.
Weihai	16.8%	The economic benefits derives from: a. Improved wastewater treatment. b. Reduced damages from occasional incidents of blocked sewage pipes. c. Land value appreciation from relocation of existing treatment plant. The project's scope remained unchanged and targets set at appraisal were achieved.	Appraisal: RMB129 million Implementation: RMB134 million	Appraisal: RMB57.1 million/year Operation ² : RMB57.1 million/year	The slightly higher capital expenditures and cost of operation and maintenance will solely have marginal effect (less than 1%) on the economic return. The return will thereby still be above a reasonable hurdle rate.
Yantai (with GEF)	15.8%	The economic benefits derives from:a. Improved wastewater treatment through reduced septic tank overflows.b. Reduced pollution discharges to the Bohai SeaThe project's scope largely remained unchanged and targets were achieved.	Appraisal: RMB195 million Implementation: RMB228 million	Appraisal: RMB17.0 million/year Operation ³ : RMB19.9 million/year	The higher capital expenditures and cost of operation and maintenance will have a marginal effect on the economic return of app. 3-4%. The return will thereby still be above a reasonable hurdle rate.

Zaozhuang	15.0%	 The economic benefits derives from: a. Improved flood control – reducing damages from flooding. b. Improved wastewater treatment. b. Reuse of water. The project's scope was marginally changed by dropping one of two water reuse subcomponents. It is estimated that the deleted subcomponent accounts for less than 10% of the total benefits. 	Appraisal: RMB366 million Implementation: RMB214 million	Appraisal: RMB3.0 million /year Operation ¹ : RMB1.8 million /year	The marginally lower benefits from the deleted subcomponent together with the substantial lower capital costs and costs of operation and maintenance will increase the economic return significantly.
Zhoucun	-	New component, substituted for Huantai	NA	NA	NA

1) Cost of operation and maintenance has been estimated based on the actual capital financial expenditures.

2) It has not been possible to estimate changes to the cost of operation and maintenance, and the costs has been set to the same level as at project entry.

3) Cost of operation and maintenance has been estimated based on the reduced capital expenditures. The GEF component accounts only for a small part of the cost of operation and maintenance.

4) The impact on the ERR has been roughly estimated – the actual series of costs and benefits for an ERR calculation were not established.

1.2.2 Water Supply Component. The economic benefits identified for the water supply components at appraisal included: (i) safe water supply benefits; (ii)human health benefits; and (iii) Benefits from improved environment.

The main drivers of the economic costs include: the capital expenditures; and the costs of O&M. The changes to capital expenditures since appraisal were based on actual financial results. Calculation of changes in cost of O&M was based on actual costs from the Water Company.

The impact on the economic return from changes in economic benefits and costs was roughly estimated. The review of the economic return is shown in Table 1.3.

Component	EIRR at entry	Main assumptions for the Cost Benefit Analysis			Conclusion on the Cost Benefit ²⁾
	entry	Benefit Drivers	Cost Dr Capital Costs	ivers Costs of O&M	
Gaomi	20.2%	 The economic benefits derives from: a. Water supply benefits based on willingness-to-pay. b. Additional human health benefits. The project's scope was expanded by increasing the length of the distribution network significantly. An increase in the economic benefit is expected by connecting additional households for provision of safe water to 840,000 people, who were 	Appraisal: RMB122 million Implementation: RMB155 million	Appraisal: RMB22.2 million/year Operation ¹ : RMB28.8 million/year	The higher capital expenditures and cost of operation and maintenance will alone have an effect on the economic return of app. 8-10%. Due to the high ERR in the base case the economic return from implementing the component still reach a level above a reasonably hurdle rate.

 Table 1.3. Cost Benefit Evaluation – Water Supply Components

		using ground water with high fluoride levels.			Increase in benefits from connecting additional households has not been taken into account.
Huantai	19.2%	The component was deleted from the project	Appraisal: RMB114 million	Appraisal: RMB 15.4 million	NA

1) Cost of operation and maintenance is actual number for Gaomi Water Company 2012.

2) The impact on the ERR has been roughly estimated – the actual series of costs and benefits for an ERR calculation has not been established.

1.2.3 Solid Waste Component. The economic benefits identified at appraisal included: (i) direct economic benefits from treatment of the solid waste; (ii) land value benefits; and (iii) financial benefits from sales of gas from the landfill.

The main drivers of the economic costs of the solid waste components include: the capital expenditures; and the cost of operation and maintenance. Calculation of the changes in capital expenditures since appraisal was based on actual financial results. Calculation of changes in costs of O&M was based on estimates.

The impact on the economic return from changes in economic benefits and costs was roughly estimated. The review of the economic return is shown in Table 1.4.

Component	EIRR	Main assumptions for the C	Cost Benefit Anal	ysis	Conclusion on the $C_{out} = R_{out} \sigma_{out}^2$
	at entry				Cost Benefit
	-	Renefit Drivers	Cost Dr	ivers	
				Costs of	
Heze	15.1%	The economic benefits derives from: a. Solid waste treatment including waste minimization, waste recycling, and sanitary disposal. b. Land value appreciation from relocation of existing dump site. The project's scope remained unchanged and targets were achieved.	Appraisal: RMB109 million Implementation: RMB138 million	Appraisal: RMB9.4 million/year Operation ¹ : RMB9.4 million/year	The higher capital expenditures will reduce the level of economic return by app. 3%. This will reduce the return from implementing the component to just above a reasonable hurdle rate. Increase in benefits due to rapid urban development since appraisal has not been taken into
Rizhao	18.6%	The economic benefits derives from: a. Solid waste treatment including waste minimization, waste recycling, and sanitary disposal. b. Land value appreciation from relocation of existing sites. c. Sales of methane gas from the landfill site. The project's scope has been unchanged and targets were achieved.	Appraisal: RMB65 million Implementation: RMB85 million	Appraisal: RMB29.8 million/year Operation ¹ : RMB29.8 million/year	account. The higher capital expenditures will reduce the level of economic return by app. 4%. This will reduce the return from implementing the component to just above a reasonable hurdle rate. Increase in benefits due to rapid urban development since appraisal has not been taken into account.

Table 3. Cost Benefit Evaluation – Solid Waste Components

1) Cost of operation and maintenance has for the estimation been kept at the same level as appraisal. A larger part of the cost of operation and maintenance are variable costs – labor, chemicals, electricity and petrol – which are not affected by increases in capital expenditures.

2) The impact on the ERR has been roughly estimated – the actual serious of costs and benefits for an ERR calculation has not been established.

2. **Financial Analysis.** An end-of-project financial analysis was conducted to: review the financial performance of revenue generating companies as covenanted in the legal agreements; tariff development and affordability of households; and affordability of participating municipalities.

2.1 Utility Tariff Analysis

Compared to the overall rapid economic development since 2005, utility tariffs were revised at a slow pace. The highest increase in water supply tariff occurred in Gaomi, where the water tariff increased 40% since 2005. For wastewater tariffs, Qixia has implemented a wastewater tariff which was able to recover full costs. Yet the wastewater tariff in Yantai remained unchanged since 2005. As a result of the slow pace in revising utility tariffs, none of the tariffs levels projected at appraisal was achieved. Given the increased costs resulting from the project and the overall price increases, there will be a continuing reliance on government support in the foreseeable future. Table 2.1 presents the average tariff comparisons for water, wastewater and solid waste. The financial position of each project company is further discussed in Section 2.2.

City	2005	20	11	2012		2013
	Actual	proj. ²	actual	f.c.r. ³	actual	Actual
Gaomi Water Supply (RMB/m ³) ¹	1.40	2.80	1.97	2.35	1.97	1.97
Gaomi Wastewater (RMB/m ³)	0.80	1.40	0.90	n/a	0.90	0.90
Heze Solid Waste (RMB/hh./mth)	1.00	none	1.00	3)	1.00	1.00
Qixia Wastewater (RMB/m ³) ⁴	None	1.20	-	0.97	1.08	1.08
Rizhao Solid Waste (RMB/hh/mnth)	3.00	none	3.00	3)	3.00	3.00
Weihai Wastewater (RMB/m ³) ⁵	0.83	1.35	4)	1.98	4)	0.99
Yantai Wastewater (RMB/m ³) ⁶	0.82	1.15	~ 0.8	-	~ 0.8	~ 0.8

 Table 2.1: Average Tariff Comparisons for Water, Wastewater and Solid Waste

¹ Base documents state 2005 actual to RMB 1.4/m3, as indicated. PAD indicates a level of 2.8.

² Projected at the time of appraisal.

