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IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-12022)

ON A

GLOBAL ENVIRONMENT FINANCING TRUST FUND GRANT

IN THE AMOUNT OF US$ 5 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

CHINA HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT

June 27, 2016

Environment and Natural Resources Global Practice
China Country Office
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2016)

Currency Unit = Renminbi (RMB) Yuan
RMB Yuan 1.0 = US$ 0.15
US$1 = RMB Yuan 6.47

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AB	Agricultural Bureau
BOD	Biological Oxygen Demand
CAS	Country Assistance Strategy
CMB	City Management Bureau
COD	Chemical Oxygen Demand
CPS	Country Partnership Strategy
DPMO	Dongying Project Management Office
EA	Environmental Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FEPA	Farmers Environmental Protection Association
FM	Financial Management
FSW	Free Surface Wetland
FY	Fiscal Year
GEF	Global Environment Facility
GEO	Global Environmental Objective
ha	hectare
HRBFMDI	Huai River Basin Flood Management & Drainage Improvement
ICR	Implementation Completion and Results Report
IF	Investment Fund
ISR	Implementation Status and Results Report
MS	Moderately Satisfactory
mu	15 mu equals one hectare
MU	Moderately Unsatisfactory
NPV	Net Present Value
O&M	Operation & Maintenance
PAD	Project Appraisal Document
PIU	Project Implementation Unit
PLG	Project Leading Group
PMO	Project Management Office
PMP	Pest Management Plan

PPMO	Provincial Project Management Office
QAG	Quality Assurance Group
QEA	Quality at Entry Assessment
QSA	Quality of Supervision
RAP	Resettlement Action Plan
RMB	Chinese currency
SAAS	Shandong Academy of Agricultural Science
SIL	Sector Investment Loan
SPFB	Shandong Provincial Finance Bureau
SS	Suspended Solids
TA	Technical Assistance
TN	Total Nitrogen
TP	Total Phosphorus
U	Unsatisfactory
UNEP	United Nations Environment Program
USD	US dollars
WASP	Water Quality Analysis Simulation Program
WRB	Water Resources Bureau

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CHINA HUAI RIVER BASIN MARINE POLLUTION REDUCTION PROJECT

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A. Basic Information			
Country:	China	Project Name:	GEF Huai River Basin Marine Pollution Reduction Project
Project ID:	P108592	L/C/TF Number(s):	TF-12022
ICR Date:	06/13/2016	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	THE PEOPLE'S REPUBLIC OF CHINA
Original Total Commitment:	USD 5.00 M	Disbursed Amount:	USD 3.94 M
Revised Amount:	USD 3.94 M		
Environmental Category: B		**Global Focal Area: I**	
Implementing Agencies: Shandong Provincial Water Resources Department			
Cofinanciers and Other External Partners: NA			

B. Key Dates				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	03/22/2010	Effectiveness:	07/05/2012	06/22/2012
Appraisal:	07/25/2011	Restructuring(s):		
Approval:	02/23/2012	Mid-term Review:	09/01/2014	09/26/2014
		Closing:	12/31/2015	12/31/2015

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Unsatisfactory
Risk to Global Environment Outcome	High
Bank Performance:	Moderately Unsatisfactory
Borrower Performance:	Unsatisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry:	Moderately Unsatisfactory	Government:	Unsatisfactory
Quality of Supervision:	Moderately Unsatisfactory	Implementing Agency/Agencies:	Moderately Unsatisfactory
Overall Bank Performance:	Moderately Unsatisfactory	**Overall Borrower Performance:**	Unsatisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
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):	Yes	Quality of Supervision (QSA):	None
GEO rating before Closing/Inactive status	Unsatisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Agricultural extension and research	14	13
Irrigation and drainage	26	26
Public administration- Water, sanitation and flood protection	6	5
Solid waste management	9	6
Wastewater Treatment and Disposal	45	50
Theme Code (as % of total Bank financing)		
Environmental policies and institutions	28	15
Pollution management and environmental health	42	52
Rural services and infrastructure	10	13
Water resource management	20	20

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Laura Tuck	Pamela Cox
Country Director:	Bert Hofman	Klaus Rohland
Practice Manager/Manager:	Iain G. Shuker	Ede Jorge Ijjasz-Vasquez
Project Team Leader:	Xiaokai Li	Xiaokai Li
ICR Team Leader:	Anis Wan	
ICR Primary Author:	Anis Wan	

F. Results Framework Analysis

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

To demonstrate innovative and cost-effective water pollution control practices in Guangli river catchment area of the Dongying Municipality, contributing to pollution reduction in the Bohai Sea.

Revised Global Environment Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

NA.

(a) 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 :	Project induced reduction in pollutant/nutrient loads entering Bohai Sea from Guangli River Watershed - COD, BOD,NH3-N, TP (tons/year)			
Value (quantitative or qualitative)	0	COD: 517.6 BOD: 215 NH3-N: 134 TP: 12.9		COD: 20.67 BOD: 0 NH3-N: 0 TP: 2.34
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Not achieved. Wetland & rural wastewater treatment facilities largely completed but yet to become operational. Simulated results are shown in Section 3. The results shown above come from agricultural and rural pollution reduction.			
Indicator 2 :	Reduction in pollutants/nutrients through constructed wetlands at Dongbalu - COD, BOD, NH3-N, TP (tons/year)			
Value (quantitative or Qualitative)		COD: 430 BOD: 215 NH3-N: 129 TP:12		COD: 0 BOD: 0 NH3-N: 0 TP: 0
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Not achieved. Wetland construction completed but expected to become operational only by August 2016. Thus the actual achievements are zero. Simulated results are shown in Section 3.			

(b) 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 :	Annual volume of treated wastewater at wetlands (million m^3/year)			
Value (quantitative or Qualitative)	0	9.25		0
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. %	Not achieved. Wetland expected to be operational by August 2016. Actual results are zero. Simulated result is the same as the target, which is questionable (should			

achievement)	be 1/3 of the estimated values as the water covered area of wetland is 1/3 of the original plan).			
Indicator 2 :	Rural wastewater pollution load reduction in participating villages - COD, SS (tons/year)			
Value (quantitative or Qualitative)	0	COD: 9.3 SS: 4.6		0
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Not achieved. Only one rural wastewater treatment facility in intermittent operational, four completed construction by closing date, two completed in June 2016, one dropped out. Low water volume and O&M remain concerns.			
Indicator 3 :	Livestock waste pollution reduction in participating villages - COD, TN, TP (tons/year)			
Value (quantitative or qualitative)	0	COD: 78.3 TN: 0.743 TP: 5.883		COD: 20.67 TN: 0.196 TP: 1.55
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Not achieved. Target not achieved mainly due to lower demand from farmers.			
Indicator 4 :	Agricultural pollution/nutrient load reduction in participating villages - NH3-N, TP (tons/year)			
Value (quantitative or qualitative)	0	NH3-N: 5 TP: 0.123		NH3-N: 7.40 TP: 0.79
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Targets over-achieved despite reduced area because they were set too low. One target should be TN instead of NH3-N. It was a mistake in the PAD. In northern China NH3-N content in the soil is very low with limited value for monitoring.			
Indicator 5 :	Proportion of farmers adopting integrated and balanced fertilizer application technology in participating villages (%)			
Value (quantitative or Qualitative)	0	80		44
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Partially achieved. 55% farmer participation achieved. Applied on 1,851 ha versus the original plan of 2,278 ha of land. Fewer farmers participated due to decreasing land area and migration as a result of urbanization.			
Indicator 6 :	Number of Farmers Environmental Protection Associations Operational			
Value (quantitative or Qualitative)	0	22		10
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Partially achieved. A total number of 10 FEPAs established (registered, rules stipulated, office provided, training provided and villagers are members). But most are not fully operational and their practicality and sustainability remain unclear.			
Indicator 7 :	Number of people trained			
Value (quantitative or Qualitative)	0	4,500		4,464
Date achieved	12/31/2011	12/31/2015		12/31/2015

Comments (incl. % achievement)	99% achieved. 4,420 farmers trained (including 2,081 in Kenli county, 300 in Dongying city, 439 trained externally and joined study tours, 1,600 field training), 44 PMO staff trained and joined study tours.			
Indicator 8 :	Study of the impact on pollution reduction through constructed wetlands in Guangli River			
Value (quantitative or Qualitative)	No	Completed		Completed
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Partially achieved. Report completed but based on simulated data rather than actual monitoring data since the wetland is yet to become operational.			
Indicator 9 :	Evaluation study and management planning for Agricultural and Rural Pollution Reduction in Guangli River catchment			
Value (quantitative or Qualitative)	No	Completed		Completed
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Partially achieved. Report completed but rural pollution reduction study is largely based on simulated data because most rural wastewater treatment facilities are yet to be put into operation.			
Indicator 10 :	Development and dissemination of Huai River basin-wide replication strategy			
Value (quantitative or Qualitative)	No	Completed		Completed
Date achieved	12/31/2011	12/31/2015		12/31/2015
Comments (incl. % achievement)	Partially achieved. Report completed but largely based on simulated data because wetland and most rural wastewater treatment facilities are yet to be put into operation. Two dissemination workshops conducted.			

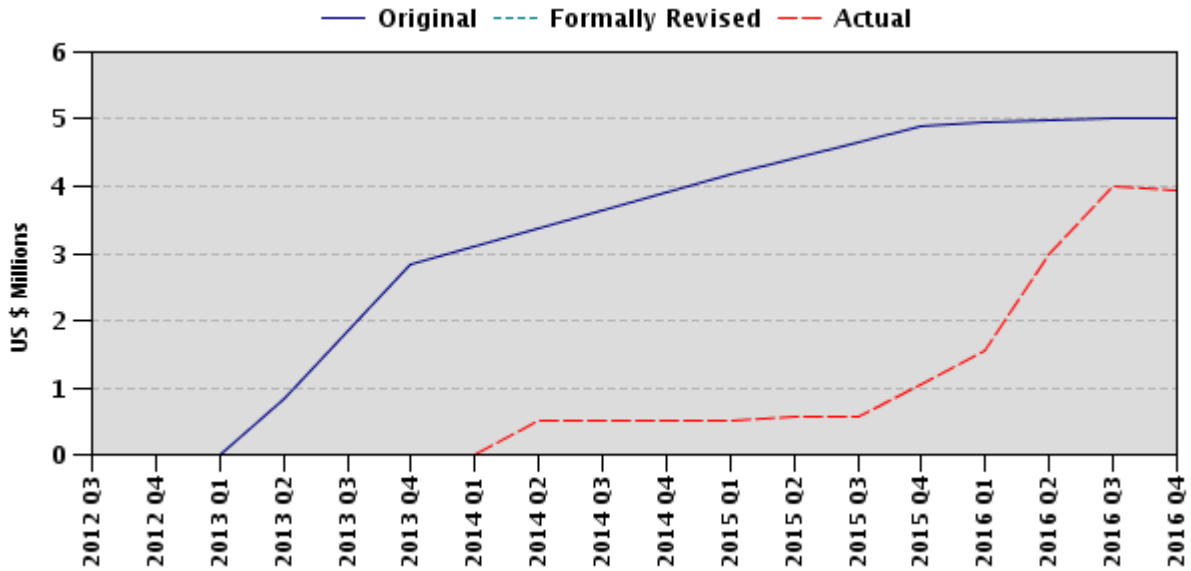
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	06/20/2012	Satisfactory	Satisfactory	0.00
2	12/29/2012	Satisfactory	Satisfactory	0.00
3	06/25/2013	Satisfactory	Moderately Satisfactory	0.00
4	03/07/2014	Moderately Satisfactory	Moderately Satisfactory	0.50
5	06/28/2014	Moderately Unsatisfactory	Unsatisfactory	0.50
6	12/30/2014	Moderately Unsatisfactory	Moderately Unsatisfactory	0.56
7	06/16/2015	Moderately Unsatisfactory	Moderately Unsatisfactory	1.05
8	12/17/2015	Unsatisfactory	Unsatisfactory	3.01

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal

Country and Sector Context

China's rapid economic growth has come at a high environmental cost. In particular, a seriously deteriorating water environment caused mostly by land-based pollution from industries, farming and domestic sources was of major concern to authorities at the time of appraisal. The majority of the rivers and lakes in the country were - and continue to be - polluted to different degrees. This had alerted Chinese policy makers and the general public to give much higher priority to pollution reduction and control and was clearly articulated in the 12th Five-Year Plan (2011-2015), which aimed to follow a green growth path. Improved water management was one of the pillars of green growth.

The Huai River Basin[1] is one of the most important water systems in China. The key development challenge in the Huai River Basin was to maintain the balance between socioeconomic development and environmental protection. With rapid economic growth in the region, the Huai River Basin had become one of the most polluted basins in China, discharging increasing quantities of nutrients and pollutants into the Bohai Sea and Yellow Sea, contaminating these international waters. Shandong Province, which has the longest coastline within the Huai River Basin, contributed more pollutant loads to these seas than any of the other three provinces. Water pollution in Dongying originated from both point and non-point sources in urban and rural areas. The municipal sewage accounted for 60%, industrial sewage for 8%, and rural wastes and agricultural runoff for about 30% as the main sources of pollution of the Guangli River, which contributes to water pollution and eutrophication in the Bohai Sea. The main issues with existing water pollution control practices were two-fold: (a) *Lack of a balanced and integrated approach to water pollution management.* (b) *Lack of effective institutional mechanism for managing non-point source (NPS) pollution in rural and agricultural areas.* The Project is in line with the Master Plan for Dongying Water City Development (2009) setting the goal to transform the Guangli River into an eco-corridor during the "12th Five-Year Plan" period, through improving water quality and the environment.

Rationale for Bank Involvement and Higher Level Objectives to Which the Project Contributed

The project contributed to China's objective of improved water resources management and pollution control. As part of the Bank's program to assist China in water resources and environmental management, the proposed project was well aligned with the Government's Long Term Strategic Plan for Water Pollution Management and Control in Key Basins and

[1] The vast majority of Shandong province is located in Huai River Basin while a small part is located in Yellow River Basin. But the Shandong Water Resources Bureau belongs solely to the jurisdiction of Huai River Commission. Therefore the GEF project is named Huai River and placed under Huai River Commission even though the Guangli River flows into the Yellow River.

Seas, as well as one of the main pillars of the Country Partnership Strategy (CPS) for China for the period 2006 – 2010**: "**managing resource scarcity and environmental challenges", and for the period 2011 – 2015.

Global Objectives for GEF

The proposed project was part of the World Bank and GEF Strategic Partnership Investment Fund for Pollution Control in Large Marine Ecosystems of East Asia (the IF), a program approved by GEF in 2005 to finance innovative demonstration projects for pollution control. The IF is managed in cooperation with the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) that has developed a Regional Sustainable Development Strategy of the Seas of East Asia. PEMSEA is also part of the regional implementation plan of the UNEP's Global Program of Action (GPA) for the Protection of the Marine Environment from Land-based Activities. The project was expected to provide incremental benefits to the baseline of the Bank-financed China Huai River Basin Flood Management and Drainage Improvement Project[2] (HRBFMDI Project) which became effective in January 2011.

