Document of
The World Bank

Report No: ICR00003541

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-97173)

ON A

GRANT FROM
THE GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$4.788 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

SHANGHAI AGRICULTURAL AND NON-POINT POLLUTION REDUCTION PROJECT

December 18, 2015

Water Global Practice
China and Mongolia Country Management Unit
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective October 31, 2015)

Currency Unit = Renminbi Yuan (RMB)
RMB 1.00 = US$0.157
US$1.00 = RMB 6.35

FISCAL YEAR
January 1–December 31

ABBREVIATIONS AND ACRONYMS

APL	Adaptable Program Loan
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CSTR	Completely Stirred Tank Reactor
EA	Environmental Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
GEF	Global Environment Fund
GEO	Global Environment Objective
HRT	Hydraulic Retention Time
ICR	Implementation Completion and Results
M&E	Monitoring and Evaluation
NH3-N	Ammonia Nitrogen
O&M	Operation and Maintenance
OP	Operational Policy
PAD	Project Appraisal Document
PDO	Project Development Objective
PIA	Project Implementation Agency
PIF	Project Identification Form
PMO	Project Management Office
RAP	Resettlement Action Plan
RMB	Renminbi
SABTS	Shanghai Agricultural Broadcasting Television School
SAC	Shanghai Agricultural Commission
SATESC	Shanghai Agricultural Technology Extension and Service Center
SDRC	Shanghai Development and Reform Commission
SBH	Shanghai Bright Holstan Company Limited
SFB	Shanghai Finance Bureau
SMG	Shanghai Municipal Government
TN	Total Nitrogen
TP	Total Phosphorus

Regional Vice President: Axel van Trotsenburg
Senior Global Practice Director: Junaid Kamal Ahmad
Sector Manager: Ousmane Dione
Project Team Leader: Gang Qin

CHINA
Shanghai Agricultural and Non-point Pollution Reduction Project

CONTENTS

A. Basic Information

Country:	China	Project Name:	GEF Shanghai Agricultural and Non-point Pollution Reduction Project
Project ID:	P090376	L/C/TF Number(s):	TF-97173
ICR Date:	12/15/2015	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	SHANGHAI MUNICIPAL GOVERNMENT
Original Total Commitment:	USD 4.79M	Disbursed Amount:	USD 4.79M
Revised Amount:	USD 4.79M		
Environmental Category: B		**Global Focal Area: I**	
Implementing Agencies: Shanghai APL Project Management Office			
Cofinanciers and Other External Partners:			

B. Key Dates

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	04/04/2008	Effectiveness:	07/27/2010	12/10/2010
Appraisal:	08/17/2009	Restructuring(s):		07/15/2013 06/17/2014
Approval:	06/10/2010	Mid-term Review:		
		Closing:	06/30/2014	06/30/2015

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Moderately Satisfactory
Risk to Global Environment Outcome	Low or Negligible
Bank Performance:	Moderately Satisfactory
Borrower Performance:	Moderately Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Moderately Unsatisfactory	Government:	Moderately Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Moderately Satisfactory

Overall Bank Performance:	Moderately Satisfactory	**Overall Borrower Performance:**	Moderately Satisfactory

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	Moderately Satisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Agricultural extension and research	9	20
General agriculture, fishing and forestry sector	50	44
General water, sanitation and flood protection sector	7	14
Public administration- Agriculture, fishing and forestry	21	19
Wastewater Treatment and Disposal	13	3
Theme Code (as % of total Bank financing)		
Other rural development	63	63
Pollution management and environmental health	12	17
Rural services and infrastructure	25	20

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Axel van Trotsenburg	James W. Adams
Country Director:	Bert Hofman	David R. Dollar
Practice Manager/Manager:	Ousmane Dione	Ede Jorge Ijjasz-Vasquez
Project Team Leader:	Gang Qin	Takuya Kamata
ICR Team Leader:	Gang Qin	
ICR Primary Author:	Toyoko Kodama	

F. Results Framework Analysis

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

The Global Environment Objectives and the Project Development Objectives (PDOs) are to demonstrate effective and Innovative pollution reduction activities in Shanghai's rural areas in order to reduce the rural/agricultural pollution load (especially nutrients) to the East China Sea.