³ Full cost recovery (f.c.r.) comparison is based on latest financial results FY2012. For Heze and Rizhao f.c.r. 2012 are forecasted in the solid waste tariff reviews undertaken in 2010.

⁴ No wastewater tariff was levied in the Qixia EDZ area in 2005. The f.c.r. tariff is the computed tariff needed for 2014 based on estimates of income and expenditure provided by the Qixia PIU.

⁵ The average wastewater tariff in Weihai has declined slightly due to domestic sales rising more rapidly than income from other customer segments (government, industrial and commercial).

⁶ In Yantai no information is available to compute the average tariff, but there has been no increase in the tariff scale since 2005. Equally it is not possible to compute the f.c.r. tariff based on the information available.

2.2 Affordability of Water and Wastewater Tariffs

Affordability of the public utility services, analyzed at project appraisal, concluded that the projected tariffs were fully affordable to all households. Specifically, the analysis confirmed full affordability by low-income households of projected water and wastewater tariffs, which covered on average 4.1% and 5.2% of the monthly income, which is an acceptable benchmark for affordability analysis.

Review of improvement in affordability during the period of implementation was conducted by comparing tariff increases to income growth, where GDP per capita growth was been used as a proxy for income growth (see Table 2.2 below). The high growth of GDP per capita compared to the increase in tariffs indicates that affordability of utility service tariffs has improved during the project period. It was noted that tariff increases were mostly related to water supply rather than the wastewater service. Affordability of the municipal solid waste service was not analyzed at appraisal.

City		2005			2013			GDP
	do	domestic tariffs			domestic tariffs			per capita
RMB/m ³	WS	WW	Total	WS	WW	total	Increase	Growth
Gaomi	1.4	0.7	2.1	1.9	0.9	2.8	47%	236%
Qixia	-	-	-	n/a	0.7	-	-	116%
Weifang	1.4	0.9	2.3	n/a	n/a	-	-	213%
Weihai	1.7	0.7	2.4	n/a	0.8	-	-	126%
Yantai	1.5	0.7	2.2	2.0	0.9	2.9	32%	246%
Zaozhuang	1.0	0.7	1.7	1.5	0.8	2.3	35%	213%

 Table 2.2: Comparison of Tariff Increases with GDP Growth

¹ The wastewater tariff in Qixia EDZ (the area served by the new SDEPII treatment plant), although approved by Qixia government has not yet been implemented by the Administration Committee of Qixia EDZ.

2.3 Financial Analysis of Project Companies

Project companies prepared annual financial forecasts during project implementation as required under the terms in the Project Agreement. One of the purposes of the financial forecasts was to review compliance with the covenanted key indicators, i.e., cost recovery ratio of 1.0; and debt service ratio of 1.3 before the company can incur any additional debt.

2.3.1 Financial Performance of Wastewater and Solid Waste Companies

The financial performance of wastewater and solid waste companies was in compliance with the financial covenant of cost recovery ratio, as defined in their subsidiary agreements. This was made possible through a provision in the legal arrangements that defined net revenues to include both operating revenue and non-operating income, and as such, included government subsidies. As the companies avoided taking on any additional debt, the debt-service-ratio covenant did not apply.

Wastewater and solid waste services provided by project companies were financed partially through the government budgetary system, rather than on a fully commercial basis. Thus, wastewater and solid waste companies did not rely on an independent revenue stream to provide services. Wastewater tariffs collected via water supply companies were initially remitted to the Government and then released to the companies based on their financial needs. The Government assumed the responsibility for providing wastewater and solid waste companies sufficient funds to cover their expenses for operation, debt service and other costs. However, as the companies are supported on a net basis, they do not accumulate cash over time. As the companies' expenses during implementation and operation were fully provided for by government subsidies, the cost-recovery-ratio is technically pre-set at 1, as the subsidies do not include an element allowing the company to generate cash in excess of annual needs. Financial support from the government was not solely provided as revenue to the companies, but also as additional capital. Due to the different ways of providing the subsidy, the support was not fully reflected in the companies' income statement. Apart from the support for operating expenses and debt service, governments also provided wastewater and solid waste companies funds for ongoing capital expenditures, such as for expanding the networks to new areas as a result of urban expansion, etc.

The above described government support was particularly appropriate for the new wastewater and solid waste companies, as the sectors were still under development, and full cost recovery tariffs in these two sectors would not be realistic or feasible. The tendency in recent Bank-funded wastewater and solid waste

projects in China has been to allow retention of the debt for wastewater and solid waste investments on government books, rather than being on-lent to the individual companies.

2.3.2. Financial Performance of the Project's Water Supply Company

Water supply operations of GWSC were fully commercialized, except for government-supported rural water supply programs. GWC made efficiency gains by reducing staff from about 380 to about 300 during the project. It also increased its annual water revenue from RMB 31 million/year to RMB 44 million/year in 2013. It was able to recover full costs from revenue generated, and is on a solid foundation, with equity to total balance at a robust 51%. GWC received budgetary allocations to finance its wastewater operations and the investment program.

Water supply operations of GWSC were in compliance with the cost recovery covenant until 2011. The company failed to comply with the cost recovery covenant in 2012 and 2013 as depreciation exceeded provision for debt service. Taking into account that the subsidies to the Company's wastewater operations do not allow the company to generate cash in excess of annual needs, the Company was in compliance with the covenant in 2012 and 2013, and has been able to meet their cash outgoings. The company will be in full compliance with the covenant again in 2014 with a smaller revision of the water tariff. The debt-service-coverage ratio requirements did not apply, as the company did not incur any additional debt. The Company was also required to generate sufficient revenues to cover any increase in working capital requirement and 20% of its three year rolling capital investment needs. The water supply operation was not able to meet this requirement, but will do so with the expected increase in tariffs. Financial forecasts are provided below.

2.3.3 Financial Forecasts of Project Companies

The requirement of financial forecasts applied only to Gaomi Water Supply Operations, Weihai, Yantai and Qixia Wastewater Companies, and with the Rizhao Solid Waste Company.

GWSC was the designated project company for the construction of the new water supply and wastewater facilities in Gaomi city. GWSC was financed through four main funding channels: water supply charges, which the Company collected and retained; Gaomi Government budget allocation for wastewater operations; company borrowing including the World Bank loan; government counterpart funding as a contribution to the project and other government sponsored investment projects e.g. rural water supplies.

Table 2.4 below provides a medium term forecast of the performance of the water supply operations of GWSC based on the assumption that the current average tariff increases by 20% in 2014 to a level of RMB 2.35/m3.

<u> </u>			-		
RMB'000	2011	2012	2013	2014	2015
	base	base year	forecast	forecast	forecast
	year				
Water Cumply Devenue	12 926	11 000	11 252	52 092	52 000

Table	24.	Financial	Projections	for the	Water	Supply	Onerations	of GWSC
I abic	4.. .	I'manciai	1 I Ujections	ior the	vv atti	Suppry	Oper acions y	

Water Supply Revenue	42,836	44,088	44,352	52,983	53,022
Operating support	0	3,074	0	0	0
Other revenue	10,115	6,183	6,199	6,416	6,640
Total Revenues	52,951	53,345	50,551	59,398	59,662
Personnel	7,123	5,925	6,000	6,060	6,121
Electricity Expense	5,350	4,865	4,870	5,078	4,948
Chemical	850	1,253	1,255	1,300	1,346

Sales Expenses Administrative Expenses Other Expenses Expenses	10,348 11,496 12,055 47,222	10,683 11,789 17,288 51,802	10,718 10,790 17,210 50,843	10,821 11,004 17,613 51,875	10,927 11,224 17,896 52,462
EBITDA	5,728	1,543	-292	7,523	7,201
Depreciation	4,857	4,491	4,491	4,073	4,073
EBIT	871	-2,948	-4,782	3,450	3,127
Net interest payments	674	-335	0	1,342	1,695
EBT	197	-2,613	-4,782	2,108	1,433
Income Tax	78	0	0	527	358
Earnings after Tax	119	-2,613	-4,782	1,581	1,074
Cost Recovery Ratio	1.02	0.92	0.90	1.02	1.01
Debt Service Coverage Ratio ¹	1.21	0.26	-0.05	0.94	0.81
Additional requirement ²	-1,021	-4,847	-5,735	1,385	432

1) The covenant did not apply as the water operation did not incur any additional debt

2) Surplus/Shortfall in meeting the additional requirement on coverage of 20% of Capital Investments

The Yantai Xi Anhe Wastewater Company (YWC) was the designated project company for the construction and operation of the wastewater facilities implemented in Yantai city under the project. The company was established in 2006, consolidating treatment facilities, trunk sewers and pumping stations, while government retained control of secondary and tertiary networks. YWC is currently financed through the Yantai Government budgetary procedures. The company has no independent sources of revenue as the wastewater tariff in Yantai is a government fee under the overall administration of the Finance Bureau. YWC prepares an annual budget which, once approved, forms the basis of monthly budgetary allocations made to the Company. There is no relationship between wastewater fees collected from users in the Company's service area and the revenue received by YWSC from Yantai Government. The equity to total balance of YWWC is at a low level of 9%, indicating that the Company is fully funded by Government contributions. Yantai Municipal Government pursued private sector participation in the wastewater sector through a number of BOT contracts for the wastewater treatment.