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

GEO

The GEO as described in the Grant Agreement was: to demonstrate innovative and cost-effective water pollution control practices in the Guangli river catchment area of the Dongying Municipality, contributing to pollution reduction in the Bohai Sea.

Indicators

The main GEO outcome indicators of the proposed project were: (a) project-induced reduction in pollutant and nutrient loads entering the Bohai Sea from the Guangli River Watershed; and (b) reduction in pollutants and nutrients through a constructed wetland at Dongbalu.

1.3 Revised GEO (*as approved by original approving authority*) and Key Indicators, and reasons/justification

The GEO and key indicators were not formally revised.

1.4 Main Beneficiaries

The project envisaged to benefit about 1.8 million people in Dongying city (of whom approximately half are women). More specifically, beneficiaries would include: (a) farmers benefiting from improved production practices and production cost savings; (b) rural and urban residents benefiting from improved living environment and reduced water pollution

[2] It was originally planned to blend the GEF Huai River Project with the Bank loan Project (HRBFMDI). But the preparation of the GEF grant project was delayed and the HRBFMDI could not wait for it. So it became a standalone project. Also the loan project was regarding flood management while the GEF project was mostly regarding wetland construction.

in the Guangli river; and (c) fishermen benefiting from a reduced threat of eutrophication in the Bohai Sea.

1.5 Original Components

As originally approved the Project was designed to support four components (see Annex 1 for details):

Component A. Wetland Construction and Sluice Gate Operation Optimization (original base Cost: US$27.19 million):

(a) Construction of a wetland at Dongbalu consisting of a free surface flow wetland, an ecological retention pool, an entrance gate, a gated overflow weir and a pumping station, and provision of related equipment; (b) Upgrading of the automatic gate control system covering three sluice gates on the Guangli River, and the gates at the entrance and exit of the Dongbalu wetland; and (c) Provision of cash transfers to people affected by the wetland construction.

Component B. Agricultural Pollution Control and Rural Waste Management (original base Cost: US$4.59 million):

(a) Wastewater, human and livestock waste collection and treatment in participating villages; (b) (i) Introduction of agricultural pollution reduction technologies and management practices in Participating Villages through comprehensive and balanced fertilizer applications, provision and use of insect luring lamps, and construction of eco-trenches and buffer strips in crop fields; and (ii) monitoring of the results of implementation of these technologies and practices; and (c) establishment, equipping and operation of Farmer Environmental Protection Associations (FEPAs) in participating villages.

Component C. Capacity Building and Policy Studies (original base Cost: US$1.85 million):

(a) Establishment and operation of an environmental protection education and training center to be located in Dongying Municipality for training and dissemination of technologies and good practices in environmental protection, nutrient management and pollution reduction; (b) Capacity building activities to provide technical and project management training for staff involved in Project implementation and monitoring; and (c) (i) Evaluation study of the effectiveness of constructed wetlands in the treatment of polluted water based on the analysis of the Project monitoring results; (ii) development of an agricultural pollution reduction and rural waste management strategy and plan for the Guangli River Watershed in the Dongying Municipality, including an evaluation study of the related Project interventions for the purpose; and (iii) development of a Huai River Basin-wide replication strategy for cost-effective water pollution control, including dissemination and training and workshops as required for the purpose.

Component D. Project Management and Implementation Support (original base Cost: US$2.29 million):

(a) Provision of technical assistance for the review of technical designs and tendering

documents, construction quality of Project facilities, and for Project reporting; (b) Project monitoring and evaluation; and (c) Support for project management by the PMOs and PIUs.

1.6 Revised Components

The original components were not formally revised during implementation.

1.7 Other significant changes

The scope of several key activities was reduced as shown below. These changes occurred primarily due to an early change in the wetland design and the subsequent implementation delays, also resulting in cost overruns of the wetland. There was no restructuring during the implementation though to reflect the reduced scope. A detailed analysis of the individual changes and their impact on outcomes is provided in section 2.2 and 3.2.

Table 1: Completed project costs against budgeted costs

Component	Project Costs			GEF Financing		
	Original	Actual	Percentage	Original	Actual	Percentage
	(US$'000)		(%)	(US$'000)		(%)
Wetland Construction and Sluice Gate Operation Optimization	27,188	41,572.5	152.91	1,843	1,845	100.1
Agricultural Pollution and Rural Waste Management	4,591	2088.2	45.48	1,839	1,626.9	88.47
Capacity Building and Policy Studies	1,851	355.2	19.18	1,011	348.3	34.45
Project Management and Implementation Support	2,290	826.7	36.1	307	124.5	40.55
Total Costs	37,828	44,842.6	118.54	5,000	3,944.7	78.89

Changes in design for the Constructed Wetland at Dongbalu led to a significantly reduced water covered area and caused major delays. The feasibility study report included a constructed wetland of a total land area of 2,698 mu with water covered area of 2,485 mu mainly for the purpose of water treatment. In the end, the completed water covered area, i.e. the wetland area that possesses treatment capacity, was only about one-third of the original plan (874 mu versus 2,485 mu). The significant delay in completion of the wetland left no time for its operation and monitoring.

The wastewater part of sub-component B.1 was reduced. It was envisaged to support eight villages with 9,325 people and a treatment capacity of 233 tons /day. In the end five villages completed the construction of their wastewater treatment facilities covering 5,118 people, one village dropped out because it became connected to the public sewer system, while the remaining two were completed in June 2016. Due to the low water volume and implementation delays only one facility has been put into intermittent operation since September 2015.

Ecological buffer strips and eco-trenches were only partially adopted. 1,109 hectares of farmland in the six participating villages were planned to be used as buffer strips without using any fertilizers in order to reduce the TN and TP load. In reality only 10% of the designed area has been completed (4 buffer strips built instead of the planned 6) because most farmers were not willing to adopt the zero fertilizer application approach. Meanwhile, a total length of 1,709 meters of eco-trenches has been built in the four pilot

villages instead of the originally planned six villages, accounting for only 40% of the originally planned length. The effect of eco-trenches is expected to be lower than the original design because some of the side slopes of the trenches were not stabilized as designed, and the vegetation was just naturally grown plants instead of the planned plant species that had stronger capacity to absorb TN and TP.

The proportion of farmers adopting integrated and balanced fertilizer application technology in participating villages was 44% versus 80% planned. Balanced fertilizer application covered 1,862 ha versus the planned 2,278 ha of land.

Fewer FEPAs were established than planned. Annex 2 in the PAD envisaged the establishment of 22 FEPAs, with a minimum of 8 for activities under component B and the remaining 14 to be financed by non-project funds as a part of project replication. However, the results framework only showed 10 FEPAs to be established, which was a typo. The 22 EFPAs in Annex 2 was the original intention and in reality only 10 FEPAs were established because the other villages were not covered by the project investment and had less incentives to participate.

Livestock waste storage and treatment significantly reduced: During appraisal it was planned to build 1,650 livestock waste storage tanks of 3 different sizes with a total volume of 2,500 m3. In addition, a centralized composting facility was supposed to be built. At completion, 83 tanks had been built with a total volume of 660 m3, and the centralized composting facility was not built due to lower demand and concerns over O&M.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Soundness of the background analysis supporting the project, lessons learned incorporated, and the rationale for the Bank's intervention:

The project design took into account Bank's experiences with water pollution reduction and management interventions (e.g., the GEF Baltic region agricultural pollution control program). These included: (a) effective water pollution management in a basin or catchment requires an integration of pollution reduction at source and treatment of polluted water; (b) pollution reduction measures need to be prioritized in line with the government strategy and priority programs, as well as the interests of other key stakeholders, particularly for local communities; (c) design of wetlands should be adapted to local conditions, both in terms of water quality and the operating environment (e.g. temperature), and avoid excessive landscaping; and (d) a community-based approach is essential for sustainable agricultural non-point pollution control and rural waste management;

Rationale for Bank Involvement. The project supported the government‘s priorities in systematically controlling pollution in heavily polluted river basins including the Huai River by reducing land-based pollutants to international waters such as the Bohai Sea and Yellow Sea. The design was consistent with the Bank Group‘s Country Partnership Strategy for China (CPS dated May 23, 2006), which required that the Bank Group helps China mainstream environmental concerns into the development process. "Taking steps to minimize water pollution" and piloting and scaling up "policies and mechanisms to address

agriculture non-point pollution" were among priority Bank engagement areas. The project also fit with the regional PEMSEA strategy (of which the IF is a partner), which promotes sustainable development in the region.

Assessment of project design.

Overall, the project objectives were clearly stated and responsive to China's priorities, while meeting the Bank's goals as set out in the CAS. The components were broadly designed to match the project objectives. Environmental and social factors were adequately incorporated into the design. Environmental impacts were expected to be largely beneficial, with any potential minor negative impacts readily mitigated by project interventions. However there were several design shortcomings which in hindsight affected project performance during implementation:

Institutional arrangements caused difficulties in cross sectoral coordination: Since this Project was originally associated with a Bank supported loan Project - Huai River Basin Flood Management and Drainage Improvement Project (HRBFMDI) - its institutional arrangement was inherited from the HRBFMDI Project. The Shandong Provincial Project Management Office (PPMO) for the HRBFMDI Project was set up in the Water Resources Bureau (WRB) and also served as the PPMO for this project. Therefore the Dongying Municipality Project Management Office (DPMO) was also located in the Water Resources Bureau, with Project Implementation Units (PIUs) established in the three implementing agencies (Water Resources Bureau, City Management Bureau, and Agricultural Bureau). This arrangement made cross sectoral implementation difficult because WRB is only a sectoral bureau that is at the same administrative level as the other two IUs and thus has little authority to lead and coordinate. Originally it was planned to blend the GEF operation with the IBRD loan. In the end it became a standalone GEF project because the preparation of the associated HRBFMDI loan Project was much faster and could not wait for the GEF.

The implementation period of three and half years seemed too short. It typically takes at least two years for a wetland to be designed and physically constructed. Establishing the plants in the wetland, growing them to maturity and reaching full biological effectiveness and capacity will typically take another two years. It is only at that time that the pollution reduction effect of the wetland can be measured, monitored and evaluated, which may take another year. Therefore, a five year implementation time frame would have been more appropriate.

GEO and key indicators were not fully aligned: The GEO was to demonstrate innovative and cost-effective water pollution control practices in the Guangli River catchment of Dongying Municipality, contributing to pollution reduction in the Bohai Sea. It combined objectives at two different levels, with the demonstration effect pitched at the project level while the contribution to pollution reduction in the Bohai Sea being a higher level objective, with, however, very limited overall contribution compared to the size of Bohai Sea. Moreover, the two GEO level indicators both focus on measuring pollution reduction effects, without measuring the demonstration effect, innovation and cost effectiveness of the water pollution control practices.

The design of project components and activities was too complex: The project aimed at an integrated approach to pollution reduction by including non-point agricultural and rural

pollution. While conceptually sound, given the limited funding and tight implementation period, tackling these two sets of issues cutting across three sectors, in addition to an already challenging task of wetland construction, seemed over-ambitious.

The Farmer Environmental Protection Association (FEPA) lacked community ownership. While being an important innovation at the time of appraisal, FEPA seemed to lack a more thorough analysis of prior experience elsewhere and more in-depth consultations with the communities. In reality, farmers were not enthusiastic due to a lack of ownership within the community and a lack of financial sustainability. In their eyes, environmental protection is of a public goods nature and thus should be the government's responsibility. The original idea was to replicate the successful experience from Water User Associations. But the latter was feasible because it is directly linked to farmers' agricultural production and household benefits, which is not the case with FEPA. Therefore farmers had few incentives to actively participate.

The design of the rural wastewater treatment facilities appeared inefficient due to low water volume. The domestic wastewater systems were only designed for laundry, kitchen and shower wastewater and did not include toilet water. Also, a large number of farmers have become migrant workers leaving behind only the elderly and children in the villages. The relatively big investment in rural wastewater systems appears inefficient compared to its low usage, without connecting to toilet water as the biggest source of domestic wastewater.

Government commitment and stakeholder involvement

During project preparation the local (Dongying municipal) government was committed to the project objectives and innovative approach. It provided institutional and human resources support, set up the PLGs and PMOs at various levels and made commitments to providing counterpart funding. However, after project approval there were frequent changes of leadership during implementation. As a result, the municipal government priorities and policies changed. This led to substantial changes to the original wetland design very early in the project resulting in significant implementation delays.

During project preparation efforts were made to consult stakeholders to give a demand driven character to investments. Meetings and consultations were held at all levels, including with communities, government agencies and the private sector. The results of consultation were incorporated into the project design where appropriate. Yet, there seemed to be a lack of deeper understanding of some of the project objectives, which contributed to the fact that some project activities were not fully implemented as planned. For example, the villagers were not very active joining the FEPAs because their purpose and benefits were not totally clear. Some farmers were not willing to use their land as buffer area without using fertilizer at all due to concerns of reduced agricultural productivity, leading to significantly reduced total buffer area.

Assessment of risks. At project concept stage, the Project team identified the risks to achieving the PDO in the various risk categories and listed the proposed mitigation measures: (a) setting up a multi-sectoral project leading group, and agreeing upfront on the division of responsibility amongst the different agencies and the coordination mechanism; (b) hiring competent technical and implementation support consultants, and providing targeted training for project staff; (c) enhancing ownership of beneficiary communities

through continued public awareness raising activities, financial subsidy and affordable contributions, and establishing FEPAs to institutionalize communities‘ self-management; and (d) provision of implementation support on technical aspects and on project management by qualified staff during Bank missions.

The overall risk rating for the project, implementing agencies’ capacity and project complexity were all rated Medium, which proved to be too optimistic. The risk assessment underestimated the difficulties with multi sector coordination and project complexity which caused substantial challenges during implementation. It also underestimated the risk of getting communities’ incentives in place for successful participation in the FEPAs. Similarly, the risks of successfully implementing rural and agricultural non-point pollution activities were also higher than expected. One of the mitigation measures - hiring competent technical and implementation support consultants, and providing targeted training for project staff did not materialize as planned. The originally planned international consultancy was not hired. Instead the PMU used counterpart funding and hired local consultants.

The risks of changed government priorities, rapid urbanization which affected several activities, and insufficient technical support service for non-point pollution reduction activities were not identified at appraisal.

The Bank’s Quality Assurance Group (QAG) did not conduct a Quality at Entry Assessment (QEA) for the project.