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

There was no change in the GEO.

(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 :	**Demonstration of pollution reduction technologies (number)**			
Value (quantitative or Qualitative)	0.00	8.00	6.00	6.00
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 100% achieved.** Target was revised because of changes in project scope and technologies to be demonstrated. All technologies demonstrated proved successful and replicable.			
Indicator 2 :	**Reduced pollution of TN (total nitrogen) from subproject sites in Livestock Waste Mgmt Tech. Demo. component (ton/yr)**			
Value (quantitative or Qualitative)	0.00	30.60	425.00	536.50
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 126% achieved.** The original target only considered liquid waste but not solid waste. It was revised at the first project restructuring. The liquid reduction load also achieved the original target.			
Indicator 3 :	**Reduced pollution of TP (total phosphorus) for subproject sites in Livestock Waste Mgmt Tech component (ton/yr)**			
Value (quantitative or Qualitative)	0.00	7.80	129.00	163.80
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 127% achieved.** The original target only considered liquid waste but not solid waste. It was revised at the first project restructuring. The liquid reduction load also achieved the original target.			
Indicator 4 :	**Reduced pollution of BOD (biological oxygen demand) from subproject sites in Livestock Waste Mgmt comp (ton/yr)**			
Value (quantitative or Qualitative)	0.00	606.50	1,983.00	2,442.90

Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 123% achieved.** The original target only considered liquid waste but not solid waste. It was revised at the first project restructuring. The liquid reduction load also achieved the original target.			
Indicator 5 :	**Reduced pollution of COD (chemical oxygen demand) from subproject sites in Livestock Waste comp (ton/yr)**			
Value (quantitative or Qualitative)	0.00	1,347.50	4,198.00	4,828.50
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 115% achieved.** The original target only considered liquid waste but not solid waste. It was revised at the first project restructuring. The liquid reduction load also achieved the original target.			
Indicator 6 :	**Reduced pollution of NH3-N (Ammonia Nitrogen) from subproject sites in Wetland Demo. component (ton/yr)**			
Value (quantitative or Qualitative)	0.00	1.87	2.29	16.60
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 724% achieved.** The original target was based on 4 villages. It was revised in the first project restructuring as the scope was expanded, but it was still conservatively set due to uncertainties regarding the performance of the technology.			
Indicator 7 :	**Reduced pollution of TP from subproject sites in Wetland Demo component (ton/yr)**			
Value (quantitative or Qualitative)	0.00	0.57	0.70	2.20
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 314% achieved.** The original target was based on 4 villages. It was revised in the first project restructuring as the scope was expanded, but it was still conservatively set due to uncertainties regarding the performance of the technology.			
Indicator 8 :	**Reduced pollution of BOD from subproject sites in Wetland Demo component (ton/yr)**			
Value (quantitative or Qualitative)	0.00	33.21	28.03	90.70
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 324% achieved.** The original target was based on 4 villages. It was revised in the first project restructuring as the scope was expanded, but it was still conservatively set due to uncertainties regarding the performance of the technology.			
Indicator 9 :	**Reduced pollution of COD from subproject sites in Wetland Demo component (ton/yr)**			
Value (quantitative or Qualitative)	0.00	59.28	40.91	173.40