Table 2.5 below provides a forecast of the performance of YWC based on what is considered to be a realistic service fee having regard to current wastewater tariff levels and the requirements of the project's covenants. The projections indicate that a service fee of RMB $1.0/m^3$ for wastewater treated would allow the Company to cover their full costs.

RMB'000	2011	2012	2013	2014	2015
	base year	base year	forecast	forecast	forecast
Wastewater revenue ¹	0	0	0	41,060	43,800
Operating support	28,742	26,209	28,518	0	0
Total Revenues	28,742	26,209	28,518	41,060	43,800
Personnel	7,074	6,939	7,364	7,564	7,828
Electricity Expense	11,683	12,001	11,916	11,868	13,641
Materials (Chemical and Water)	3,018	3,161	3,212	3,437	3,557
Maintenance	1,521	1,135	946	4,098	2,833
Sludge	1,297	966	1,739	2,010	2,026
Other Expenses	1,144	1,589	1,444	1,510	1,484
Operating Expenses	25,736	25,791	26,621	30,487	31,369
EBITDA	3,006	418	1,897	10,573	12,431
Depreciation	6,241	975	967	8,472	8,472
EBIT	-3,235	-557	930	2,100	3,959

Table 2.5: Financial Projections of Yantai Xin'anhe Wastewater Treatment Company

Net interest payments	0	0	0	610	577
EBT	-3,235	-557	930	1,491	3,382
Income Tax	0	0	0	0	0
Earnings after Tax	-3,235	-557	930	1,491	3,382
Service Price (RMB/m ³) ²	0.72	0.74	$\begin{array}{c} 0.80\\ 0.80\end{array}$	0.85	0.82
Full Cost Price (RMB/m ³) ³	0.91	0.75		1.00	0.95

1) Assumed revenue from wastewater fees

2) Service price required to meet cash outgoings

3) Service price required for full cost recovery

The Weihai Water Group Company (WWGC) only operates the network, while treatment is outsourced based on a BOT agreement. WWGC is financed by a government budgetary and fees paid to the various BOT contractors are not recorded in WWGCs accounts. Weihai government only subsidizes cash outgoings and excludes any provision for asset depreciation. Table 2.6 below provides a forecast of the financial performance of the Wastewater Sector in Weihai based on the current wastewater tariff.

	Table 2.6:	Projected	Financial	Performance	of the	Wastewater	Sector in	Weiha
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RMB'000	2011	2012	2013	2014	2015
	base year	base year	forecast	forecast	forecast
Wastewater revenue in Weihai ¹	49,799	52,787	55,612	57,520	57,825
Other income	0	0	0	0	0
Total Revenues	49,799	52,787	55,612	57,520	57,825
Sewers and Pump Station					
Personnel	7.860	9.001	11.384	11.726	12.077
Electricity Expense	12.065	13.862	13.800	13.938	14.008
Maintenance	6,155	6,501	7,741	7,973	8,212
Other Expenses	8,479	8,353	7,830	8,065	8,307
Outsource Expenses					,
Sludge Disposal	210	214	214	214	214
WWTP BOT Fee	52,118	57,287	73,102	76,091	79,080
Other expenses	5,073	5,225	5,382	5,543	5,710
Total operating Expenses	91,961	100,442	119,453	123,550	127,608
EBITDA	-42,161	-47,655	-63,840	-66,030	-69,783
Depreciation	383	11,892	17,219	19,089	20,958
EBIT	-42,545	-59,547	-81,060	-85,119	-90,741
Net interest payments	0	0	0	3,476	3,300
EBT	-42,545	-59,547	-81,060	-88,595	-94,041
Income Tax	0	0	0	0	0
Earnings after Tax	-42,545	-59,547	-81,060	-88,595	-94,041
	0.00	1.00	0.00	0.00	0.00
Assumed tariff (RMB/m ²)	0.98	1.00	0.99	0.99	0.99
Service Price $(RMB/m^3)^2$	1.84	1.81	2.19	2.18	2.24
Full Cost Price (RMB/m ³) ³	1.84	1.98	2.44	2.45	2.54

1) Wastewater fees in Weifang based on assumed wastewater tariff

2) Service price required to meet cash outgoings

3) Service price required for full cost recovery

Table 2.7 below provides a financial forecast for the Qixia City Dongsheng Water and Wastewater Company (QWC) based on the approved tariff to be implemented from 1st January 2014. The projections are illustrative only, as there is no history of past financial or operational performance. The wastewater treatment plant is not yet fully operational – the forecast is however made for the full year 2014 and 2015.

Table 2.7: Projected Financial Performance of the Wastewater Sector in Qixia

RMB'000	2011	2012	2013	2014	2015
	not opr.	not opr.	not opr.	Forecast	Forecast
Wastewater revenue ¹	-	-	-	7,379	7,983
Other income	-	-	-	0	0
Total Revenues	-	-	-	7,379	7,983
-					
Salaries	-	-	-	1,285	1,330
Electricity Expenses	-	-	-	2,837	3,030
Maintenance Expenses	-	-	-	157	163
Administration	-	-	-	503	521
Other Expenses	-	-	-	214	226
Total operating Expenses	-	-	-	4,997	5,269
EBITDA	-	-	-	2,382	2,714
Depreciation	-	-	-	1,507	3,014
EBIT	-	-	-	875	-301
Net interest payments	-	-	-	1,849	1,762
EBT	-	-	-	-975	-2,063
Income Tax	-	-	-	0	0
Earnings after Tax	-	-	-	-975	-2,063
-					
Assumed tariff (RMB/m ³)	-	-	-	0.63	0.64
Service Price $(RMB/m^3)^2$	-	-	-	0.97	0.93
Full Cost Price (RMB/m ³) ³	-	-	-	0.97	1.08

1) Wastewater fees in Qixia based on assumed wastewater tariff

2) Service price required to meet cash outgoings

3) Service price required for full cost recovery

Table 2.8 below provides a financial forecast for the **Rizhao Urban Environmental Company (RUEC)** based on the current tariff. The Company owns and operates the landfill site only. Cost of collection and transfer is not included. The results show that the current tariff level cannot cover cash outgoings. Specifically, the financial projections indicate that a solid waste treatment tariff of about RMB 90/ton is needed to cover full costs. The current tariff of RMB 27/ton can solely cover a smaller part of the costs with the remaining part of the costs being met by government subsidy. The Rizhao Municipal Government is expected to continue subsidizing RUEC.

RMB'000	2011	2012	2013	2014	2015
	base year	base year	Forecast	forecast	forecast
Solid waste revenue ¹	3,829	3,860	3,897	4,131	4,378
Other income	0	0	0	0	0
Operating subsidies					
	2,640	3,483	3,442	3,648	3,867
Total Revenues	6,469	7,343	7,338	7,779	8,245
Personnel	695	738	820	880	950
Fuel Expense	680	804	890	943	1,000
Special Materials Expense	593	521	550	583	618
Wastewater Treatment Fee	2,583	3,429	3,640	3,858	4,090
Water and Electricity Expense	7	10	10	11	11
Maintenance Fee	174	289	194	201	208
Administrative expenses	1,822	1,817	2,287	2,534	2,780
Other Expenses	343	314	325	336	348
Total operating Expenses	6,897	7,923	8,716	9,346	10,005
EBITDA	-429	-580	-1,378	-1,567	-1,760
Depreciation	0	0	0	4,259	5,910

Table 10.	Financial	Ductor	f	41.0	DUEC	
1 able 2.0:	г шанстаг	Projections	IOL	une (KULU)	,

EBIT Net interest payments EBT Income Tax Earnings after Tax	-429 0 -429 0 -429	-580 0 -580 0 -580	-1,378 0 -1,378 0 -1,378	-5,827 282 -6,108 0 -6,108	-7,669 267 -7,936 0 -7,936
Assumed tariff (RMB/ton)	27	27	27	27	27
Service Price (RMB/ton) ²	50	61	71	71	72
Full Cost Price (RMB/ton) ³	50	61	71	87	97

1) Solid waste fees in Rizhao based on assumed solid waste tariff - tipping fee

2) Service price required to meet cash outgoings

3) Service price required for full cost recovery

2.3 Fiscal Sustainability

Affordability of participating Municipalities was analyzed at project appraisal to ensure adequate fiscal capacity of local government for both debt servicing and incremental recurrent costs needed for the sustainable operations and maintenance of the project facilities. As illustrated in Table 2.9, municipal revenues have grown significantly since project start, and are adequate to meet the limited increases in project costs, and contribute to a positive development in affordability during project implementation.