2.2 Implementation

The following factors have affected project performance during implementation:

Changes in design for the constructed wetland at Dongbalu caused major delays. The original design in the feasibility study report included a constructed free-surface flow wetland with a total land area of 1.8 km^2 mainly for the purpose of water treatment. This originally constituted approximately 75 percent of the total project investment (90% at completion). However, before the preliminary design in line with the approved project feasibility study was developed, a decision to instead build a wetland leisure park had been made by the Dongying municipal government under new leadership. The earthworks for the new leisure park design were completed within a short period of time without obtaining agreement from the Bank. Wetland bed preparation was based on a water park design and later had to be adjusted to meet water treatment wetland design standards at significant additional cost.

As remedial measures the World Bank missions in 2013 proposed a number of improvements to the wetland design to ensure that it would be able to serve the intended water treatment functions to the extent possible. It took one and half years of extensive discussions between the Donging government and the Bank to finally agree upon a compromise design at the end of 2014 that was financially and technically realistic to salvage the situation. Some of the earth was backfilled and eventually it took nine months to complete the construction and planting works by September 2015 based on the revised wetland design, at a much smaller scale. In the end the completed water covered area, i.e. the wetland area that possesses treatment capacity, was only about one-third of the original plan in the feasibility study report (874 mu versus 2,485 mu). And the pollution reduction

effect of the treated water estimated to be much lower than expected. The significant delay of the wetland construction left no time for its operation and monitoring and evaluation. It also had an impact on other components because the implementing agencies of other components were concerned that the Project had a risk of being cancelled if agreement could not be reached on the design of the biggest component – wetland, and therefore were hesitant to proceed.

Provision of counterpart funding was delayed. The Dongying municipal government made a commitment to allocate counterparts funds for the wetland component, but the planned budget was not used for the first year due to the project design change and delay and could not be carried over to the second year. During the second year a change of leadership at the municipal government led to misunderstandings and thus the project missed the annual budgeting process. As a result during almost 2 out of the 4 years of implementation counterpart funds were not provided on time. Only after the Provincial Financial Bureau and the Bank intervened counterpart funding was eventually provided for the relevant project activities. This was one of the main reasons for the implementation delay.

Pumping station remains to be completed. Another reason for the wetland not being operational was that the pumping station located at the north end of the wetland has yet to be completed. The civil works of the pumping station had been finished and the pump had been purchased. Yet as part of the master plan the Dongying government later decided to increase the capacity of the pumping station and planned to purchase another pump with larger capacity to pump water from the Dongbalu and the other two wetlands to be constructed by the government funding. The pumping station is expected to be completed around August 2016.

Survival rates were low due to high salt content of the soil and delayed planting: The implementation delay caused the project to miss the optimal planting season of April/May 2015. Soil leaching to address the high salinity issue took quite some time and planting only started in June but was slower in July and August due to the flooding season and was completed in September 2015, which was not a good season for the macrophytes to germinate and grow. This was exacerbated by the higher than expected salt contents in the soil of the wetland despite the leaching process. So the survival rate was only about 50%. As remedial measures the implementing agency and contractor have signed a contract to ensure that they would carefully manage the water/salt conditions, replant as needed in the spring of 2016 to increase the plant survival rate to a satisfactory level (designed survival rate was 80- 85% or above).

Water volume collected for the wastewater treatment facilities was low: The wastewater part of sub-component B.1 was supposed to support the construction of rural domestic wastewater treatment works in eight selected villages located in the upper reaches of the Guangli River Basin. Among which one village dropped out because its sewers were already connected to the urban domestic wastewater treatment plant. Four villages have completed the construction of their wastewater treatment facilities. One village changed the design from a waste water stabilization pond to artificial wetland treatment with reduced effectiveness, as this community lives closer to the sewage facility and expressed concerns about odor and potential safety risks. Two villages (financed by counterpart funding) experienced delays and were completed in June, 2016. The treatment facilities in the above mentioned five villages cover 5,118 people (127 ton/day) compared to 9,325

people (233 ton /day) as originally planned. Furthermore, the wastewater volume collected from the project households is low because 1) the domestic wastewater design only included laundry, kitchen and shower wastewater but did not include the biggest source - toilet water; 2) more and more farmers have become migrant workers and left only the elderly and children behind in the villages. During implementation the Bank team recommended that the wastewater system should include toilet water but the investment to renovate toilets should be borne by farmers. However, farmers showed little interest and thus this did not materialize in the end. Due to the low water volume and implementation delay only one facility has been put into intermittent operation (since September 2015) by project close. The main issue remains to be whether sufficient sewage can be collected and the facilities could be sustainably utilized with sound O&M measures.

Livestock waste storage and treatment facilities were reduced due to lower demand: It was planned to build 1,650 livestock waste storage tanks of 3 different sizes with a total volume of 2,500 m^3. In addition, a centralized composting facility was supposed to be built, which would include (i) a manure collecting system to collect livestock wastes from all animals in two villages, (ii) an aerobic composting workshop to treat collected manure and produce organic fertilizer, and (iii) a liquid distribution system to convey livestock liquid wastes for irrigation and land application. In reality 83 tanks have been built with a total volume of 660 m^3, and the centralized composting facility was not built due to concerns over O&M, particularly during low temperatures in winter. The number of storage tanks is significantly lower than the original plan due to lower demand as a result of the reduced number of livestock households in the villages. With more people working outside the villages as migrant workers livestock production is shifting from scattered smallholdings towards larger scale farms. Also, the originally designed storage tanks were mostly 1 m^3, which were too small for practical use.

Balanced fertilizer application[3] was partially implemented due to decreasing farm land area. Ten villages participated in the program and received subsidies for purchase of balanced fertilizer. The original design was to cover 2,278 hectares of land while the actual result was 1,862 hectares, partly due to the overall decreasing cropping area as a result of urbanization, and also the implementation delays. Training was provided to farmers to enable them to better understand its benefit, introduce the concept of eco- farming, and increase utilization effectiveness of the fertilizers while reducing water pollution. Farmer interviews confirmed that there was a high level of community participation. At the same time technical assistance and services need to be improved to help farmers increase awareness of its linkage with pollution reduction and achieve better results.

Construction of buffer strips and eco-trenches was partially completed due to low commitment from the communities. 1,109 hectares of farmland in the six participating villages were planned to be used as buffer strips without using any fertilizers in order to reduce the TN and TP inflow into the Guangli River. In reality only 10% of the designed area has been completed (4 buffer strips built instead of the planned 6) because most farmers were not willing to adopt the zero fertilizer application approach due to concerns

[3] The target for agricultural non-point pollution should be "Total Nitrogen" instead of "NH3-N", as shown in the feasibility report. It was a mistake in the PAD. In northern China NH3-N content in the soil is very low with limited value for monitoring.

over lower productivity. Meanwhile, a total length of 1,709 meters of eco-trenches were built in the four pilot villages instead of six planned villages. The effect of eco-trenches turned out to be lower than the original design because some of the side slopes of the trenches were not stabilized as designed, and the vegetation was consisted mainly of naturally grown plants instead of the planned plant species that would have had stronger capacity to absorb TN and TP.

FEPAs were established but not fully functioning. It was planned to establish a total of 22 FEPAs in 22 villages, including a minimum of eight FEPAs to be established linked to project activities under sub-components B rural waste treatment and agricultural pollution reduction, and another 14 FEPAs to be also funded by the Project but linked to pollution reduction activities financed by non-project funds as a part of project replication. The purpose was to enable farmer communities to participate collectively in environmental protection project activities, to take responsibility for O&M, and to replicate best practices in their respective villages. In reality, only 10 FEPAs were established in 10 villages (registered and with rules and regulations stipulated and offices provided), out of which about 2 – 3 were functioning better with a higher level of participation and better awareness of the pollution reduction objectives. The FEPAs were mainly led by village chiefs and management teams. Among most villagers interviewed the understanding of the roles and responsibilities of the FEPAs was limited. While recognizing the innovative nature of the FEPAs, the practicality and sustainability of these FEPAs, which were mainly of a public goods nature and seemed lacking community ownership and funding, is of concern.

Capacity building and policy studies were affected by change in domestic policy and implementation delay. These were designed to be closely linked with the Components A & B. This component used only about 20% of the project resources allocated. Due to changes of domestic policies towards domestic training and overseas study tour some planned training and study tours did not happen, which to some extent affected the capacity building of FEPAs and PMO staff. Most farmer training was conducted at a late stage so the impact was limited during implementation. The policy studies were originally designed to be comprehensive studies to assess project innovations in rural environmental management, and create a replication strategy for dissemination of best practice examples in an expanded area within the Huai River Basin. However, the policy studies and planning exercise started quite late due to delays of other components. At project closure these reports were completed but mostly using simulated analysis instead of actual monitoring data. So their effectiveness remain to be verified after the facilities will be put into full operation.

Project Management and Implementation Support requires further strengthening. The project management component only used 36% of the total budgeted resources, and only 41.69% of GEF grant was used. As mentioned above in Section 2.1, the institutional set up made the cross agency coordination difficult. Furthermore, the PMO (DWRB) was implementing only one small sub-component, while most other activities were implemented by CMB (wetland), and to a lesser extent by AB (non-point pollution). This arrangement provided fewer incentives and little leverage for the PMO to lead implementation overall. In hindsight, it would have been more appropriate, and likely more effective, to put the DPMO in a higher level comprehensive bureau such as the Finance Bureau or Planning and Reform Commission.

Mid-term-review (MTR): At appraisal a MTR was planned to be conducted on September 1, 2014. In September 2014 a supervision mission was carried out but no formal MTR was undertaken. When the counterpart and the Bank team reached agreement on the remedial measures to the revised wetland design an MTR should have been carried out to respond to the changed circumstances to help improve project performance and increase the likelihood of achieving the GEO.

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

Design. Overall, the M&E arrangements for the project were well designed and included implementation performance and results monitoring, specialized monitoring, and safeguards compliance monitoring. However, the GEO and key indicators were not fully aligned. Both GEO indicators were designed to measure pollution reduction effects. No indicators were included to measure the demonstration effect, innovation and cost effectiveness of the pollution control measures. Project implementation performance monitoring was undertaken by the Dongying PMO, with inputs from the PIUs and Dongying Environmental Protection Bureau, and with the assistance of implementation support consultants. Technical monitoring, including water quality of wetlands inflow and outflow, water quality of treated rural wastewater, effect of changes in fertilizer use on surrounding water quality was carried out by the Dongying Environmental Protection Bureau, the Dongying Agricultural Bureau PIU, and Shandong University. Safeguards compliance monitoring, based on the EMP, PMP and RAP, was conducted through an external environmental and resettlement supervision consultancy.

Implementation. M&E activities started late due to the overall implementation delay. Dongying Environmental Monitoring Station was contracted to monitor and assess the impact of the Dongbalu Wetland and Wastewater Treatment. The relevant monitoring data were provided for the period from September to December 2015, and monitoring will last until June 2017. The wetland related results indicators for effluent could not be monitored because the wetland has yet to become operational. Most rural wastewater treatment indicators are also unavailable due to the fact that the facilities are not yet fully operational. Estimations and simulated assessments based on other similar operations have been carried out as a part of the Study of the Effect of Wetlands on Pollution Reduction. But some simulated results are questionable as pointed out in Section 3.2. Besides, Shandong Agricultural Academy of Science (SAAS) has carried out monitoring and assessment of the impact of the agricultural pollution reduction activities, which included some actual monitoring data and evidence based analysis. The key results are explained in Section 3.2 and the Results Framework in the Data Sheet.

Utilization. As a result of the implementation delays few monitoring and evaluation data were available to guide resource allocation and decision making. Due to the lack of actual monitoring data and the limited time left for the studies mentioned above, the accuracy and applicability of the analyses are affected.

2.4 Safeguard and Fiduciary Compliance

Safeguards

*Environment***:** The project was appropriately categorized as "B". It complied with the requirements of the Bank's environmental assessment (OP 4.01), and Pest management

(OP 4.09) safeguards. It was expected to have a significant positive environmental impact in terms of pollution reduction. Negative impacts were associated mainly with construction activities. These impacts were minimal, site specific, reversible, and easily mitigatable. An EMP had been developed, laying out necessary mitigation measures, institutional arrangements, and a monitoring plan to avoid or minimize adverse impacts. A Pest Management Plan (PMP) had been developed to help farmers reduce the use of chemical pesticides in the pilot villages. In accordance with Bank Safeguard policies and applicable national regulations, public consultations were conducted during the environmental assessment process, including a questionnaire survey and meetings with the project affected people and other stakeholders. Feedback received and concerns expressed were taken into account in the EA process and project design.

*Social***:** The project complied with the relevant national laws and regulations, as well as the Bank OP4.12 requirements. A RAP was prepared setting forth appropriate compensation and restoration measures for the relocation cases and other impacts. The project had positive social impacts in terms of reduced pollution levels, benefitting farmers and fishermen, as well as the rural and urban population in the Guangli river watershed. The project had a potential negative social impact from the construction of wetlands at Dongbalu, as it required a change in land use for land owned by the state-owned Shandong Shengli Petroleum Company. This land use change entailed relocation of seven small-sized enterprises that leased the land for their businesses, and also affected some power lines and fish ponds. Provision of cash transfers for the planned activities under this sub-component was completed in 2012. The total actual cost was US$ 7.41 million compared to the estimated US$ 6.79 million in the PAD, fully financed by counterpart funding. The Shandong Construction Development Research Institute was contracted to carry out an external monitoring and assessment of the resettlement and submitted a completion report in April 2013, which was reviewed by the Bank and found acceptable.

Fiduciary

Expenditure and post procurement reviews were regularly carried out by the Bank's procurement and financial management (FM) specialists. Issues raised by these reviews were clarified and efficiently resolved. Based on training provided by the Bank team's procurement, disbursement and FM specialists, the Project's PMUs were in a position to maintain clear and detailed accounts, as well as progress reports.

Financial Management. The GEF Grant and the Designated Account was managed by Shandong Provincial Finance Bureau (SPFB). The project financial management capacity had been strengthened through training and implementation support. During implementation the withdrawal application and reimbursement processes were slow due to the PMU's lack for experience with Bank financed projects and lack of communication between the PMU and the Dongying Municipal Finance Bureau. Later this issue was resolved through improved communication, concerted efforts by all the relevant parties, and increasing the threshold of the special account deposit. Financial reports were submitted on time and financial statements had unqualified audit opinions.

Procurement was carried out by the DPMO. The principal risk of procurement staff's lack of experience under Bank-financed projects was mitigated through targeted training, appropriate setting of prior review thresholds, close coordination with and guidance from the PPMO, and implementation support from the Bank. A procurement manual has been

prepared to guide staff responsible for processing and approving procurement. Procurement of works, goods and consulting services were carried out in compliance with the relevant procurement guidelines. Procurement processes were delayed due to the overall implementation delay and lack of counterpart funding at times but resolved at a later stage of implementation.