City	Revenue				
	2005 RMB billion	2012 RMB billion	Increase	Growth Rate	
Heze Municipality	1.6	10.5	540%	30.4%	
Rizhao Municipality	8.4	14.9	78%	8.6%	
Weihai Municipality	10.6	23.1	120%	11.8%	
Weifang Municipality	11.9	52.3	331%	23.2%	
Yantai Municipality	12.6	46.3	267%	20.4%	
Zaozhuang Municipality	8.6	22.9	165%	14.9%	
Zibo Municipality	11.8	17.5	48%	5.7%	

 Table 2.9: Growth in Municipal Revenues during the Project Implementation

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team Members

Names	Title	Unit	Responsibility/ Specialty
Lending	1	1	
Shenhua Wang	Snr. Urban Specialist/Team Leader	SASDU	Overall
Chaogang Wang	Senior Social Development Specialist	MNSSU	Social
Chongwu Sun	Senior Environmental Specialist	EASCS	Environment
David I	Sr Financial Management Specialist	LCSFM	Financial Management
Hardy M. Wong	Consultant	TWIWA	Solid Waste
Jaroslav Kozel	Consultant	ECSUW	Engineering
Ji You	Urban Specialist	EASCS	Engineering
Jian Xie	Senior Environmental Specialist	ECSEN	Environment
Mei Wang	Consultant	EASCS	Economic Analysis
Mingyuan Fan	Sr Sanitary Engineer	EASCS	Engineering
Patrick E. McCarthy	Consultant	EASUR	Engineering
Rajagopal S. Iyer	Consultant	SASDU	Project Management
Sandra Greiner	Environmental Specialist	EASUR – HIS	Environment
Shunong Hu	Senior Water Engineer	EASCS	Engineering
Xiaofeng Li	Operations Analyst	UDRUR	Operations
Xuemei Guo	Country Program Assistant	EACPQ	Assistant
Zhentu Liu	Senior Procurement Specialist	EASR2	Procurement
Supervision/ICR			
Guangming Yan	Infrastructure Spec./Team Leader	EASCS	Overall
Chaogang Wang	Senior Social Development Spec.	MNSSU	Social
Chongwu Sun	Senior Environmental Specialist	EASCS	Environment
David I	Sr Financial Management Specialist	LCSFM	Financial Management
Hardy M. Wong	Consultant	TWIWA	Solid Waste
Hong Chen	Operations Officer	EASSD	Procurement
Jian Xie	Senior Environmental Specialist	ECSEN	Environment
Jingrong He	Procurement Specialist	EASR2	Procurement
Jun Zeng	Social Development Specialist	EASCS	Social
Margaret Png	Lead Counsel	LEGLE	Counsel
Mei Wang	Consultant	EASCS	Economic Analysis
Miki Endo	Operations Officer	SEGES	Operations
Mingyuan Fan	Senior Sanitary Engineer	EASCS	Engineering
Nicolas Kotschoubey	Consultant	MNSHD	Project Management
Rajagopal S. Iyer	Consultant	SASDU	Project Management
Sandra Greiner	Environmental Specialist	EASUR – HIS	Environment
Shunong Hu	Senior Water Engineer	EASCS	Engineering
Vellet E. Fernandes	Program Assistant	EASIN	Assistant
Xuemei Guo	Country Program Assistant	EACPQ	Assistant
Xujun Liu	Consultant	EASCS	Procurement
Yi Geng	Sr Financial Management Specialist	EASFM	Financial Management
Zhentu Liu	Senior Procurement Specialist	EASR2	Procurement

(b) Staff Time and Cost								
	Staff Time and Cost (Bank Budget Only)							
Stage of Project Cycle	No. of staff weeks	USD Thousands (including travel and consultant costs)						
Lending								
FY05	27.07	120.66						
FY06	52.78	274.04						
FY07	23.79	107.87						
Total:	103.64	502.57						
Supervision/ICR								
FY07	5.58	20.44						
FY08	14.84	56.32						
FY09	7.15	52.05						
FY10	10.78	72.16						
FY11	10.18	60.54						
FY12	9.33	53.7						
FY13	9.85	32.6						
FY14	4.75	16.16						
Total:	72.46	363.99						

Annex 5. GEF-supported Septic Tank Management Component

A. Background

A key environmental problem generally found in Shandong Province was insufficient wastewater treatment and serious pollution of rivers, and the Bohai Sea. Despite the considerable investments made to collect and treat domestic and industrial wastewater and increase coverage of wastewater services in major cities, pollution in rivers has decreased only marginally. Most river quality data indicate they are Class IV or worse. Septage overflows from poorly maintained septic tanks emerged as a major contributor to pollution of rivers, and the severe damage caused to the shallow Bohai Sea ecosystem. Most cities depended on septic tanks for wastewater management, which was, and still is, a building code requirement for every building constructed. Septic tanks were rarely emptied, resulting in overflows of untreated wastewater to the river systems during sewer blockages and rain storms. Shandong Province, situated on the east coast of China, has a 3,000 km coastline with the Bohai and Yellow Seas, both of which drain a major part of the Province.

During the preparation of the Second Shandong Environment Project (SEP II) for World Bank financing, the GEF provided a Grant of US\$5 million additional support, per the request of Shandong Province, to demonstrate septage management techniques that could contribute to a reduction in land-based pollution reaching the Bohai Sea, which is a pollution hotspot in the seas of East Asia. Shandong was a signatory of Memorandum of Agreement initiated by the United Nations Development Program/Global Environment Facility/International Maritime Organization (UNDP/GEF/IMO) Regional Program.

Yantai Municipality, which has about 19,000 septic tanks, was selected for the pilot GEF activity that was linked to the Yantai wastewater component of SEP II. An area with 1,700 septic tanks was selected for the pilot. GEF support was intended to implement major institutional and technology reforms, which would not otherwise be carried out by any wastewater sector agency in China. The goal of the pilot project was to demonstrate to Chinese municipalities the rationale for the proper management of septic tanks. The key objectives of the activity were to: (i) demonstrate the feasibility of institutional and technical arrangements required to ensure improvements in the local environment; and (ii) disseminate among Bohai Declaration signatories and to others the positive impacts that can be achieved by reducing the annual pollution load discharged from septic tanks to the Bohai and Yellow Seas.

B. The GEF-supported Yantai Septic Tank Management Project

Global Environmental Objectives. The Global Environmental Objective of the GEF activity was to reduce the land-based pollution along the Yantai coast and the Bohai Sea through development of a pilot septic tank management system in Yantai and dissemination of the Yantai model in Shandong province and in other parts of China.

GEO Indicators. The GEO outcome indicator was tons/year of pollution discharges to Bohai Sea reduced.

Project Beneficiaries. The septic tank management system benefitted about 800,000 people.

GEF Project Components/Activities. The GEF-supported activities included: establishment of the septic tank management system and regulatory framework; provision or facilities and equipment, including a fleet of ten septage emptying vacuum tankers and associated equipment; joint sewerage-septage treatment facility at Xinanhe; dissemination and promotion; incremental operating costs; and consulting services for implementation support and assistance to the Yantai Municipality. The GEF project cost estimate at appraisal was US\$5.40 million, including the GEF Grant of US\$5.0 million.

Revised GEF Project Components/Activities and Significant Changes

Two significant changes occurred during implementation. The number and volume of septic tanks estimated at appraisal were found to be incorrect, requiring adjustments during implementation, such as the addition of 520 septic tanks, outside the pilot area, to the program, and making adjustment to the indicator target. The second significant event was the decision of the Yantai Municipal Government to establish a permanent Septic Tank Management Office in a newly constructed building, staff and annual budget allocations.

C. Key Factors Affecting Implementation and Outcomes

Weaknesses in Baseline Data on Septic Tanks: The number of septic tanks in the pilot area was found to be 1,056, instead of the 1,700 estimated, and the average volume of a septic tank was found to be about 24 m3, instead of the figure of 44 m3 estimated during the baseline survey. These discoveries impacted on the performance targets for the subcomponent. During implementation, the Yantai Septic Tank Management Office expanded the number of septic tanks covered, by including an additional 520 septic tanks from outside the pilot area.

Project Preparation and Design. The lack of records of existing septic tanks, their ownership and their operational status, influenced project design, impacted implementation and monitoring outcomes. Specifically, it impacted on the results indicator which was to measure tons/year of BOD reduced. Estimation of baseline data had to be done only through a survey, and to a degree, it was impossible to accurately assess the number and volumes of existing septic tanks in the pilot area, as there were no records available.

Quality at Entry. Design and quality at entry is assessed as satisfactory, despite the weakness in the baseline data. The GEO was consistent with the Province's commitment to sustainable environmental management, and to the UNDP/GEF/IMO Regional Program to protect large marine ecosystems (LME) in the Bohai Sea. Project design incorporated global experience, realistic expectations of BOD reduction in septic tanks, formulation of a framework and regulations for septic tank management, information collection and operations management systems to develop a detailed monitoring and evaluation protocol, and arrangements for dissemination of the experience of septic tank management, which was very relevant to China conditions where use of septic tanks is widespread even to date.

D. Implementation

All original GEF-supported activities were completed by the original loan closing date of December 31, 2013. The original planned project outputs and outcomes were not achieved due to the overestimation of baseline data. However, with the adjustments made during implementation, it is concluded that the outcomes were achieved. The GEF Grant of US\$ 5.00 million was disbursed, and the Grant leveraged a Yantai Municipal Government contribution of US\$ 3.49 million, compared to the contribution of US\$0.40 million estimated at appraisal.

Factors that contributed to the successful implementation of the project, on time, and within budget, include: (i) the strong commitment of Shandong Province and the Yantai Municipal Government; (ii) the environmental management policies and framework of Shandong Province; and (viii) the determination of Yantai Municipality to formulate and implement the GEF-supported pilot septic tank management system with necessary adjustments and establishing a permanent Office for Septic Tank Management, despite the difficulties experienced with: incorrect baseline data; procurement and registration of foreign-manufactured septic tank emptying vehicles; and challenges of emptying septic with highly consolidated settled solids.

E. Monitoring and Evaluation (M&E) Design, Implementation and Utilization

Design. Incorrect baseline data on the number and volume of septic tanks for the GEF component indicator, inflated the indicator targets for reduction of pollution discharges to the Bohai Sea. However, with the information that became available during septic tank emptying, an additional 520 septic tanks were included, and the target was adjusted. An information system was designed to track routes of emptying vehicles, frequency of emptying, and volume of septage removed.

Monitoring. A detailed monitoring was done on a daily basis and an information management system was developed and utilized for monitoring. The monitoring of the septic tank emptying data brought to light the inaccuracies in the baseline data on the number and volume of septic tanks in Yantai.

Utilization. Monitoring and evaluation information enabled a more accurate assessment of the number and volumes, septage removed and adjustment of the indicator target.

F. Outputs of the GEF-supported Septic Tank Management System

GEF-supported project activities completed are described below.

(a) Provision of a fleet of ten septic emptying vacuum tankers with capacity of 6 tons, 8 tons and 10 tons, and associated equipment.

(b) Construction of a joint sewerage-septage treatment plant with a capacity of 45 m^3/h , including deodorization and sewerage pumping facilities.

(c) Development and publication of policy and regulations for septic tank management, including Regulations for Septic Tank Clean-up and Treatment Operation; and Yantai Urban Septic Tank Construction and Management Method), and Septic Tank Operation & Maintenance (O&M) manual.

(d) Development of an Information Management System (IMS) for septic tank management.

(e) Establishment of a permanent Septic Tank Management Office with new offices, staff and budget.

(f) Septic tank emptying was internalized, and carried out in over 1,600 septic tanks for each of the past three years, as illustrated in the table below.

Vear	Number of	Cleaned-up and Treated	Reduction of
1 cai	Septic Tanks	Septage (tons)	$BOD_5(tons)$
2011	1,080	10,396.9	1,453.42
2012	1,600	10,018.1	806.42
2013	1,600	10,726.1	1,294.64
Total	4,280	31,141.1	3,554.48

Summary of Septic Tank Emptying Data

(g) The Yantai Municipal Government project team participated in 12 international/national conferences, published five papers, and disseminated over 15,000 promotional materials sharing the experience of the septic tank management program.

G. Achievement of Global Environment Objectives

The Global Environment Objectives were achieved, as illustrated below (also refer to Results Framework in the Data Sheet in the main text of the ICR.

- Land-based pollution discharges to the Bohai Sea was reduced. BOD₅ reduction was 1,185 tons/year on average (the target was 1700 t/a), which has greatly reduced the influence of land-source pollution in Bohai Sea bay
- The joint sewerage-septage treated at the Xin'anhe WWTP was 10,380 tons/year on average (the target was 150,000 tons/year)
- A lower cost technology for septic tank management was introduced and embraced by Yantai
- The culture of regular periodic emptying of septic tanks was introduced, resulting in the enhanced functioning of septic tanks, and avoided damage caused by sewage overflows
- A permanent institutional arrangement for septic tank management was established in Yantai
- A GIS-based information management system to track and monitor tanker routes, operational data, and the frequency of emptying is in use in Yantai
- The experience of the Yantai septic tank management system was disseminated within China and abroad
- A discussion has begun among decision-makers on septic tank design, and changes to building code requirements for septic tanks
- A dynamic monitoring and evaluation was developed, and is in use

H. Post Completion Phase

Activities planned by the Yantai Municipal Government for the post completion phase include:

(a) continue the campaign to raise citizen awareness of the importance of septic tank maintenance through regular emptying ST maintenance;

(b) enforce the requirement to empty septic tanks on a regular basis, and select, on a competitive bidding process, a panel of qualified private companies that will be licensed to undertake septic tank emptying;

(c) support a phased expansion of the septic tank emptying program outside the pilot area;

(d) continue support for the Septic Tank Management Office;

(e) incorporate the cost of septic tank emptying in the wastewater tariff through a marginal increase, as the task is considered an integral function of wastewater management;

(d) examine the continued use of septic tanks where sewer systems are available, and also consider changes to the current building code requirement of septic tanks in all buildings;

Annex 6. Resettlement Implementation

Under the project, six cities/counties including Yantai, Heze, Weifang, Gaomi, Qixia, and Zaozhuang had resettlement activities. Resettlement Action Plans (RAP) were prepared, in consultation with affected persons (AP), and publicly disclosed, complying with World Bank policies and procedures. Resettlement activities were implemented according to the RAPs and were monitored by the Shandong Construction Development and Research Institute as the external monitoring agency. Annual safeguard compliance reports prepared by the project implementing units were submitted regularly. All resettlement activities were carried out satisfactorily in accordance with Chinese regulations and Bank policies.

Resettlement activities comprised 1,331.3 mu of permanent land acquisition, 1,620.9 mu of temporary land use, and 94,750.8 m2 of house demolition. The total area of enterprise, institution and shops affected was 16,090.8 m2. Population affected by the project was 4,200 persons. Details are shown in the table 1 below.

Sub- component	Perman Acqu (r	ent Land iisition nu)	Tempora Occuj (m	ary Land pation 11)	House Demolition (m ²) Enterprise/institutio n/shop affected (m ²)		d House Demolition (m ²)		Enterprise/institutio n/shop affected (m ²)		Affec peop (Pers	eted ble on)	To comper composition (10 ⁴ Y	tal nsation sts Yuan)
	Р	А	Р	А	Р	А	Р	А	Р	А	Р	А		
Yantai	59.5	60.9	296.6	303.8	-	-	-	-	77	59	289.4	426.3		
Heze	366	346	-	-	-	-	-	-	350	271	668	658		
Weifang	102.7	65.9	-	-	24426	17694.1	-	-	225	113	1185.3	1780.8		
Gaomi	74.5	55.0	1211.8	1167.6	-	-	-	-	119	108	368.5	302.6		
Zaozhuang	551.8	753.4	-	-	107373	77056.7	10387. 7	16090.8	3228	3548	11246. 6	23824. 2		
Qixia	59.35	50.1	393.5	149.5	-	-	-	-	121	121	376.6	276.2		
Subtotal	1214	1331.3	1901.9	1620.9	131799	94750.8	10387. 7	16090.8	4718	4220	14134. 5	27268. 1		
Huantai [*]	177	0	1218.5	0	0	0	0	0	83	0	614.5	0		
Total	1391	1331.3	3120.3	1620.9	131799	94750.8	10387. 7	16090.8	4801	4220	147490	27268. 1		

Table 1 Comparison of Actual and Planned Resettlement Impacts of the Project

*Note: Huantai dropped out of the project in 2010.