2.5 Post-completion Operation/Next Phase

The Government remains committed to providing the necessary support for a successful project transition, including maintaining the project organizations at each level for a transitional period and provision of the required operating cost beyond completion of the Project The wetland will be integrated into the broader wetlands construction program which includes two other wetlands funded by the government. The city planning bureau has stipulated O&M regulations including influent management, plant cleaning and replanting, harvesting and weeding. The agriculture bureau has also developed O&M measures for wastewater treatment facilities, and livestock waste storage. As an interim measure to support FEPA's development the municipal finance bureau has made a commitment to establish a budget line starting from 2016 to support the ten FEPAs with about US$ 5,000 per year each. M&E for the wetland and other components will be continued by the Municipal Environmental Protection Monitoring Station until June 2017. Despite these commitments the post completion operation remains a concern for most components (See section 4).

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Relevance of objectives: Substantial.

The GEO of "to demonstrate innovative and cost-effective water pollution control practices in the Guangli River catchment of Dongying Municipality, contributing to pollution reduction in the Bohai Sea" was relevant at appraisal and remained broadly relevant and consistent with the Country Partnership Strategy (CPS) through to completion. It continues to be relevant to the new CPS FY13-16, highlighting "supporting greener growth", **"**demonstrating innovative ways to manage wetlands and lakes, including through the increased use of wetlands to filter urban and industrial run-off before excess nutrients cause eutrophication in lakes, rivers, and bays (including the Bohai and South China Seas)". In addition, the project objectives were consistent with the following outcomes under the CPS: (i) enhancing urban environmental services; (ii) demonstrating sustainable approaches to natural resources management approaches, and (iii) demonstrating pollution management.

However, during implementation the relevance of some project activities changed due to evolving circumstances and the project should have made adjustments accordingly to remain relevant to the prevailing situation. For example, as explained in section 2.2, fast paced urbanization led to fewer villages participating in rural waste water treatment activities, reduced demand for livestock waste storage, decreased farming area for balanced fertilizer application, etc. A restructuring should have been carried out to respond to these changes and to increase the likelihood of achieving the GEO.

Relevance of design: Modest.

Overall, the project objectives were clearly stated, responsive to China's priorities and consistent with the CPS. The components were broadly designed to match the project objectives. However, as mentioned in section 2.2 several design shortcomings affected project performance during implementation, including: inappropriate institutional arrangements inherited from the HRBFMDI Project caused difficulties in cross sectoral coordination; The implementation period of three and half years seemed too short; GEO definition and key indicators were not fully aligned; Combination of wetland construction with non-point agricultural and rural pollution management seemed over-ambitious; FEPA lacked community ownership; The design of the rural wastewater treatment facilities appeared inefficient due to low water volumes; The risks of changed government priorities and rapid urbanization affected several activities, and insufficient technical support service for non-point pollution reduction activities should have been identified and mitigation measures proposed at appraisal.

3.2 Achievement of Global Environmental Objectives

1). Achievement of the first objective of demonstrating innovative and cost effective water pollution control practices in the Guangli river catchment of Dongying Municipality: Modest

Innovation:
The Project has demonstrated that a constructed wastewater treatment wetland can be built locally on beachland with high salt and alkaline content. This was the first time that such a wetland was constructed in Dongying, and the concept, technology and design are considered very innovative in Dongying. The successful physical construction of the wetland has also helped to convince the Dongying municipal government to invest in two similar wetlands (Dongqilu and Yihonghe) that are expected to be completed by end of 2016 with a total daily treatment capacity of 300,000 cubic meters (with an estimated cost of RMB 411 million Yuan), forming an integrated system together with the GEF financed Dongbalu wetland.

Another innovation was the integrated approach to water pollution management adopted by the Project, combining wetland treatment with non-point agricultural pollution management, rural wastewater treatment and institutional arrangements. Due to the limited scale of funding and the complexities of coordinating several line agencies this somewhat over ambitious design was difficult to implement and the expected synergies could not be fully achieved.

The third innovative feature was the establishment of Farmers Environmental Protection Associations (FEPAs). While recognizing the innovative nature of the FEPAs, their practicality and sustainability remains uncertain. They were mainly of a public goods nature and seemed lacking community ownership and funding. Their purpose was to enable farmer communities to participate collectively in environmental protection project activities, to take responsibility for O&M, and to replicate best practices in their respective villages. In reality, only 10 FEPAs were established in 10 villages (compared to the originally planned 22 FEPAs), out of which about 2 – 3 were functioning well with a higher level of participation and better awareness of the pollution reduction objectives.

Among most villagers the understanding of the roles and responsibilities of the FEPAs remained limited.

Cost effectiveness:
Despite the explicit mention of cost effectiveness in the GEO no cost effectiveness analysis was carried out at appraisal. Also, there were no indicators to measure cost effectiveness at any level. Instead the project conducted a cost benefit analysis with a series of assumptions that in hindsight appear both conceptually questionable and difficult to quantify and attribute (see section 3.3). Given the public goods nature of the project components a cost effectiveness analysis would have been the appropriate approach.

At this point it is difficult to assess whether the assertions in the main text in the PAD that the components were cost effective are indeed valid. As for the constructed wetland there is evidence from similar projects, such as the Ningbo wetland project, that the cost per unit water treated can be significantly lower than conventional treatment (RMB 0.1 Yuan versus RMB 0.4-0.5 Yuan). However, in this project the cost of wetland construction was 75% higher than the original estimate and the treatment area was significantly smaller than designed. Since the wetland is not operational yet it is also unclear how high the O&M costs will be, making a cost effectiveness estimate for its operation difficult. Similarly, the PAD claims that the rural waste water treatment component is cost effective because of low capital investment, scattered nature of houses and availability of waste land to dispose tail water. In reality, the volume of wastewater treated is very low due to the fact that the design excluded toilet water (hoping it would be financed by other sources) and fewer farmers remain in the villages due to urbanization. The agriculture pollution component, while designed to reflect best international practices, was applied on a smaller land area due to urbanization and insufficient commitment from the communities to fully implement the improved practices. Also, there are insufficient data available to support the assumption that farmers actually increased productivity and reduced input cost as a result of this component.

2). **Achievement of the second objective of contributing to pollution reduction in the Bohai Sea: Negligible**.

The project had three components that would potentially contribute to pollution control in the Bohai sea: the constructed wetland, the rural waste treatment facilities and the agriculture nonpoint pollution control activities. By the closing date none of these components had a significant impact on pollution reduction.

Constructed wetland: Due to the significant changes to the design, its implementation was delayed and the water covered area and effectiveness was much lower than expected. The occupied land area of the wetland was the same as the originally planned 2,625 mu. But the water cover area of the constructed wetland, i.e. the wetland area that possesses wastewater treatment capacity, was only about one-third of the original plan in the feasibility study report (874 mu versus 2,485 mu). The actual effectiveness of the wetland was even lower because the completed vegetation coverage was only 64% of the water covered area (561 mu of area covered by emerged aquatic plants), versus the original plan of 79% for emerge plants (1,700 mu) and 95% for three types of plants[4] (2,355 mu). The

[4] Including 1,700 mu of emerged plants, 262 mu of floating plants, 393 mu of sub-merged plants.

overall delay, the unfinished pumping station and the low survival rate of the plants in the wetland rendered the project unable to become operational on time and prove its effectiveness. Monitoring and Evaluation could not be carried out to support an evidence based assessment of the component's actual results and impact. The wetland is expected to be put into operation by August 2016. At least one year of monitoring data (once per month) are required to assess the actual treatment performance. So the earliest time to obtain the required data would be August 2017. In reality it may take longer as it takes time for the plants to grow and the wetland environment to become mature and fully functional.

In the absence of actual data on effluent for the wetland component simulations were made to indicate potential effectiveness. The simulated data, based on other similar constructed wetlands using the actual monitored influent data through Water Quality Analysis Simulation Program (WASP) models, indicate that the potential contribution of the wetland to the reduction of pollutants/nutrients loads entering the Bohai Sea will be: 403.25 t/a (against the target 430.25 t/a; 93.78%); BOD 92.03 t/a (against target 215 t/a; 42.34%); NH3-N 12.37 t/a (against target 129 t/a; 9.59%); and TP 0.46 t/a (against target 12 t/a; 3.83%). However, the simulated COD reduction is questionable due to the reduced scale of the wetland and an estimate closer to one third of the target would appear more reasonable.

The concern over the accuracy of the COD simulation also puts the entire simulation results into question. One factor that was underestimated during the wetland design was the improvement of the water quality in the Guangli River during the past few years due to comprehensive treatment conducted by various domestic programs. The original influent quality was COD 60mg/l, NH3-N 2.5 mg/l while the current quality is COD 40mg/l, NH3-N 2mg/l, which has already met the project end target (surface water standard class V). Some project activities (agricultural and rural pollution reduction) may have contributed to this improvement, but given the relative size of the project interventions (about 12%) its contribution is considered insignificant[5]. This raises a relevance issue because this improvement had been part of the Dongying municipal government master plan and should have been anticipated and taken into consideration when designing the project activities and setting appropriate target values for the pollution reduction measures. Actually the target values of effluent only meeting surface water standard Class V appears too conservative.

Rural waste management: Out of the original plan of serving 9,325 people in eight villages and a treatment capacity of 233 tons per day only 5,118 people in five villages were actually covered (127 tons per day). By project closing only one facility had been put into operation due to the delay and lower than expected wastewater volumes. The actual monitored reduction in COD and SS is zero versus a target of 9.3 tons and 4.6 tons per year. Eighty three livestock waste storage tanks have been built with a total volume of 660 m^3 as compared to 1,650 tanks originally planned with a volume of 2,500 m^3. The

[5] The total cropping area in Guangli River catchment is 20,030 hectare while the project treated area is only about 2,420 hectare (1,850 ha using balanced fertilizer and 570 ha buffer zone).

centralized composting facility was not built due to lower demand for such a facility and concerns over O&M. The projected pollution reduction is COD 20.67 t/a, TN 0.196 t/a, and TP 1.55 t/a.

Agriculture pollution control: Balanced fertilizer was applied on 1,862 hectares, versus the original 2,278 ha planned. Farmers participation rate was 44% (1,661 households out of 3,723 households) versus the target of 80 %. Four Buffer strips were completed on only 10% of the designed 1,109 hectare of land and a total length of 1,709 meters of eco-trenches were built in four pilot villages instead of the planned 6 villages. The side slopes of the trenches were not stabilized as designed, and the vegetation consisted mainly of naturally grown plants instead of the planned plant species that would have had stronger capacity to absorb TN and TP. The pollution reduction for this component is TN 7.4 tons/year (the PAD had mistakenly set the target for agricultural non-point pollution reduction as NH3-N instead of TN) versus the target of 5 tons/year, and TP 0.79 tons/year versus the target of 0.123 tons/year. These two targets are over-achieved despite the reduced scope because the target values for balanced fertilizer were believed to be set too low. The monitoring data for balanced fertilizer is 5.92 tons/year and 0.74 tons/year for reduction in TN and TP respectively.

The achieved total reduction of pollutants/nutrients loads for all the above components was COD 20.67 t/a (against target of 517.6 t/a; 3.99%); BOD none (against target 215 t/a); NH3-N – none (against target 134 t/a); TN 7.596 t/a (against target of 5.743 t/a set at intermediate outcome level, 132%), and TP 2.34 t/a (against target 12.9 t/a; 18%). Therefore the project failed to achieve the second objective.

3.3 Efficiency

The Project's efficiency is rated negligible.

At appraisal the project conducted a cost benefit analysis with a series of assumptions that in hindsight appear both conceptually questionable and difficult to quantify and attribute. The main benefits included cost savings associated with reduced application of chemical fertilizer and pesticides, increased productivity in agriculture, and increase in the value of the land surrounding the constructed wetland. Indirect benefits included improvement in water quality, biodiversity protection in the Bohai and the Yellow Seas, and carbon emission reduction. The economic costs of the project included capital costs and O&M costs.

The economic internal rate of return (EIRR) of the project at appraisal was estimated at 13.8%, while the EIRR of wetland construction component and the treatment of pollution from rural areas and agricultural production was 14.5% and 12.3% respectively. The net present value (NPV) of the project at a discount rate of 8% was estimated at RMB153.6 million. Sensitivity analysis conducted by increasing capital costs by 10% and decreasing benefits by 10%, as well as a combination of the two, yielded EIRRs in excess of the discount rate of 8%.

However, this approach is problematic as it is practically impossible to attribute the land value increase (accounting for 80% of the quantifiable benefits as an assumption at appraisal) to the construction of the wetland, i.e. the land values might have increased in a similar way without the wetland construction.

Given the public goods nature of the project components, a cost effectiveness analysis would have been the appropriate approach.

As already discussed in Section 3.2, at this point it is difficult to assess whether the assertions in the PAD that the components were cost effective are indeed valid. As for the constructed wetland there is evidence from similar projects, such as the GEF financed China Ningbo Wetland Project, that the cost per unit water treated can be significantly lower than conventional treatment (about 0.1 yuan/ton versus 0.40-0.50 yuan/ton). However, in this project the cost of wetland construction was 54% higher than the original estimate and the treatment area was significantly smaller than designed. Since the wetland is not operational yet it is also unclear how high the O&M costs will be, making a cost effectiveness estimate for its operation difficult. Similarly, the PAD claims that the rural waste water treatment component is cost effective because of low capital investment, scattered nature of houses and availability of waste land to dispose tail water. In reality, the volume of wastewater treated is very low due to the fact that the design excluded toilet water and fewer farmers remain in the villages due to urbanization. The agricultural pollution reduction component, while designed to reflect best international practices, was applied on a smaller land area due to urbanization and insufficient commitment from the communities to fully implement the improved practices. Also, there are insufficient data available to support the assumption that farmers actually increased productivity and reduced input cost as a result of this component.

3.4 Justification of Overall Outcome Rating

Rating: Unsatisfactory

Based on substantial relevance of the Project's objectives, modest relevance of design and implementation, modest and negligible efficacy of the project's development objectives, and modest efficiency, the overall outcome is rated unsatisfactory. The Project has failed to meet the GEO of demonstrating innovative and cost-effective water pollution control practices in the Guangli River catchment of Dongying Municipality, contributing to pollution reduction in the Bohai Sea.

3.5 Overarching Themes, Other Outcomes and Impacts

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

The project's social benefits include raising awareness among villagers about the importance of environmental protection, water pollution control and the benefits of eco farming methods. It also improved the sanitary conditions in villages through rural wastewater treatment and livestock waste storage. This will benefit women and children more, as the majority of men are migrant workers. The project neither had a specific poverty nor a gender focus.

(b) Institutional Change/Strengthening

The project had a positive impact on the participating institutions as they were exposed to innovative technologies and domestic and international experience in project management, wetland design and construction and sustainable farming practices**.** The planned training and capacity building activities both domestically and internationally were reduced as a

result of a change in national policy. This has to some extent affected their ability to learn and exchange experiences with other provinces and countries.

(c) Other Unintended Outcomes and Impacts

NA.

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

Not applicable.