All APs were resettled properly according to the RAP. The implemented compensation standards for land use and house demolition were equal to or better than those stipulated in the RAP. All compensation was paid in time and all affected people were consulted fully throughout the whole resettlement process. Therefore no significant problems happened during the resettlement process. Surveys conducted among the APs in the project cities/counties indicated that the living quality of the APs is better than before and their income level has been restored and improved. Table 2 below presents the results of income restoration of sampled affected households in the project cities/counties.

Of all the project affected population, only 23 people (from 9 households) were classified as belonging to vulnerable groups in Zaozhuang and Heze sub-components. After land acquisition and housing demolition, the local government guaranteed their living standards would not be adversely affected. A variety of training courses and employment information were provided to the family member of vulnerable groups to improve their work skills and increase their employment opportunities.

Table 2 Income Restoration of Affected Households

Sub-component	No. of Sampled	Household Income	Increase	

	Households	(RM	(B)	(%)	Notes
		2007 (Baseline)	2010		
Yantai	8	64,000	106,000	65.6	
Heze	4	39,400	113,500	188.1	
Weifang	5	175,000 ^a	323,000	84.6	^a surveyed in 2006
Gaomi	5	138,500	167,000	20.4	
Zaozhuang					
Dongsha River	38	910,160 ^b	1,545,380 ^c	69.8	^b surveyed in 2006 ^c surveyed in 2009
Xisha River	10	248,847 ^d	267,598 ^e	7.5	^d surveyed in 2011 ^e surveyed in 2012
Qixia	10	112,600 ^f	144,800	28.6	^f surveyed in 2006

Annex 7. Performance of Project-financed Wastewater Treatment Plants

This annex provides information on the operational performance of wastewater treatment plants (WWTP) financed under the project, with respect to frequently encountered problems of over-design in terms of capacity, low influent BOD concentrations, and high treatment standards in China.

Discharge Standards for Municipal Wastewater in China

The Ministry of Environment (MOE) sets discharge standards of pollutants for municipal wastewater treatment plant for treated effluent (**GB18918-2002**). Table 1 below shows the parameters of the Chinese Standards.

Table1. Highest Allowable Discharge Concentration of Water Pollutants from Sewage Treatment Plants (Daily Average) (Unit: mg/l)

Basic Controlled Indicators		Class I Standard					
		Α	В	Class II Standard	Class III Standard		
COD		50	60	100	120 (1)		
BOD5		10	20	30	60 (1)		
Suspended Solids (SS)		10	20	30	50		
Animal and Plant Oil		1	3	5	20		
Petroleum		1	3	5	15		
Negative Ion Surface Active		0.5	1	2	5		
Agent							
Total Nitrogen (as N)		15	20	-	-		
NH3-N (as N)		5 (8)	8 (15)	25 (30)	-		
Total P	tal P Built before Dec		1.5	3	5		
(as P)	2005						
	Built before Jan 1,	0.5	1	3	5		
	2006						
Color (dilution magnitude)		30	30	40	50		
PH		6-9					
Bacillus Coli (count/l)		1000	10000	10000	-		

Notes: (1) Removal rate indicators should be higher than 60% when inlet water COD is higher than 350 mg/l, higher than 50% when BOD is higher than 160 mg/l;

(2) Values outside brackets refer to controlled values when water temperature is >12 °C, those inside refer to controlled values when water temperature is ≤12 °C

The Provincial Environment Protection Bureau (EPB) is responsible to assure that the MOE mandates are complied with in Shandong Province. Due to the importance attached to the north-south water transfer scheme and protection requirements for the Bohai Sea, WWTPs in Yantai and Qixia were required to adopt the Class 1B discharge standards for treated effluent. All WWTPs constructed have monitoring stations that are directly linked to the Provincial EPB monitoring system. Non-compliance invokes sanctions generally in the form of fines, and in the extreme cases, suspension of operations.

Project-financed WWTPs. Two treatment plants were constructed under the project, (i) Yantai Xinanhe WWTP (80,000 m3/d); and (2) Qixia EDZ (20,000 m3/d). Details of the WWTPs and their operations are provided below.

(a) <u>Yantai Xinanhe WWTP</u>

This sub-component was completed in November 2008. The completed works include: 16.5km wastewater collection networks including a 20,000 m3/day pump station; expansion of the existing 40,000 m3/d WWTP by 80,000 m³/d (total 120,000 m3/d), to meet Class 1B discharge standard; and a 3.13 km long sea outfall.

At design stage, the parameters of influent BOD and COD concentrations used were 280 mg/l and 580 mg/l, respectively. By the end of 2013, the average daily wastewater treatment volume was 105,000 m3/d, corresponding to 87.5% of the designed capacity of 120,000m3/d. Table 2 provided the influent/effluent concentrations for January to September 2013.

Table 2	Influent/effluent BOD	concentrations for	January to Se	eptember 2013

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Influent	132.0	94.5	143.0	170.0	240.0	171.0	139.0	125.0	168.0
Effluent	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

(b) <u>Qixia WWTP</u>

The 20,000 m3/d WWTP, as originally planned, was to collect and treat wastewater generated from an economic development zone (EDZ) established around the time of project appraisal. During project implementation, a Government decision mandated the high water consuming industries will not be permitted in the EDZ. This decision had an impact on the quantity of wastewater that will be generated from the EDZ. The matter was further complicated by the slow take up of plots in the EDZ, resulting in inadequate flows to operate the WWTP. The WWTP could not be commissioned for use by project closure.

As the Qixia Government had plans to de-commission an old WWTP which is within the built-up area of the city, which happens to be prime valuable land. A decision was made, therefore, to accelerate the decommissioning of the old WWTP, by diverting wastewater generated in the city to the project-constructed WWTP. Using own funds, Qixia city has commenced construction of a 30.2 km long sewer to convey city wastewater to the project-financed WWTP. About half the length of the pipeline was completed at project closure, and the sewer is expected to be completed by mid-2014. Upon completion of the pipeline, the Qixia WWTP will be commissioned and put into operation, utilizing the full 20,000 m3/day capacity in the second half of 2014. Data on the influent water quality and other operation al details were not available at the time of the preparation of the ICR.

Conclusions. The capacity utilization in the expanded Yantai WWTP is satisfactory, with 87.5% utilization. The design influent BOD was 280 mg/l, but the actual BOD concentrations reaching the WWTP was highest in May (240 mg/l) and averaged about 55% of the design BOD concentration. The lower influent BOD can be attributed to two possible reasons: (i) about 20%-30% is removed in the septic tanks, or (ii)high levels of infiltration. The adoption of Class 1B discharge standards was necessary to protect sensitive water bodies, and to meet the requirements of the MOE.

Annex 8 Summary of Borrower's ICR

The following is a summary of the Borrower's Implementation Completion Report (January 2014), prepared by the Shandong Provincial Project Management Office on behalf of the Shandong Provincial Government. The full report with annexes is available in the Project File. (The Borrower's ICR contains 10 Appendices, and reference is made to these Appendices throughout this Annex)

1. Assessment of Project Objective and Quality at Entry Original Project Objectives

The project development objectives are described in the main text of the Bank ICR, and the Project Appraisal Document (PAD) (36316-CHA, January 30 2007), and are not repeated here.

Quality at Entry

To ensure the quality of project preparation, an international consulting company, was engaged to assist the project cities to provide design review and advisory services. To ensure successful preparation and implementation of the project, the provincial government set up a robust structure of project management arrangements comprising project leading groups and PMOs at both provincial and city levels, replicating proven arrangements from earlier Shandong projects, which were retained throughout the implementation period. However, looking back, with the benefit of hindsight, reveals a number of concerns over the quality of preparations for the "soft" non-infrastructure aspects. These are documented in Section 6 (lessons learned).

2. Achievement of objectives and Outputs Outcome/Achievement of Objectives

The project has undoubtedly contributed to the high level objectives as set out in the PAD. In particular, both the loan-funded project components and the GEF grant component have contributed to reducing pollution discharges to the Bohai Sea and East China Sea – most especially the wastewater interventions in Yantai (which include the GEF intervention) and Weihai, both of which are coastal cities. These actions are examples of China meeting its obligations under international treaties to reduce pollution discharge to sensitive coastal waters.

The project made positive impacts and benefits to both the environment and communities in the project cities, including reduced untreated wastewater discharges, improved water supply systems, improved solid waste collection, transportation and disposal, and community and economic development. The Yantai GEF pilot project contributed to a reduction in land-based pollution discharges from other cities reaching the marine environment. Where relevant, the project interventions allowed the project cities to meet the SPG 2010 targets for wastewater and municipal solid waste management. Appendix 9 and Appendix 11 provide details of the project environmental benefits, specific environment benefits of the GEF pilot project.

Achievement of Project Components

All physical works for nine participating cities/counties, including pilot GEF-supported septic tank management activity, were completed and the objectives were largely achieved. The institutional development and capacity building programs for project owners, SPHURCB, SPFB, SPEPB and local government decision-makers were implemented as agreed (see section 2.6 below).

A comparison of original physical components (Components 1, 2 and 3) and as-built components, and project costs are provided in Annex 2 and Annex 3, respectively, of the main Bank ICR, and are not repeated here. Details are also provided in Appendix 1 and Appendix 3 of the Borrower's ICR.

Procurement

The procurement of all the project contracts was undertaken in accordance with the Bank Guidelines, and anll PIUs acknowledged the fair and high management standards of the bidding process. PIUs questioned the requirement to award contracts to the lowest responsive bidder. However, the bidding procedure itself undoubtedly was beneficial to the employers. Appendix 5 provides procurement details.

Economic Benefits

The Project has undoubtedly contributed to the Government's development objectives of sustainable economic growth, rural to urban economic migration and the creation of liveable cities. Economic output in the project cities has increased from RMB 637.12 billion in 2005 to RMB 1963.7 billion in 2012, an increase averaging 17.4% per annum. Specific benefits at the city level are discussed in Appendix 6.

The forms of direct economic benefits are variable due to various natures of different sub-components. Specific benefit streams have included: (i) flood protection, enhanced property values, amenity and tourism benefits from river rehabilitation; (ii) public health benefits, improved water quality in rivers and coastal waters from wastewater sub-components; (iii) meeting increasing demand, and health benefits by water supply component; and (iv) job creation and economic incentives by all sub-components.

Financial Performance

The financial viability of the Project's water and wastewater components and Rizhao municipal solid waste component were assessed based on the ability of the relevant utility tariff to generate sufficient revenues for the project companies to meet their principal financial targets. These targets, which were also covenanted, with a cost recovery ratio of at least 1.0 and debt servicing coverage of at least 1.3, and set on the assumption that related financial and institutional reforms took place that would allow all related water, wastewater and solid waste charges revenues to be transferred to the relevant project companies. However these financial and institutional reforms were neither covenanted nor included in the project design, and have never taken place in the wastewater and municipal solid waste sectors. As a result, some technical non-compliance with the financial covenants have been reported annually to the Bank, even worse, local governments have been reluctant to increase water and other public utility tariffs in recent years. However, where revenues have fallen short of full cost recovery, all local governments have ensured the O&M costs of these key public services have been fully funded.

The other sub-components of the project were deemed as "non- revenue generating" at project appraisal and therefore justified by assessing the financing sustainability of required budgetary support from the relevant local governments. Government revenues have grown stronger substantially over the period of project implementation, therefore the fiscal sustainability has enhanced further.

As explained in Appendix 11, the financial sustainability of the septic tank management in Yantai was strengthened during the design and implementation of the GEF grant component by integrating septic tank management by a broader management and financing of the wastewater services in the city. This approach will be recommended to other cities where relevant, and the experience of Yantai has already been widely disseminated in and out of Shandong.

More information related to the Project companies' financial performance and the current status of local government fiscal sustainability is in Appendix 8 of this report.

Construction Management

The construction management practice of all agencies involved in implementation has improved through their adoption of the institutional strengthening and training package.

These arrangements enabled project construction to be carried out to a satisfactory standard and in a timely manner, such that most of physical works were completed well in advance of the original loan closure date. Effective construction management was a key factor for the successful completion of most contracts.

Land Acquisition and Resettlement

Land acquisition and resettlement of affected residents was undertaken in accordance with the RAP approved by the World Bank and endorsed by SPG. Resettlement compensation made generally good progress. All affected residents were resettled properly and received full compensation. External monitoring indicates that the income level of affected residents is higher than before the project and their standard of living has recovered or improved. Detailed information on implementation is provided in Annex 9, and Appendix 10.

Environmental Management and Environmental Benefits

During project implementation the PIUs carried out environmental management work in compliance with the project legal documents including the EMP. The project has achieved significant positive environmental impacts, such as improving the quality of water supply, reducing pollution of rivers and promoting appropriate solid waste management, and these impacts are beneficial to public health and the quality of urban life.

Environmental improvements achieved at project closure include: (a) extension of wastewater facilities and river course rehabilitation have improved sanitation conditions and flood protection for about 2,017,000 people (the target was over 1,100,000 people). About 730,000 people (the target was about300,000 people) received access to new piped potable water supplies and 1,122,000 people (the target was 1,100,000 people) have benefitted from the provision of upgraded solid waste collection and treatment facilities; (b) the volume of wastewater treated reached 239.6 million m3/year (target was 226 million m3/year) and annual pollution abatement1 reached 22,579 tons of BOD (target was 22,080 ton/year), 4,640 tons of NH3-N (target was 4,031 ton/year), 673 tons of total phosphorus (target was 309 ton/year) and 43,437 tons of SS (target was 29,393 ton/year); (c) the volume of municipal solid waste collected and transferred to sanitary landfill reached 351,660 ton/year (target was 450,775 ton/year). The actual population growth for Heze and Rizhao did not reach the prediction made during the project appraisal stage, so the volume of municipal solid waste collected and transferred to sanitary landfill solid waste collected and transferred to sanitary landfill did not exceed the 2013 end target; and (d) urban water supply production reached 25.1 million m3/year (the target was 53.3 million m3/year). More information related to EMP implementation and the environmental benefits resulting from each sub-component are shown in Appendix 9.

¹ Qixia EDZ WWTP has not put into operation yet, so the pollution abatement in terms of BOD, NH3-N, TP and SS is 0; and Weifang's data not available

Poverty Alleviation and Social Impact

Achievements in poverty alleviation and social benefits included: (i) significant local temporary job opportunities and over 200 new permanent jobs in O&M; (ii) health benefits to a population of 730,000, including 340,000 in fluoride-affected areas; (iii) public health and amenity benefits from improved flood control; (iv) extending solid waste collection and closure of unsanitary refuse dumps; (v) increased wastewater collection and treatment (including improved quality of coastal bathing waters in Yantai and Weihai); (v) equal access to services by the poor and vulnerable people including improved affordability due to rising income levels across the social spectrum' (vi) all displaced persons benefited from strict application of the Bank's policies on involuntary resettlement, thus mitigating the main social risk identified at project appraisal; and (vii) social benefits of the Yantai GEF project, including better residential environments by eliminating septic tank overflows, reducing pollution of the sea, improving the quality of bathing beaches and reducing the possibility of the spread of contagious diseases.

3. Major Factors Affecting Implementation and Outcome

Factors outside the control of the local government or the implementing agency

The exchange rate of US\$ with RMB was steady 1:8.27 up to July 2005, but fell to around 1:6.05 by loan closure in December 2013. This total fall of over 25% significantly reduced the real value of WB loan and increased the level of counterpart funding required as most contracts were denominated in Chinese RMB rather than US dollars.

Huantai County decided for its own reasons to withdraw from the project at a very early stage. This necessitated a project restructuring and the Zhoucun sewerage and river rehabilitation sub-component being introduced.

Factors under the control of the local government

Water, wastewater, and municipal solid waste user tariffs have not kept pace with inflation let alone increased to recognize the improved services now offered as a result of the project. This failure to act on the part of local governments has increased the level reliance on government subsidies, made involvement less attractive to the private sector, and further reduced the limited financial autonomy of the project implementing agencies (as well as compromising compliance with financial covenants in the loan legal documents). Qixia EDZ Administration has still to implement any wastewater tariff.

Weifang government made several changes of mind and had long period of indecision in what wastewater treatment solution should be implemented for the area benefiting from the WB funded sewerage improvements. Although a solution is now being implemented via local funding, the achievement of a successful outcome was delayed and loan savings of about US\$ 10.9 million resulted.

Factors under the control of the PIUs

The WB guidelines that the contract should be awarded to the bidder who offers the lowest substantially responsive bid was questioned by most PIUs. Some issues have occurred where contracts were awarded on the basis of the lowest cost with the contractor subsequently trying to increase its payments through variations and claims as a result of ambiguities in the contract documents. It has therefore been identified that contract documents in general should be of a higher quality to prevent the malign competition with low price bidding.

Although loan was allocated to each PIU for local training initiatives, most of these funds have not been used due to various reasons. The loan was intended for the PIU to identify their training needs in order to enhance technical, financial or institutional capability.

Staff changes occurred during the project preparation and implementation which caused some difficulties. In most cases, there was no proper transition arrangement for staff changes resulting in a negative impact on the project implementation, such as impeding project monitoring by not providing updated information or data in time.