4. Assessment of Risk to Development Outcome

The risk to development outcomes is rated as high. The wetland is currently not operational so it remains uncertain how well the system will function and provide the intended benefits, especially given the high salinity content and the cold weather conditions in winter. The wetland area is also quite large and its O&M, harvesting of the plants and management may prove challenging. The rural wastewater treatment facilities have a substantial risk of not remaining functional in the long term because the communities seem to lack sufficient incentives to pay for O&M and the water flows are lower than expected. The FEPAs are also at risk as they are designed to be self-financing and fully participatory but in reality farmers' incentives to participate and contribute financially are low. The risk to the sustainability of some non-point agriculture pollution components including application of balanced fertilizer, eco trenches and buffer strips are substantial without the financial and technical support of the project, and a lack of commitment by the farmers. Livestock waste storage will be relatively sustainable because the O&M cost is low and there is significant uptake by the farmers.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Moderately Unsatisfactory

Overall, the Bank team made substantial efforts and played an important role in facilitating the project's preparation and design to ensure that the project objective was of strategic relevance and was responsive to the priority issues that were of major concerns to the government. Preparation and appraisal of technical aspects was conducted with the Bank's assistance, engaging the counterparts in dialogue, studies and fieldwork to develop an innovative approach and implementation modality. The essential component to achieving the GEO was the wetland and the bank team helped introduce an innovative wastewater treatment concept which was applied in Dongying for the first time. The original wetland design supported by the Bank team was sound. The Bank also ensured that fiduciary and safeguards arrangements were adequate and could meet the Bank's and country's respective policies and requirements.

However, there were significant shortcomings related to the design features that affected project performance and results. As explained in Section 2.1 these included the inefficient

institutional arrangements, short implementation period, GEO and key indicators not fully aligned, design of project components and activities too complex, high expectation of the FEPAs, design of the rural wastewater treatment facilities with insufficient water volume, design of the 1 m^3 livestock waste storage not being very practical.

(b) Quality of Supervision

Rating: Moderately Unsatisfactory

The Bank provided frequent and timely implementation support and supervision during the whole process of implementation. At the beginning of implementation, the Bank team identified the issue of a changed design of the Dongbalu wetland and immediately requested the counterparts to discontinue implementation and take remedial actions. The Bank team engaged in a proactive and persistent process of negotiations to reverse the wetland design to the extent possible to bring the project back on track towards achieving its GEO. It sought support from higher level leadership, including the Provincial and Dongying municipal government and Bank management, to help coordinate with the relevant parties and solve the problem, and provide counterpart funding. The Bank team also provided strong technical support to identify suitable solutions to re-design the wetland in a technically and financially viable way. After the third revised wetland design was agreed and acted upon the Bank team provided intensive support to accelerate implementation through the regular supervision missions that were undertaken bi-annually, as well as through site-specific technical visits, as evidenced in the aide memoires. During the last year of implementation the Bank team worked effectively with the PMUs to overcome the implementation hurdles to finally complete the construction of the wetland. The Bank team also ensured that financial management, procurement, environmental and social safeguard issues were effectively addressed and training provided as needed. Mission aide memoires and ISRs were regularly completed, and of good quality.

On the other hand, some shortcomings remain: (i) The institutional arrangements remained as a key weakness, and the problem was identified at the beginning of the project. While it might have been challenging to totally rectify the situation, stronger institutional support, including seeking more support from the project leading group, and/or a possible restructuring, should have been provided to help the client improve its project management efficiency; (ii) Due to the serious Dongbalu wetland construction problems, supervision of the Bank predominantly focused on solutions to this component. Therefore comparatively less attention was paid to the other parts of the project; (iii) ISR ratings should have been downgraded to MU or below much earlier because the change of the wetland design and other delays posed a significant risk to both implementation performance and achievement of the GEO.

(c) Justification of Rating for Overall Bank Performance

Rating: Moderately Unsatisfactory

Given the quality of Bank's performance at entry and during supervision, the Bank's overall performance is rated moderately unsatisfactory. Throughout the life of the project, the Bank team provided strong technical and operational support to the client. It identified the critical issues in a timely manner and made significant efforts to help solve the ensuing problems. However the apparent shortcomings described above, including flaws in project

design and supervision, risk assessment, candor of ISR ratings, and lack of restructuring warrant a MU rating for Bank performance.

5.2 Borrower
(a) Government Performance

Rating: Unsatisfactory

The agencies involved including MOF, the Huai River Commission, the Shandong provincial government and the Dongying municipal government, as well as other members of the project leading group, all played important an important role, to varying degrees, in guiding and supporting the development and implementation of the project and its Global Environmental Objectives. They provided leadership, coordination and services, financial and human resources, and made institutional arrangements. In the beginning, the local (Dongying municipal) government was committed to the project objectives and innovative approaches. It provided institutional and financial support, set up the PLGs and PIUs at various levels and made commitments to provide further counterpart funding. However, there were frequent changes of leadership during project preparation and implementation. Fairly early on, the municipal government priorities and policies changed compared to the original project design, which led to the substantial changes to the wetland design. This in turn caused significant implementation delays and a reduced scope and pollution reduction function of the wetland. After the revised design was eventually agreed upon, the government continued to provide support, especially during the last year of implementation, to accelerate implementation and complete the project activities to the extent possible. However, since the changed design of the wetland is considered to be the main reason for the inability of the project to achieve the expected pollution reduction objective, government performance is rated unsatisfactory.

(b) Implementing Agency or Agencies Performance

Rating: Moderately Unsatisfactory (MU)

Provincial PMO: MU. The provincial PMO was in charge of overall coordination and project management. It made strong efforts to coordinate cross sectoral activities, which proved to be difficult due to the inefficient institutional set up. Being located in a different city it made extra efforts to travel to the project site multiple times to provide implementation support and supervision, especially in the later stages of project implementation. However it would have been helpful if the vigor of supervision were there in the beginning, and the critical issue of the wetland design change identified earlier and the Bank's agreement obtained before the earthworks were carried out to avoid a series of substantial issues later. More proactivity in seeking support from the PLGs to solve the problems would have also been helpful.

Dongying Municipal PMO: MU. Overall, the Dongying PMO (Water Resources Bureau) was efficient in completing the tasks it was assigned and delivered the sluice gates component on time and within budget. However, it was less efficient in cross sectoral coordination for the reasons described in section 2.2 as a result of the inefficient institutional set up, especially during the early stage of the implementation. Its performance improved later with more experience gained and has made significant efforts

to support and urge the other agencies to accelerate implementation and improve project performance.

Dongying Municipal Urban Construction Bureau: MU. The Urban Construction Bureau was in charge of implementation of the Dongbalu constructed wetland. Overall it demonstrated strong technical capacity and completed the construction within a short period of time. However, when the design change was decided at the municipal level the bureau did not obtain agreement from the Bank until after it had gone far into construction per the revised wetland design. This led to the serious delays already discussed. And it took a long time for them to agree on and finalize the wetland design after the Bank interfered.

Dongying Municipal Agricultural Bureau: MU. The Dongying Municipal Agricultural Bureau was in charge of the rural waste management and agricultural pollution control components, as well as the establishment of the Farmers' Environmental Protection Associations, and training components. While the physical implementation of the components was managed reasonably well, there were substantial delays and reduced scope in several activities. The training of farmers was less effective in explaining the linkage between the investments and the project objectives and there was no systematic assessment of the impact of farmers training conducted.

(c) Justification of Rating for Overall Borrower Performance

Rating: Unsatisfactory

Frequent changes in leadership and a unilateral decision by the municipal government to change the design of the key component of the project led to substantial implementation delays, reduced scope and ultimately a failure to achieve the GEO on time. Line agencies tried their best to implement their respective activities but coordination was difficult throughout implementation leading to underperforming and mostly delayed results.

6. Lessons Learned

Government commitment is critical. This project showed once again that sustained government commitment is key to effective and successful implementation. While even frequent changes in government leadership are a regular challenge in development work, it is critical to maintain close communication between the client and the Bank throughout the preparation and implementation process. The fact that the client not only changed the design of the most critical component of the project without consulting the Bank, but also implemented the civil works unilaterally, led to a very significant delay in overall implementation, reduced scope, and eventually to a failure to reach the agreed objectives on time.

Restructuring should have been carried out. When very early in the process the government decided to change the wetland design it took over one year of complex and protracted negotiations to agree on a revised treatment wetland design. During most of that period the outcome was uncertain because most of the wetland earthworks had already been completed in a way that was not well suited for a pollution treatment wetland. It was evident that even if agreement could be reached on the final design it would also be unlikely to reach the design capacity and therefore the full anticipated pollution control

impact. Given the serious nature of the component change and obvious significant cost implications, and also changes in other components, an early and thorough restructuring should have been carried out and may have led to a better outcome.

Appropriate institutional arrangements are critical for successful coordination and implementation. Integrated and complex projects that require support from several line agencies are prone to coordination challenges and often suffer from difficulties in coordinating several equal line agencies, and a lack of ownership among the departments that are not in charge of most of the project activities. To ensure effective coordination it is critically important to locate the lead unit in a department that has the authority to coordinate other departments, such as in the finance bureau or the planning agency. In cases where this is not practical, at least the lead unit should be in charge of the biggest component and a project leading group needs to play a more active role in ensuring effective coordination.

Complexity of design needs to match the funding size and implementation period. Finding the right balance between an innovative integrated design and practical implementation capacity proved to be a challenge. While it was conceptually desirable to integrate both infrastructure focused interventions such as the wetland with demand-side management interventions (awareness raising, policy incentives, behavior change) and management practices (introducing new technologies and environmentally friendly agriculture production practices), this complexity proved to be too difficult to coordinate and implement in this project. As a relatively small intervention with a short implementation period of only three and half years the project was only partly able to overcome the coordination and implementation challenges. One of the lessons learned is that balanced and integrated projects of this nature must have a certain size and funding volume (or blended with loan projects) to get full leadership attention, and they need a longer and more realistic implementation period to succeed.

Farmer Environmental Protection Associations need to be based on community ownership. The FEPAs were a novel and innovative design feature in this project. Building on successful experiences from water user associations and producer associations in other parts of the country, the idea was to connect farmers and communities around environmental issues and jointly implement project interventions, take responsibility for O&M and replicate best practices in their respective villages. While this idea had appeal to some, the majority of farmers did not see sufficient incentives to engage in a meaningful way. The lesson here is that the introduction of a new and unproven innovation is risky and that in the future a much more thorough analysis and preparation is needed before such a component is integrated into an already complex operation. The team should be commended for taking risks but introducing innovation needs more evidence of the key factors that are critical for success upfront.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

Implementing agencies' comments have been incorporated into the ICR and reflected in the summary of Borrower's ICR attached in Annex 4.

(b) Cofinanciers

NA

(c) Other partners and stakeholders
NA

Annex 1. Project Costs and Financing

(a) Project Cost Financing by Component

Component		Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	(%)
A. Wetland Construction and Sluice Gate Operation Optimization		**27,188**	**41,572**	**153**
A1	Constructed Wetland at Dongbalu	19,473	33,994	175
A2	Sluice Gate Operation Optimization	923	166	18
A3	Resettlement Compensation	6,792	7,413	109
B. Agricultural Pollution Control and Rural Waste Management		**4,591**	**2,088**	**45**
B1	Rural Waste Management	2,255	1,626	72
B2	Agricultural Pollution Control	2,003	374	19
B3	Establishment and Operation of FEPAs	333	88	26
C. Capacity Building and Policy Studies		**1,851**	**355**	**19**
C1	Education and Training Center	193	37	19
C2	Capacity Building	778	35	4
C3	Policy Studies	880	283	32
D. Project Management and Implementation Support		**2,290**	**826**	**36**
D1	Implementation Support	1,849	313	17
D2	Monitoring and Evaluation	91	16	18
D3	Project Management	350	497	142
Total Baseline Costs		**35,920**	**44,842**	**125**
Physical Contingencies		1,908	0	**0**
Price Contingencies		0	0	**0**
Total Project Costs		**37,828**	**44,842**	**119**
Project Preparation Facility (PPF)		0	0	**0**
Front-end fee IBRD		0	0	**0**
Total Financing Required		**37,828**	**44,842**	**119**

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD)	Actual/Latest Estimate (USD)	Percentage of Appraisal
Borrower	Counterpart funding	32,828,000	40,897,900	124.58%
GEF	Grant	5,000,000	3,944,700	78.89%
Total		37,828,000	44,842,600	119%

Annex 2. Outputs by Components

Project Outputs	Plan at Appraisal	Actual Completed
Component A Wetland Construction and Sluice Gate Operation Optimization		
(a). Construction of wetlands at Dongbalu consisting of free-surface flow wetlands, an ecological retention pool, an entrance gate, a gated overflow weir and a pumping station, and provision of related equipment;	The feasibility study report included a constructed free-flow surface wetland with a total land area of 2,625 mu (1.8 $km^{2)}$ mainly for the purpose of water treatment, of which the water covered area, i.e. the wetland area that possesses treatment capacity was 2,485 mu. The area covered by aquatic plants was 2,355 mu (emerging plants 1,700 mu, floating plants 262 mu, and sub-merged plants 393 mu), with 95% of vegetation coverage in the surface area . It will treat about 70,000m^3/day (2,900 m^3/hour) between March and November, and 25,000 m^3/day (1040 m^3/hr) between December and February, i.e. about 43% and 15% of total river flow (50 - 60 million m^3/year). The designed influent quality: COD Cr ≤ 60 mg/L, BOD5≤20 mg/L, NH3－N≤8 mg/L, TP ≤1.0 mg/L; while the effluent quality is: COD – 40 mg/L; BOD – 10 mg/L; ammonia – 2.0 mg/L; TP -0.4 mg/L. In addition, an ecological retention pool, an entrance gate, a gated overflow weir and a pumping station were to be built.	Due to the revised design of the free flow surface wetland, the occupied land area of the completed wetland is same as the original plan: 2,625 mu (1.8 km^2). But the completed water covered area, i.e. the wetland area that possesses pollution treatment capacity, was only about one-third of the original plan (874 mu versus 2485 mu). The significant delay in completion of the wetland left no time for its operation and monitoring. The area covered by aquatic plants in the wetland is 561 mu and vegetation coverage in the water surface area is 64.2%. The current influent water quality is significantly improved (COD 40mg/l, NH3-N 2mg/L) due to the comprehensive treatment conducted by various domestic programs. Some project activities (agricultural and rural pollution reduction) may have contributed to this improvement, but given the relative size of the project interventions (about 12%) its contribution is considered insignificant. In 2008 the total cropping area in Guangli River catchment was 20,030 hectare while the project treated area was only 2,400 hectare (1,850 fertilizer and 571 buffer zone). Moreover, according to a survey carried out in 2010, 60% of the pollution was from domestic sewage, 30%

		agricultural non-point pollution, and 10% industrial pollution. So apparently the sewage pipelines connecting more households to the urban sewers and the wastewater treatment plants built in the past few years have been very effective. But this improvement should be part of the Dongying municipal government master plan and should have been anticipated and taken into consideration when designing the project activities and setting appropriate target values for the pollution reduction measures. Actually the target values of effluent meeting surface water standard V appear too low. Another reason for the wetland not being operational was that the pumping station located at the north end of the wetland has yet to be completed. The civil works of the pumping station has been finished and the pump purchased. Yet as part of the master plan the Dongying government later decided to increase the capacity of the pumping station and planned to purchase another pump with larger capacity to pump water from the Dongbalu wetland and the other two wetlands to be constructed by the government funding. The pumping station is expected to be completed around August 2016.
(b). Upgrading the automatic gate control system covering three sluice gates on the Guangli River, and the gates at the entrance and exit of the Dongbalu wetlands	Upgrading the automatic gate control system covering three sluice gates on the Guangli River, and the gates at the entrance and exit of the Dongbalu wetlands	The automatic gate control system covering three sluice gates on the Guangli River, and the gates at the entrance and exit of the Dongbalu wetlands have been completed and operating well.
(c) Provision of cash transfers	c) Provision of cash transfers	Provision of cash transfers for

to Affected Persons of the wetlands construction.	to affected persons of the wetlands construction.	the planned activities under this sub-component was completed in 2012. The total actual cost was US$ 7.41 million compared to the estimated US$ 6.79 million in the PAD, fully financed by counterpart funding.
Component B Agricultural Pollution Control and Rural Waste Management		
(a) 1. Wastewater treatment in Participating Villages;	The wastewater part of sub-component B.1 was supposed to support the construction of rural domestic wastewater treatment works in eight selected villages located in the upper reaches of the Guangli River Basin.	One village dropped out because its sewers were already connected to the urban domestic wastewater treatment plant. Four villages have completed the construction of their wastewater treatment facilities before the closing date. One village changed the design from a waste water stabilization pond to artificial wetland treatment with reduced effectiveness, as this community lives closer to the sewage facility and expressed concerns about odor and potential safety risks. Two villages (financed by counterpart funding) experienced delays and are completed in June, 2016. The treatment facilities in the above mentioned five villages cover 5,118 people (127 ton/day) compared to 9,325 people (233 ton /day) as originally planned. Furthermore, the wastewater volume collected from the project households is low because 1) the domestic wastewater design only included laundry, kitchen and shower wastewater but did not include the biggest source - toilet water; 2) more and more farmers have become migrant workers and left only the elderly and children behind in

		the villages. During implementation the Bank team recommended that the wastewater system should include toilet water but the investment to renovate toilets should be borne by farmers. However, farmers showed little interest and thus this did not materialize in the end. Due to the low water volume and implementation delay only one facility has been put into intermittent operation by project close. The main issue remains to be whether sufficient sewage can be collected and the facilities could be sustainably utilized with sound O&M measures.
(a) 2. Livestock waste collection and treatment in Participating Villages;	It was planned to build 1,650 livestock waste storage tanks of 3 different sizes with a total volume of 2,500 m^3. In addition, a centralized composting facility was supposed to be built, which would include (i) a manure collecting system to collect livestock wastes from all animals in two villages, (ii) an aerobic composting workshop to treat collected manure and produce organic fertilizer, and (iii) a liquid distribution system to convey livestock liquid wastes for irrigation and land application.	In reality 83 tanks have been built with a total volume of 660 m^3, and the centralized composting facility was not built due to lower demand for such facility and concerns over O&M. The number of storage tanks is significantly lower than the original plan due to smaller demand as a result of the reduced number of livestock households in the villages. With more people working outside the villages as migrant workers livestock production is shifting from scattered smallholdings towards larger scale farms. Also, the originally designed storage tanks were mostly 1 m^3, which were too small for practical use.
(b) Introduction of agricultural pollution reduction technologies and management practices in Participating	The original design was to apply balanced fertilizer to cover 2,278 hectares of land.	Ten villages participated in the program and received subsidies for purchase of balanced fertilizer. The actual result was

villages through comprehensive and balanced fertilizer applications, provision and use of insect luring lamps, and construction of eco-trenches and buffer strips in crop fields; and monitoring of the results of implementation of these technologies and practices		1,862 hectares, partly due to the overall decreasing cropping area as a result of urbanization, and also the implementation delays. Training was provided to farmers to enable them to better understand its benefit, introduce the concept of eco-farming, and increase utilization effectiveness of the fertilizers while reducing water pollution. Farmer interviews confirmed that there was a high level of community participation. At the same time technical assistance and services need to be improved to help farmers increase awareness of its linkage with pollution reduction and achieve better results.
	100 solar insect luring lamps installed	All 100 solar frequency insect luring lamps were installed, out of which 30 each were in Huangdian and Shangzhuang, 20 each in Shaotou and Wangying. Each lamp could cover 2 – 3 hectares. The previous mission observed that some lamps were stolen. The ICR mission observed that the lamps were collected from the field for storing and will be reused next year. Interviews with farmers confirmed that they were very positive about the function of these lamps witnessing lots of insects being killed. However farmers indicated that there wasn't significant reduction of pesticide use as a result of the use of the lamps. This was because the area covered by the lamps wase relatively small and they were not convinced that the lamps can substitute a significant amount of pesticides.

	About 1,109 hectares of farmland in the six participating villages were planned to be used as buffer strips without using any fertilizers in order to reduce the TN and TP inflow into the Guangli River.	In reality only 10% of the designed area has been completed (4 buffer strips built instead of the planned 6) because most farmers were not willing to adopt the zero fertilizer application approach due to concerns over lower productivity. Meanwhile, a total length of 1,709 meters of eco-trenches was built in the four pilot villages instead of the 6 planned villages. The effect of eco-trenches turned out to be lower than the original design because some of the side slopes of the trenches were not stabilized as designed, and the vegetation was consisted mainly of naturally grown plants instead of the planned plant species that would have had stronger capacity to absorb TN and TP.
(c)Establishment, equipping and operation of FEPAs in Participating Villages.	It was planned to establish a total of 22 FEPAs in 22 villages (a minimum of eight FEPAs would be established for project activities under sub-components B (a) rural waste treatment, and B (b) agricultural pollution reduction, and other FEPAs would be established for pollution reduction activities financed by non-project funds as a part of project replication. The purpose was to enable farmer communities to participate collectively in environmental protection project activities, to take responsibility for O&M, and to replicate best practices in their respective villages.	In reality, only 10 FEPAs were established in 10 villages (registered and with rules and regulations stipulated and offices provided), out of which about 2 – 3 were functioning better with a higher level of participation and better awareness of the pollution reduction objectives. The FEPAs were mainly led by village chiefs and management teams. Among most villagers interviewed the understanding of the roles and responsibilities of the FEPAs was limited. While recognizing the innovative nature of the FEPAs, the practicality and sustainability of these FEPAs, which were mainly of a public goods nature and seemed lacking community ownership

		and funding, is of concern.
Component C Capacity Building and Policy Studies:		
(a) Establishment and operation of an environmental protection education and training centre to be located in Dongying Municipality for training and dissemination of technologies and good practices in environmental protection, nutrient management and pollution reduction;		An Education and Training Center was established in 2014 within the Dongying Vocational College. Technical training was provided by the center to government officials, project staff and FEPA members on subjects related to the project activities implementation and management. The total number of trainees is 4,420 farmers, including 2,081 trained in Kenli county, 300 in Dongying city, 439 farmers trained externally and participated in study tours, 1,600 farmers trained in the field, 44 PMO staff trained and participated in study tours. Most farmer training was conducted at a late stage and thus had limited impact for implementation. The original cost allocation for this subcomponent was USD 193,000 (100% counterpart funding) while the actual cost was USD 37,000 (100% GEF grant). Only 19% of the original budget was spent because the civil works for building the training center did not happen. The training center is located in the existing Dongying Vocational College instead.
(b) Capacity building activities to provide technical and Project management training for staff involved in Project implementation and monitoring	Capacity building activities to provide technical and Project management training for staff involved in Project implementation and monitoring. Capacity building and policy studies were designed to be closely linked with the Components A & B. A capacity building program	A substantial number of FEPA members were trained on a variety of subjects concerning rural and agricultural pollution reduction by the Kenli agricultural extension service center and Dongying Vocational Colleague (Education and Training Center) and so on. A total

	was developed by the Provincial and Dongying PMOs, which included training, and domestic and international study tours related to project management, implementation and future O&M.	number of 4,420 farmers have been trained, including 2,081 in Kenli county, 300 in Dongying city, 439 farmers trained externally and participated in study tours, and farmers field training was 1,600, 44 PMO staff have been trained and participated in study tours. The PPMO organized an overseas study tour in September 2015 regarding project management, and Dongying PMO organized domestic study tours regarding agricultural and rural waste management. However, most farmer training was conducted at a late stage and thus had limited impact on project implementation. And much of the external training and study tours could not be implemented due to changes in national government policy in this regard. The original cost allocation was US$ 778,000, among which GEF grant was US$ 240,000 while the actual cost was only US$ 36,000, among which GEF grant was US$ 29,000.
(c) Evaluation study of the effectiveness of constructed wetlands in the treatment of polluted water based on the analysis of the Project monitoring results; development of an agricultural pollution reduction and rural waste management strategy and plan for the Guangli River Watershed in the Dongying Municipality, including an evaluation study of the related Project interventions for the purpose; and development of a Huai River Basin-wide replication strategy for cost-	The policy studies were originally designed to be comprehensive studies to assess project innovations in rural environmental management, and create a replication strategy for dissemination of best practice examples in an expanded area within the Huai River Basin.	The policy studies and planning exercise started quite late due to delays of other components. At project closure, some reports were completed while others were in the process of finalization, mostly using simulated analysis instead of actual monitoring data. So their effectiveness remain to be verified after the facilities will be put into full operation. Shandong University has delivered the report on the contracted policy studies. On October 20 – 21, 2015 a seminar was held in Dongying

effective water pollution control, including dissemination and training and workshops as required for the purpose.		with 85 participants, including representatives from Hua River Commission, Shandong Provincial EPA, and other domestic experts to discuss and disseminate the relevant lessons and experiences. Another workshop was held in Dongying in December 2015 to further disseminate the lessons learned. Due to the implementation delay this sub-component was also significantly scaled back with the original cost estimate being US$ 880,000 (among which GEF is US$ 770,000) while the actual being US$ 286,000 (100% GEF grant).
Component D Project Management and Implementation Support:		
(a) Provision of technical assistance for the review of technical designs and tendering documents, construction quality of Project facilities, and for Project reporting;		The Dongying Municipal City Management Bureau and Agricultural Bureau hired the relevant experts to provide technical assistance for project technical designs, tendering documents, construction supervision, including wetland specialists, procurement specialists, FEPA specialists etc. Dongying PMO hired a third party consultancy to provide technical support for the preparation of the Feasibility Study Report.
(b) Project monitoring and evaluation;	Project progress and technical monitoring and evaluation, including water quality of wetlands inflow and outflow, water quality of treated rural wastewater, effect of changes in fertilizer use on surrounding water quality.	M&E activities started late due to the overall implementation delay. Dongying Environmental Monitoring Station was contracted to monitor and assess the impact of the Dongbalu Wetland and Wastewater Treatment. The relevant monitoring data were provided for the period from September to December 2015,

		and monitoring will last until June 2017. The wetland related results indicators for effluent could not be monitored because the wetland has yet to become operational. Most rural wastewater treatment indicators are also unavailable due to the fact that the facilities are not yet fully operational. Estimations and simulated assessments based on other similar operations have been carried out as a part of the Study of the Effect of Wetlands on Pollution Reduction. Besides, Shandong Agricultural Academy of Science (SAAS) has carried out monitoring and assessment of the impact of the agricultural pollution reduction activities, which included some actual monitoring data and evidence based analysis. SAAS has been contracted to provide monitoring and evaluation services for a duration of 5 years. They were supposed to provide semi-annual reports to the Dongying PMO from the beginning of 2014 to the end of 2018. Due to the implementation delay their monitoring work only started in 2015, so it will last for 4 years instead of 5 years until 2017. The SAAS has delivered the agricultural pollution reduction monitoring/study report (including estimate of pollution reduction) on December 25th, 2015. However the report is mostly based on estimated results instead of actual monitoring data. Therefore its effectiveness remains to be verified once the wetland and other facilities become fully operational.

(c) Support for Project management by the PMOs and PIUs.		The project management component (D) only used 36% of the total budgeted resources, and only 41.69% of planned GEF grant was used. The institutional set up made the cross agency coordination difficult. Furthermore, the PMO (DWRB) was implementing only one small sub-component, while most other activities were implemented by CMB (wetland), and to a lesser extent by AB (non-point pollution). This arrangement provided fewer incentives and little leverage for the PMO to lead implementation overall. In hindsight, it would have been more appropriate and likely more effective, to put the DPMO in a higher level comprehensive bureau such as the Finance Bureau or Planning and Reform Commission.

Annex 3. Institution Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Xiaokai Li	Senior Water Resources Management Specialist	EASIN	Task Team Leader (TTL)
Ximing Zhang	Senior Water Resources Specialist	EASCS	Co- TTL
Joe Zhao	Wastewater Management/Constructed Wetlands	Consultant	Technical Specialist
Weiguo Zhou	Rural Wastewater &Agricultural Pollution Control	Consultant	Operations Specialist
Peter Haase	Constructed Wetland/Wastewater Management	Consultant	Technical Specialist
Zongcheng Lin	Senior Anthropologist	EASCS	Social Safeguards
Feng Ji	Environmental Specialist	EASCS	Environmental Safeguards
Jian Xie	Senior Environmental Economist	EASER	Economic analysis
Yi Dong	Senior Financial Management Specialist	EAPFM	Financial Management (FM)
Yuan Wang	Procurement Specialist	EAPPR	Procurement
Marta Molares-Halberg	Lead Counsel	LEGES	Lawyer
Robert O'Leary	Senior Finance Officer	CTRFC	Disbursement
Tomoko Kato	Operations Officer	EASIN	Operations
Vellet E. Fernandes	Program Assistant	EASIN	Administrative and Client Support (ACS)
Hongwei Zhao	Program Assistant/Team Assistant	EACCF	ACS
Dan Xie	Program Assistant/Team Assistant	EACCF	ACS
Supervision/ICR			
Dong, Yi	Senior Financial Management Specialist	EAPFM	FM
Ji, Feng	Environmental Specialist	EASCS	Environmental Safeguards
Lin, Zongcheng	Senior Anthropologist	Consultant	Social Safeguards
Yao, Songling	Senior Social Development Specialist	GSU02	Social Safeguards
Zhang, Ximing	Senior Water Resources Specialist	GWA02	Co-TTL
Li, Xiaokai	Lead Water Resources Management Specialist	GWA01	TTL
Wang, Yuan	Senior Procurement Specialist	GGO08	Procurement
Yu, Zhuo	Finance Specialist	WFALN	Disbursement
Anis Wan	Operations Officer	GEN02	ICR team leader
Cai, Mantang	Water Environment & institution specialist	Consultant	Environment
Li, Ou	Social Development Specialist	Consultant	Environment
Wu, Deyi	Constructed Wetland Specialist	Consultant	Procurement
Jieli Bai	Program Assistant	EACCF	ACS
Hongwei Zhao	Program Assistant	EACCF	ACS

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY08	3.74	13,932
FY09	13.86	37,589
FY10	18.94	78,567
FY11	16.49	77,726
FY12	9.78	87,357
Total	**62.81**	**295,171**
Supervision/ICR		
FY13	9.56	52,220
FY14	6.17	37,578
FY15	4.73	40,924
FY16	4.59	46,749
Total	**25.05**	**177,470**

Annex 4. Summary of Borrower's ICR and/or Comments on Draft ICR

I. Project Background, Objectives and Content

1.1 Project Background and Objectives

In recent years, the ecological problems of Bohai Sea have become increasingly prominent and terrigenous excessive discharge phenomenon is still serious; the marine development scale of region surrounded by Bohai Sea has extended and the contradiction between the development and protection is becoming more and more obvious. The pollution of sea area in Dongying is relatively serious while it is the direct victim of pollution. As the main drainage channel running through the Dongying downtown and the only river connecting Yellow River with Bohai Sea, due to the fast development of industry and agriculture in Guangli River basin in recent years, the pollution aggravates. The water body of this river basin is polluted seriously, so the treatment to the pollution in Guangli River basin has no time to delay.