Costs and Financing

Costs. A breakdown of project costs by components is provided in Appendix 3 where the final project costs are compared with those identified in the PAD. Total project costs (including GEF) identified during project appraisal were US\$ 281.11 million (refer to Annex 5 of the PAD), of which the total project cost for the loan project was US\$275.71 million and the cost for the GEF project was US\$5.4 million. The detailed completion costs for each of the project components are included in Appendix 3 of this report.

Financing. Comparison of the final financing plans with that included in the PAD for the loan and GEF grant parts of the project are available in Annex 2 of the ICR. Counterpart funding sources included: state bonds, provincial government provision, and local finance from municipal government and the PIUs. The final financing ratio of Bank loan to counterpart financing was 50.5% to 49.5%. During project appraisal, that ratio was estimated to be 53.3% to 46.7%. The ultimate financing ratio of GEF Grant to counterpart financing was 58.9% to 41.1%. During project appraisal, that ratio was estimated to be 92.6% to 7.4%, with the significant difference resulting from additional investment made by Yantai into its facilities for managing septage.

4. **Project Sustainability**

Prospects for Sustainability. We recognize sustainability of the Project needs to be viewed in terms of (a) whether an appropriate institutional arrangement has been set up to provide for managerial autonomy and sustainability; (b) the ability of assigned institutions to operate and maintain the facilities; and (c) financial sustainability. In our view the overall Project can be considered largely sustainable against these criteria, but there are some reservations. Except in Qixia, where O&M capacity has yet to be tested, all facilities are being well operated and maintained. Although all local governments are providing sufficient budget or subsidies to ensure project operations are fully financed, tariffs are generally not at a level that provide for financial sustainability.

Ensuring sustainability was a key design feature of the GEF grant funded septic tank management (STM) study in Yantai, where the new management method clearly defines institutional responsibilities for STM, and financing of the service has been integrated with wastewater management. Project sustainability is briefly discussed in paragraphs 4.2 through 4.4 below and in further detail in Appendix 7. In summary, institutional sustainability is mixed, financial sustainability rests on the adequacy of continued budgetary subsidies from local government in almost every case, and operational sustainability can be considered to be well assured except in Qixia.

Institutional and Managerial Sustainability. In the case of the Gaomi, Rizhao, and Weihai components, the IAs were already well established operating units experienced in relevant public utility management. All three are legally and nominally managerially autonomous but with autonomy partially compromised due to a lack of financial autonomy or the fact they are closely supervised by government departments. However, if there was the political will they could easily be made more fully autonomous. In the case of Heze, Yantai and Qixia, the PIUs were newly formed companies that are now also responsible for O&M

of the project facilities. Here is staffed in a manner that would facilitate similar autonomy to Rizhao, but the Yantai and Qixia PIUs are currently not viable as independent institutions.

Financial Sustainability. Financial sustainability for revenue generating sub-projects should be judged by the cost recovery rate. This was referred to in paragraph 2.5 and is discussed in more detail in Appendix 8. Currently only Gaomi water sub-component can be considered financially sustainable and this is further assured by recent policy announcements at national level that will result in significant increases in water tariffs. All the wastewater implementing agencies are still financed via budgetary transfers, which make no provision for depreciation. Thus technically they are not sustainable in financial terms as budgets and capital investment funding cannot be assured into the future - however, at the present time for all project components, the budgets are adequate for full funding of O&M requirements in 8 of the 9 cities. In Qixia, the project facilities have yet to be brought into operation.

Operational Sustainability. In 8 of the 9 cities the project facilities are being operated satisfactorily and staff are adequately trained. In some instances, such as Yantai, Rizhao, Gaomi, Weihai and Heze, the project facilities have already been operational for a number of years and operational sustainability can be fully assured based on this experience. The only concern relates to Qixia in view of the fact the new WWTP cannot yet be brought into operation and therefore the sustainability of future operations cannot be assured at this time.

5. The Bank and Borrower Performance

Bank Performance. From the Borrower's perspective the actual performance of the Bank has been somewhat mixed. Whilst good advice on technical design was provided during project preparations, the monitoring and evaluation framework and associated performance indicators proved to be poorly designed and the established performance baseline was inadequately documented. Also some Bank stipulations in the legal documents were inappropriate (especially the requirement to on-lend to agencies with no financial capacity to repay, an issue referred to in the Design Review and Advisory Consultant's report, and which repeated mistakes from other projects).

During implementation, the Bank has been generally supportive and responsive, although there have been frustrating delays in obtaining some "no objections" where there was no obvious reason for any delay. From the governments perspective there could also have been more flexibility shown by the Bank in dealing with the changes proposed in Weifang, leading to a lost opportunity to fully utilize the loan.

Borrower Performance. The national and provincial government's commitment to the project remained strong and supportive during all phases of the Project. Local governments also generally performed well as evidenced by the fact that all physical works were completed on schedule, almost all loan covenants were fully complied with throughout project implementation, safeguard activities were mostly well managed, there were no instances of mis-procurement and only minor technical matters were raised during financial audits. Details of covenant compliance are provided in Appendix 12.

However, exceptions to this general high level of performance were (i) Huantai government's action to withdraw from the project, (ii) changes and delays in implementing an effective wastewater treatment in Weifeng (with consequential loan savings resulting), (iii) protracted delays in handling resettlement issues in Zaozhuang, and (iv) the reluctance on the part of all local governments to increase water, wastewater and MSW user tariffs.

6. Lessons Learned

Overview. The SDEPII has been very successful with most of its original objectives achieved particularly in terms of the planned physical interventions. The entire implementation process has been a valuable experience for all the agencies involved, and much capacity building of the IAs has been achieved that

will help them with future projects. The WB loan has not just simply helped finance the Project, but has also introduced advanced management practices for project implementation and enterprise operation, such as modern project management, international practice of bidding and contracting, construction supervision, performance measurement, and the project completion evaluation. Significant capacity building in WB procurement, contract and project management, WWTP operations and maintenance, environmental monitoring, and financial management have been achieved. WB project implementation rules and procedures on procurement, contracts management and construction supervision have been broadly accepted as being fair and giving greater assurance of a satisfactory outcome. Good experience has been gained by practicing these rules and procedures, which have been replicated on similar projects not financed by WB.

Implementation Lessons

Multi Disciplinary Contracts. The PIUs expressed the view during the project completion phase that there may be some advantages in implementing projects, such as WWTP construction, by means of single multidisciplinary contracts. In two WWTP projects in Yantai and Qixia, this type of contracting approach was used. With this method, any interfaces between the different disciplines are the responsibility of a single contractor. This is a major advantage to the PIU and project owners, simplifies project management, transfers risk away from the project owner, and sharpens accountability for project delivery. Several of the PIUs now agree that such a contracting arrangement would be useful in the future.

Collaboration for inter-municipal wastewater treatment: Zhoucun and Zouping County reached agreement on cost-sharing for capital and operating costs for wastewater facilities. Measures were also put in place to monitor the quality of effluent flowing from Zouping County to Zhoucun, and to measure the volume of flows. This achievement signifies collaboration for inter-municipal infrastructure planning and construction, including collaboration between neighbouring Environmental Protection Bureaus.

Lessons for the Future

Arrangement for Utilising the Remaining Bank Loan. Although loan savings were identified from 2010 onwards and discussed with the Bank in May 2011, it proved impossible to put these saving to effective use. The main cause was the lack of a scientifically prepared proposal, acceptable to the Bank, from the Weifang Government to justify its plans as an alternative means of achieving the PDO of SDEPII. The issue remained unresolved until the middle of 2013 leaving insufficient time for utilizing the loan saving by other project cities. It is felt the issue might have been resolved within reasonable time if the SPG had intervened earlier, and the Bank had shown greater flexibility and understanding in its consideration of Weifang's plans.

Prevention of Unreasonable Contract Variations. PMOs and IAs now realize the importance of accurately preparing the bidding documents, including designs, specifications and BOQ, etc. This will benefit the PIUs by enabling unreasonable variations to be easily rebutted in future.

Annex 9. List of Supporting Documents

- (i) Project Appraisal Document
- (ii) Loan Agreement and amendments
- (iii) Project Agreement and amendments
- (iv) Environmental Assessment dated February 2006
- (v) Resettlement Action Plans
- (vi) Social Assessment
- (vii) Dam Safety Report
- (viii) Procurement Plans and updates
- (ix) Aide-memoires, Management Letters and 8 Implementation Status Reports
- (x) Restructuring Paper of January 2010

(xi) GEF Component: Project Completion Evaluation Report by ESD China Ltd.

(xii) Complete Borrower's Implementation Completion and Results Report, including ten (10) Appendices



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