Based on this, Dongying City plans to reduce the emission of terrigenous nutrients and pollutants through conducting comprehensive prevention and control of river basin pollution in Guangli River in Dongying City to reduce the negative impact on Bohai Sea so as to establish a model project with innovative concept and high benefits. Dongying City uses grants from Global Environment Facility (GEF) and local supporting funds to start to implement "Huai River Basin Marine Pollution Reduction Project" in 2012 and the project construction period is 4 years (January 2012 to December 2015). This project uses Guangli River in the Huai River Basin of Shandong Province as a demonstration. Through sustainable measures, reduce the total pollutant discharge into the river of land point sources and non-point sources, improve the self- purification capacity of river water body, reduce the total pollutant discharge into the sea and reduce the degree of pollution of sea water; through the comprehensive management of river basin, control the pollution in Guangli River Basin in Dongying City and set a model for the river basin management of other provinces in Huai River Basin.

The development goal of this project is to demonstrate innovative and cost-effective water pollution control measures in Guangli River Basin in Dongying City to contribute to the reduction of pollution in Bohai Sea.

1.2 Project Construction Content and Completion

Grants to Marine Pollution Prevention and Control Project of Huai River Basin from Global Environment Facility is located in Dongying District and Guangli River Basin in Kenli County in Dongying City of Shandong Province, mainly including wetland construction and gate optimization, agricultural pollution control and waste management in rural area, capacity building and policy research, project management and implementation support;

(1) Wetland construction and gate optimization

Constructed wetland , including two parts, funded by GEF grants and counterpart funded respectively, which were constructed respectively on January 10, 2015 and December 5, 2014. By the end of September 2015, all works were completed according to the plan. Among them, some works with GEF grants mainly include earthwork arrangement, plant cultivation and construction of ecological floating bed; some local supporting works mainly include earthwork arrangement, diversion sluice, canal distribution, guide wall, culvert pipe and other construction. The design flow is $7.0\times104m^3/d$ (March –November) and $2.5\times104m^3/d$ (December-February of next year); designed influent quality: CODCr≤60mg/L, BOD5≤20 mg/L, NH3－N≤8 mg/L, TP

≤1.0 mg/L; Effluent quality: carry out requirements of Class V standard of *Environmental Quality Standard for Surface Water* (GB3838-2002). The area covered by aquatic plants in wetlands is 374166m^2 and vegetation coverage in the water surface area is 64.2%.

Gate optimization. The content has been completed according to the plan and the current state of operation is good. Existing automatic gate control system includes three sluices in Guangli River and sluices newly built in the water inlet and outlet of Dongbalu wetland, which have run automatically. These facilities will play an important role in regulating the flow rate of river water, increasing the carrying capacity of the water body and adjusting the water balance of wetland.

Resettlement compensation. Only those relating to wetlands in this project involve land acquisition and resettlement, which have been finished in 2012. Usage right of 2667 mu land was transferred to Dongying Municipal Government from SINPEC Shengli Oilfield Group. The relocation and full compensation of all enterprises have been completed successfully.

(2) Agricultural pollution control and waste management in rural area

①Rural sewage treatment. In order to reduce the disorderly discharge of domestic sewage, choose Zhaojia Village, Shantou Village, Wangying Village, Xuejia Village, Jiangjia Village, Huangdian Village and Qinjia Village along the Guangli River to be the pilots. Among them, Huangdian Village, Xuejia Village, Qinjia Village, Jiangjia Village and Wangying Village use wastewater treatment process of "anaerobic acidification+ constructed wetlands (subsurface flow) to dispose domestic sewage. The total treatment capacity is up to 225m^3/day and the designed influent quality is CODCr≤300mg/L, BOD5≤200 mg/L, SS≤150 mg/L, NH3-N≤40 mg/L and TP ≤6.0 mg/L; the effluent quality reaches Standard B of the first class in *Discharge standard of pollutants for municipal wastewater treatment plant*; the sewage treatment facility of Shaotou Village has no processing terminal and the sewage enter into the urban sewage treatment facility through the laid sewage pipe network and the effluent quality reaches Standard A of the first class in *Discharge standard of pollutants for municipal wastewater treatment plant*; Zhaojia Village disposes the domestic sewage by constructing constructed wetlands.

The rural sewage treatment engineering in Huangdian, Xuejia, Qinjia, Jiangjia and Zhaojia supported by GEF grants has been completed fully and checked and accepted. The domestic sewage treatment engineering of domestic supported Wangying Village and Shaotou Village is under construction and the project construction is expected to be finished in the mid-May 2016.

② Excrement storage tank for cultivation dejection in rural area. In order to reduce the pollution of rural farms to the environment, the project has set up manure pit with different volume in Shaotou Village, Wangying Village, Xuejia Village, Jiangjia Village, Huangdian Village, Qinjia Village and other pilots for collecting cultivation dejection. There are 42 manure pits with 5m^3, 40 manure pits with 10m^3 and one manure pit with 50m^3 in total (83 in total) and the manure pits are surrounded by protective fence. At present, manure pits are put into use.

③ Agricultural pollution control. For the agricultural non-point source pollution, the project selected Shaotou Village closer to Guangli River and seriously polluting Guangli River as a pilot. By taking different measures of formulated fertilization, buffer zone and ecological intercepting ditch, the loss load of nitrogen and phosphorus in Guangli River Basin can reduce.

a. Formulated fertilization. 2014 soil testing formulated fertilization was mainly carried out in Shaotou Village, Wangying Village, Shangzhuang Village, Huangdian Village, Tang Village, Zhaojia and Xi Ying and 2015 soil testing formulated fertilization was in Shaotou

Village, Wangying Village, Shangzhuang Village, Huangdian Village, Jiangjia, Qinjia and Xuejia.

b. Ecological intercepting ditch and buffer zone. Huangdian Village, Shangzhuang Village, Wangying Village and Shaotou Village constructed the ecological intercepting ditch and buffer zone to dispose the tail water of the farmlands so that nitrogen and phosphorus in the farmland drainage can be removed and degraded. The ecological intercepting ditches in Huangdian Village, Shangzhuang Village, Wangying Village and Shaotou Village are respectively 400 meters, 642 meters, 365 meters and 302 meters.

c. Trapping light. The solar-energy frequency-vibrancy trapping lights are installed in the farmland of the pilot villages in order to effectively deal with the insects and pests in the farmland and reduce the pesticide use, of which Huangdian Village and Shangzhuang Village install 30 lights respectively and Shaotou Village and Wangying Village install 20 respectively, totaling 100 lights. The effective radius of prevention and control is 60 meters according to the actual use of the lights so the prevention and control area of each light is about 1.13 hectares.

d. Farmers' environmental protection association. This protect establishes 10 farmers' environmental protection associations which are equipped with offices and equipment and posted with rules and running procedures in 10 rural communities having important influence in Guangli River basin and totally trains members of the farmers' environmental protection association for 66 times with 4420 person-times.

(3) Capacity building and policy research

① Education and training center. The education and training center was established in Dongying Technician College in 2014 and then Dongying Agricultural Bureau hired Kenli County Agricultural Training Center as the technical supporting institution for relevant training of this project. The training institution is equipped with computers, projectors and other training equipment and prepares relevant training courseware.

② Action about capacity building. Kenli County Agricultural Training Center and Dongying Technician College have trained a large number of association members and the training theme is related with the rural and agricultural pollution control. The total number of the trained people has reached 4460 so far (including 40 people trained by the project office (purchasing and financial training)).

③ Policy research. At present, the subject research report—"Assessment and demonstration research on pollution prevention and control in Guangli River basin of Dongying City" undertaken by Shandong University has been completed and submitted in December, 2015. The grants project seminars were carried out in Dongying Blue Horizon Hotel respectively from October 20, 2015 to October 21, 2015 and on December 18, 2015, which discussed the project experience and the next-step work and shared the working experiences. The promotion of strategically plan formulation as well as website construction has been completed.

(4) Project management and implementation support

① The project sets up the three-level management organization in order to promote the successful implementation of the project: provincial, municipal and community level, including Shandong Province Project Leading Group (PPLG), Huai River Commission, Shandong Province Management Office (PPMO), Dongying City Project Leading Group (DPLG) and Dongying City Project Management Office (DPMO).

② Project monitoring and evaluation. The monitoring and evaluation for this project are implemented by Dongying Environmental Monitoring Station and Shandong Province Academy of Agricultural Sciences. The monitoring and evaluation of the constructed wetland and rural sewage treatment facilities are entrusted to Dongying Environmental Monitoring

Station which is responsible for it until June, 2017. The agreement is signed with Shandong Province Academy of Agricultural Sciences to provide monitoring and evaluation of sub-content of the agricultural pollution control and the preparation of *Monitoring and Evaluation Report about Agricultural Pollution of the Pilot Villages in Guangli River Basin* has been completed.

③ Project management and support. Dongying Urban Management Bureau and Agricultural Bureau hire the relevant experts in the implementation process of the project to provide technical assistance for the review of the project technical design, bidding documents and construction quality supervision, including purchasing experts, wetland and rural sewage processing experts and commissioner consultation of the environmental protection association. Dongying Project Office entrusts the third-party advisory agency to provide the technical assistance for the project feasibility study, project progress tracking and monitoring, process report and completion report.

1.3 Project Investment Situation

After completion of the project, the actual total investment is 44.8426 million dollars, of which actual grants of GEF is 3.9447 million dollars, accounting for 8.8% and the domestic supporting facilities are 40.8979 million dollars, accounting for 91.2%. The detailed project investment is shown in Table 1.

Table 1 GEF Project Investment List

S.N.	Project name	GEF grants US$ 000	Supporting funds US$ 000	Total US$ 000
1	Wetland construction and gate optimizatio	184.50	3972.75	4157.25
2	Agricultural pollution control and wa management in rural area	162.69	46.13	208.82
3	Project management and implementat support	34.83	0.69	35.52
4	Capacity building and policy research	12.45	70.21	82.67
Amount to		394.47	4089.79	4484.26

II. Main Factors influencing Project Execution

2.1 Positive Factors

(1)Project management organization. From preliminary preparation to completion of the project, personnel in provincial and municipal project offices are kept stable, which guarantees successful development of project management work.

(2)Working mechanism. Since May of 2014, project leading group convened a project meeting every two to three months to follow up project progress; from October of 2014 till now, provincial project office organized to go to Dongying every month to supervise progress of the project and solve problems met in the project in time, and reported progress and problems to World Bank every two months, which effectively propelled progress of project execution.

(3)Project participants. All participants of the project played due role in project construction. Project management departments at all levels fully exercised function of decision-making and management. Beneficiaries of the project also basically participated in project design and management work by respective Farmers' Environmental Protection Associations.

2.2 Negative Factors

(1)Concept deviation. Earth excavation was conducted in wet land without consent of World Bank thus backfill was conducted again in excavation segments under requirement of World Bank, which delayed project progress to some extent. The reason is that: during initial

phase of the project, there was inconformity between concepts of Dongying Municipal Government and World Bank in function of wet land that Dongying Municipal Government hoped to build the wet land into wet land landscape park for relaxation and entertainment of citizens in Dongying while the concept of World Bank was that main function of wet land shall be removing contaminant in water body and environmental benefits shall be valued more.

(2)Supporting funds. Although supporting funds of wet land construction had been listed into 2014 Dongying City Financial Investment Plan, execution period of the project was delayed to 2015. Municipal Government did not distribute funds of this item again when preparing annual budget of 2015, thus construction contract of the project was unable to be signed, which affected progress of project execution. Slow domestic supporting funds execution of sewage treatment facility construction in Shaotou and Wangying also affected execution progress of the whole project.

(3)Lack of experience. It was the first time that execution units of the project conducted project of World Bank, thus it lacked management experience of the project and did not know well about World Bank procedure, especially withdrawal and account submission, which generated certain negative influences to project execution. To overcome difficulties, staff of every project execution unit studied legal documents and financial management guides in order to better understand project policies and activities; provincial Financial Department and municipal Finance Bureau actively directed payment activities of execution units. Besides, in order to help every party better understand grand payment work, inspection mission of World Bank conducted training on aspects of payment and financial management to financial staff and project management staff of Dongying City Financial Bureau, provincial project office, Dongying project office and three project execution units.

(4)Department coordination. As there were multiple project management departments, they may work from different angles and had different understandings so that insufficient coordination between works of different departments was caused, which generated certain influence to project execution.

(5)Slow withdrawal and account submission. One of the main reasons was slow project progress, and the other is that execution units were not familiar with withdrawal and account submission procedure of World Bank. Provincial project office and Financial Department took following measures to accelerate payment progress of the project: ①they signed to agree service standard, clarifying clear time requirements for project execution units, local project office and finance bureaus at all levels in submitting, approving and handling payment application materials; ② communication between provincial project office and provincial Financial Department was enhanced, efficiently enhancing progress of withdrawal application and directing project execution units to submit unpaid applications of completed engineering in time. In addition, to accelerate payment progress and complete larger capital demand, provincial project office, provincial Financial Department and World Bank experts consulted to increase down payment of assigned account to maximum limit 1 million dollars.

(6)Policy factor. Due to new rural construction, major roads in the village were hardened. During pipeline excavation process of rural sewage treatment facility construction, villagers did not agree to destroy existing roads in the village. After active consultation of Dongying City Agricultural Bureau and construction party with cadres of village committee and villagers, project execution was assured by avoiding roads in the village while consultation process did delay progress of project construction. Moreover, as policies related to international investigation and overseas training changed, content in such aspect was restricted. Project management organization and execution units failed to fully learn and know about advanced domestic and foreign experience and methods. Thus, deviation existed in recognition and understanding of the project to some extent, which caused that the project cannot be better executed.

III. Project Development Target Completion Situation and Benefits

3.1 Project Development Target Completion Situation

Main achievement indexes of development target of the project are mainly expressed in two aspects. The first one is reduction of contaminant and nutrient content flowing from Guangli River basin to the Bohai Sea triggered by the project. The second one is reduction of contaminant and nutrient by constructing wet land in Dongba Road. Specific completion situation of monitoring index is as follows.

Index 1: Reduction of contaminant and nutrient content flowing from Guangli River basin to the Bohai Sea triggered by the project

Reduction of contaminant and nutrient content flowing from Guangli River basin to the Bohai Sea triggered by the project is equivalent to the sum of reduction of contaminant and nutrient in Dongba Road wet land, reduction of contaminant in rural sewage, reduction of contaminant in excrement of village animals and reduction of agricultural contaminant/nutrient load. Estimates of reduction of contaminant and nutrient content flowing from Guangli River basin to the Bohai Sea are COD: 449.52t/a, BOD: 92.03 t/a, NH3-N: 12.37t/a, TN: 7.51t/a and TP: 1.317t/a.

Index 2: Reduction of contaminant and nutrient by constructing wet land in Dongba Road

Analog computation is conducted to show purifying effect of Dongba Road constructed wetland in *Effect Research of Guangli River basin Water Pollution Regulation by Constructed Wetland* of Shandong University, with the result showing that: contaminant emission reduction of Dongba Road wet land is COD: 403.25t/a t/a, BOD: 92.03t/a t/a, NH3-N: 12.37t/a and TP: 0.46 t/a.

Index 1.1: Annual amount of sewage treatment by wetland

According to design flow of Dongba Road constructed wetland, which is $7.0\times104m^3$/d (March to November) and $2.5\times104m^3$/d (December to February of next year), it can be estimated that annual amount of sewage treatment by wet land is $21,500,000m^3$(design capability).

Index 2.1: Sewage control in participated villages

According to evaluation results of *Research Report on Demonstration Evaluation, Mode Study and Regulation Planning of Guangli River basin Agricultural Village Pollution Prevention* of Shandong University, China University of Petroleum (East China) and Qingdao Agricultural University, after construction of village sewage treatment facility project, about $7.85\times104\sim1.35\times105m^3$ domestic sewage will be reduced from being discharged into Guangli River basin. According to designed water quality of flowing-in and flowing-out water, it can be estimated that emission reduction of COD and SS will be about 25.6t/a and 13.9 t/a, and target value will be met after normal operation of the project.

Index 2.2: Animals excrement control over in participated villages

(1) Emission reduction of COD. Designed excrement storage tank of the project is $2500m^3$ in volume. According to designed excrement storage amount and actual volume, it can be estimated that emission reduction of COD is about 20.67t/a.

(2) Emission reduction of TN and TP. Results in *Research Report on Demonstration Evaluation, Mode Study and Regulation Planning of Guangli River basin Agricultural Village Pollution Prevention* (December of 2015) of Shandong University, China University of Petroleum (East China) and Qingdao Agricultural University is adopted for emission reduction of TN and TP. In 2015, reduction of TN and TP in excrement was 0.11t and 0.067t respectively, both lower than target value. The reason is that number of farmers households raising livestock in pilot villages reduced greatly. 83 excrement storage tanks were actually constructed, far

lower than expected amount (1500) in assessment phase of the project, which resulted that actual emission reduction of contaminant in excrement storage tank reduced.

Index 2.3: Reduction of agricultural contaminant/nutrient load in participated villages

Index of reduction of agricultural contaminant/nutrient load in participated villages is mainly expressed by effect of several measures, such as soil testing for formulated fertilization, buffer zone and ecological intercepting ditch. Such index value shall refer to results in *Research Report on Demonstration Evaluation, Mode Study and Regulation Planning of Guangli River basin Agricultural Village Pollution Prevention* (December of 2015) of Shandong University, China University of Petroleum (East China) and Qingdao Agricultural University. In 2015, reduction of TN and TP in farmland tail water was 7.40t and 0.79t respectively, meeting default target value.

Index 2.4: Proportion of farmers applying comprehensive balanced fertilization technology in participated villages

According to data provided by Dongying City Agricultural Bureau and after referring to relevant table of subsidy expenses, 10 villages got subsidy of soil testing for formulated fertilization(3723 planting households), and 1661 households got subsidy in 2014 and 2015. Thus, the proportion of planting households participating in applying comprehensive balanced fertilization technology is 44.6%.

Index 2.5: Number of operating FEPA

At present, 10 farmer environmental protection associations have all been established, with office and equipments equipped and regulations and operating procedures posted. Such index has met target value.

Index 3.1 Number of people received training

Up to now, total number of people receiving training has met 4460, slightly less than target value of 4500 people in assessment document of the project.

Index 3.2: WetLand Pollution Prevention Effect study of Guangli River

At present, subject "Effect Study of Guangli River basin Wet Land Pollution Prevention" undertaken by Shandong University has been finished and the report has been submitted in December of 2015.

Index 3.3: Evaluation Research and Management Plan of Agriculture and Village Pollution Prevention in Guangli River Basin

At present, "Evaluation Research and Management Plan of Guangli River basin Agriculture and Village Pollution Prevention" undertaken by Shandong University, China University of Petroleum (East China) and Qingdao Agricultural University has been finished and the report has been submitted in December of 2015.

Index 3.4: Development and propaganda of Huai River basin promotion strategy

On October 20th and 21th and on December 18th, 2015, grant project seminars were held in Dongying Blue Horizon Hotel respectively to exchange project work and share experience. Formulation of promotion strategy plan and website construction have been finished.

3.2 Project Benefits

(1)Economic benefits. Project construction is demonstrated by Shandong Province Huai River Basin Guangli River basin. By reducing total pollution discharge in the river from land point source and non-point source, the project reduces pollution degree in Bohai Sea and Huanghai Sea water body, and greatly promotes development of marine economy of Dongying City as well as "efficient ecological economy in Yellow River Delta". The project can generate enormous economic benefits. Economic benefits of RMB44,498,100 Yuan is expected to be generated every year after project execution.

(2)Social benefits. Social benefits are mainly expressed in enhancement of environmental protection awareness of villagers in project area, enhancement of satisfaction to community environment, recognition of people to the project, training and practicing to a group of provincial and municipal project management personnel who are familiar with World Bank business, laying good foundation for working on relevant business in the future. Besides, construction of the project will improve costal ecological environment of Guangli River and living environment of villages, and enhance city image of Dongying City to some extent.

(3)Environmental benefits. ① After normal operation of the project, reduction of contaminant and nutrient flowing from Guangli River basin to Bohai Sea is COD: 449.52t/a, BOD: 92.03t/a, NH_3-N: 12.37t/a, TN: 7.51 t/a and TP:1.317t/a respectively. ② According to *Research Report on Demonstration Evaluation, Mode Study and Regulation Planning of Guangli River Basin Agricultural Village Pollution Prevention*, 100 frequency-vibration trapping lights are installed in 4 pilot villages after project execution, effective prevention and control area meets 113 hectares, occupying 14.3% of total area of 4 pilot areas, reducing 0.34t of pesticide input. ③ After special personnel of farmers' environmental protection association communicate with the villagers, they found out that with vigorous social propaganda, professional training, conferences and material issuance as well as farmers' self-conclusion, more and more farmers have learned that there is no direct relationship between continuous increase of chemical fertilizer dosage and yield growth; with propaganda of the project and input of soil testing for formulated fertilization, more and more farmers turn to use compound fertilizer and specific fertilizer, which will generate positive influence to ecological environment in project area.

(4)Project promotion and demonstration effect. The project provides a brand new mode for basin pollution regulation, covering methods combining agricultural non-point source pollution, rural domestic sewage treatment and terminal constructed wetland treatment. Execution effect shows that such mode conforms to treatment status of basin regulation and is good in effect (refer to subject research report of *Effect Evaluation and Demonstration Research of Dongying City Guangli River Basin Pollution Prevention* of Shandong University for specific content of project promotion and demonstration effect).

3.3 Evaluation Level

Integrating constructed wetland construction, agricultural pollution control and rural waste management, famer environmental protection association construction and operation, capability construction, policy formulation, as well as project monitoring and evaluation, evaluation level of the project achievement is satisfactory.

IV. Performance Evaluation of World Bank and Borrower

4.1 Performance of World Bank

(1)Sufficient project identification and preparation. Before World Bank determined the project, it made a lot of deep investigations, including Huai River basin and sea area pollution, Guangli River costal agricultural village pollution status, economic development status of Dongying City etc., recognizing importance of regulating international basin and sea area pollution.

(2)Careful and thorough consideration. Project design is reasonable. Detailed consideration and arrangement are made to content of project construction, progress, environmental influence, subsequent operation and management.

(3)Precise and scientific project evaluation. Selection of project unit, investment orientation and scale, project design and project effect prediction all conform to international practice. Scientific method is adopted for analysis and calculation, assuring operability of project target.

(4)Serious and responsible project inspection. During project execution, inspection mission of World Bank inspected and directed deeply in project units and sites for several times, fully exchanged and communicated with project offices at all levels and every execution unit, and put forward many suggestions to promote project execution, which accelerated progress of project execution and improved project quality.

In a word, managers and experts of World Bank are precise in work style, serious in work attitude, strong in policy and are rather flexible, leaving deep impression on project offices at all levels and every execution unit. World Bank has done satisfactory work for the project.

4.2 Performance of Borrower

(1)Performance of Government

Governments at all levels highly valued application, approval, evaluation and execution of the project. Except for policy guarantee and department coordination, large amount of manpower, material resources and financial resources were provided as well. Especially in project execution, governments at all levels fully supported project construction, established project leading team and project offices, allocated capable project managers, and safeguarded due allocation of full amount of domestic supporting funds to guarantee successful development of project construction. Governments have done satisfactory work for the project.

(2)Performance of execution organization

Under leadership of Dongying Municipal Government and with support and help of provincial project office and municipal project office, every project execution unit carefully studied project documents, correctly understood target and concept of project construction, meticulously designed engineering of the project, carefully constructed, and solved problems met during project construction in time. Although overall progress of project execution is slow, most of the construction content are completed as scheduled, basically meeting expected target.

Overall performance of execution organizations during project construction is satisfactory.

V. Main Experience and Lessons of Project Execution

(I) Attention of government is important guarantee of project completion

To successfully promote project execution, governments established project management organizations at all levels. At provincial level, Vice-Governor holds the post of leader of provincial project leading team, taking charge of full leadership and coordination, as well as reviewing decision and policy. Deputy director-general of provincial Financial Department holds the post of deputy director of provincial project office to assist provincial project leading team in inspecting the project and formulating decision on aspects of strategy and policy, acting as main coordination entity of the project as well as main center of communication between World Bank, GEF and governmental central departments. At municipal level, project leading team of Dongying City is composed of staff in Finance Bureau, Development and Reform Commission, Water Conservancy Bureau, Agricultural Bureau, Urban Management Bureau, Environmental Protection Agency, Marine Fisheries Bureau, Forestry Bureau, Planning Bureau, Territorial Resources Bureau, Bureau of Housing and Construction and Weather Bureau, while daily work is hosted by Dongying City Water Conservancy Bureau.

(II) Adequate domestic supporting funds is the basis of project completion

It’s not enough for project construction to depend on GEF grant funds, it also requires support of local supporting funds, especially large amount of funds required for Dongba Road wet land construction. However, as municipal financial supporting project package of such project was not listed into 2015 Dongying City Project Construction Plan so that local supporting funds was unable to be implemented, preliminary work of the project was unable to be conducted, construction contract cannot be signed, and progress of project withdrawal and

submission was also affected. Afterwards, wet land project was successfully executed only after supporting funds was allocated duly.

(III) Good project supervision and management is important support for project execution

Shandong Province project office and Dongying City project leading team closely supervised every procedure of project preparation to guarantee that domestic departments may review in time and relevant documents may be replied to avoid delay. During project construction, Shandong Province project office went to Dongying regularly to supervise and inspect progress of project execution, put forward solution to existing problems and submitted supervision report to World Bank every time. Dongying City project office actively took charge of organization, direction and supervision of project execution, which effectively promoted progress of project execution. Under leadership of Dongying City project leading team and provincial project office, Dongying City project office established good working mechanism with different execution organizations, namely Dongying City Urban Management Bureau and Agricultural Bureau, to cooperate closely in daily work and solve problems of project execution together.

(IV) Function of environmental protection association and village committee shall be exercised

Construction content, such as sewage treatment and excrement storage tank, involves improvement of village appearance and influence during construction period. In some project villages, except for normal construction supervision, village environmental protection association and village committee actively participated in supervision of construction process by finding problems in time, putting forward requirements and actively coordinating with construction party, which guaranteed quality of construction.

(V) Construction content should be adjusted timely according to practical situation

Take construction of excrement storage tank as an example, facilities after construction greatly improved environmental health in communities, and changed the farmers' habit of piling animal excrement outside the yard or along the roads at will. However, through observation and acquaintance of environmental protection association, insufficiency of former design scheme was found, which was mainly that excrement storage tank was relatively short in height and there was no protective device so that unattended animals or even kids may fall into it while they were playing. Such risk information was reported to World Bank experts and Dongying City Agricultural Bureau by environmental protection association. And Dongying City Agricultural Bureau verified immediately and conducted funds calculation and design of installation scheme of excrement storage tank protective guard rapidly. With approval of World Bank, purchase, execution, installation, acceptance and other works were conducted quickly.

(VII) It's not favorable to set up project office in peer unit

Execution organizations of the project are Dongying City Urban Management Bureau, Agricultural Bureau and Water Conservancy Bureau while project management office is set up in Dongying City Water Conservancy Bureau, taking charge of supervision, management and coordination of the project. However, in administration, Water Conservancy Bureau, Agricultural Bureau and Urban Management Bureau are at the same level so that it is not that easy for the project office set up in Water Conservancy Bureau to coordinate with other two units. It generated negative influence to project execution to a certain degree. For better service to project execution, it is suggested that project office shall not be set up in peer management organization.

Annex 5. List of Supporting Documents

1. GEF Grant Agreement
2. GEF Project Appraisal Document
3. Mission Aide Memoires and Back-to-Office Reports
4. Implementation Status Reports
5. Borrower's ICR
6. Feasibility Study Report
7. Project Implementation Manual
8. Country Partnership Strategy of the World Bank Group for People's Republic of China for the Period FY12-FY16
9. Study of the Impact on Pollution Reduction through Constructed Wetland in Guangli River Catchment
10. Evaluation Study and Management Planning for Agricultural and Rural Pollution Reduction in Guangli River Catchment