Date achieved	05/31/2010	12/31/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 423% achieved.** The original target was based on 4 villages. It was revised in the first project restructuring as the scope was expanded, but it was still conservatively set due to uncertainties regarding the performance of the technology.			
Indicator 10 :	**Increased replication farm area using demonstrated technologies (mu[1]) (cumulative)**			
Value (quantitative or Qualitative)	0.00	16,000.00		16,000.00
Date achieved	05/31/2010	06/30/2014		06/30/2015
Comments (incl. % achievement)	**100% achieved.**			
Indicator 11 :	**Development of a replication strategy for disseminating demonstrated technologies**			
Value (quantitative or Qualitative)	None	finalized		finalized
Date achieved	05/31/2010	06/30/2014		06/30/2015
Comments (incl. % achievement)	**Achieved.** The replication strategy made recommendations on the financing, institutional, and O&M arrangements critical to the scaling up of the demonstrated techniques. It was presented to key stakeholders at a workshop during project implementation.			
Indicator 12 :	**Volume (mass) of BOD pollution load removed by treatment plant under the project**			
Value (quantitative or Qualitative)	0.00	2,011.00		2,533.60
Date achieved	05/31/2010	06/30/2015		06/30/2015
Comments (incl. % achievement)	**125% achieved.** This is a core indicator added during project implementation, aggregated from Component 1 and 2.			
Indicator 13 :	**Technologies demonstrated in the project areas (number)**			
Value (quantitative or Qualitative)	0.00	6.00		6.00
Date achieved	05/31/2010	06/30/2015		06/30/2015
Comments (incl. % achievement)	**100% achieved.** This is a core indicator added during project implementation.			

[1] One mu is 1/15 hectare.

(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 :	**Average quantity of livestock solid and liquid waste treated at livestock farms in Jinshan, Shenye and Qianwei (ton/d)**			
Value (quantitative or Qualitative)	0.00	126,000	243.00	360.00
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 148% achieved.**			
Indicator 2 :	**Average volume of rural household wastewater treated at wetland WWTS in participating villages (m3/d)**			
Value (quantitative or Qualitative)	0.00	504.00	157.00	199.00
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 126% achieved.** The original target was reduced because the area covered under the river-network wetland was significantly reduced.			
Indicator 3 :	**Number of farmers receiving skills development programs on fertilizer, insecticides and pesticides**			
Value (quantitative or Qualitative)	0.00	1100.00		1100.00
Date achieved	05/31/2010	06/30/2014		06/30/2015
Comments (incl. % achievement)	**100% achieved.**			
Indicator 4 :	**Quantity of organic fertilizer used (ton/yr)**			
Value (quantitative or Qualitative)	0.00	2400.00		2400.00
Date achieved	05/31/2010	06/30/2014		06/30/2015
Comments (incl. % achievement)	**100% achieved.**			
Indicator 5 :	**Extent of low residue and low toxicity pesticides used (percentage against total pesticides used at pilot sites)**			
Value (quantitative or Qualitative)	0.00	90.00	80.00	100.00
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments	**Revised target 125% achieved.** The target was revised to be more feasible to			

(incl. % achievement)	the situation at the time of the first project restructuring, but the results at project closing exceeded the revised as well as the original targets.			
Indicator 6 :	**Usage of green pest control techniques (at pilot sites)**			
Value (quantitative or Qualitative)	none used	description	100% of farmers are using green test techniques	100% of farmers are using green test techniques
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**100% achieved.** The target was defined in the first project restructuring.			
Indicator 7 :	**Number of subprojects satisfactorily implemented (cumulative)**			
Value (quantitative or Qualitative)	0.00	8.00	7.00	7.00
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 100% achieved.** The Integrated Livestock and Agricultural Waste Management sub-component was dropped.			
Indicator 8 :	**Number of training courses conducted**			
Value (quantitative or Qualitative)	0.00	10.00	24.00	24.00
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**100% achieved.**			
Indicator 9 :	**Number of farmers who participated in trainings and workshops (cumulative)**			
Value (quantitative or Qualitative)	0.00	2,000.00	2870.00	2870.00
Date achieved	05/31/2010	06/30/2014	06/30/2015	06/30/2015
Comments (incl. % achievement)	**Revised target 100% achieved.**			
Indicator 10 :	**Client days of training provided (number)**			
Value (quantitative or Qualitative)	0.00	2870.00		2870.00
Date achieved	05/31/2010	06/30/2015		06/30/2015
Comments (incl. % achievement)	**100% achieved.** This is a core indicator added during project implementation.			
Indicator 11 :	**Client days of training provided - Female (number)**			
Value (quantitative or Qualitative)	0.00	400.00		574.00

Date achieved	05/31/2010	06/30/2015		06/30/2015
Comments (incl. % achievement)	**143% achieved.** This is a core indicator added during project implementation.			

G. Ratings of Project Performance in ISRs

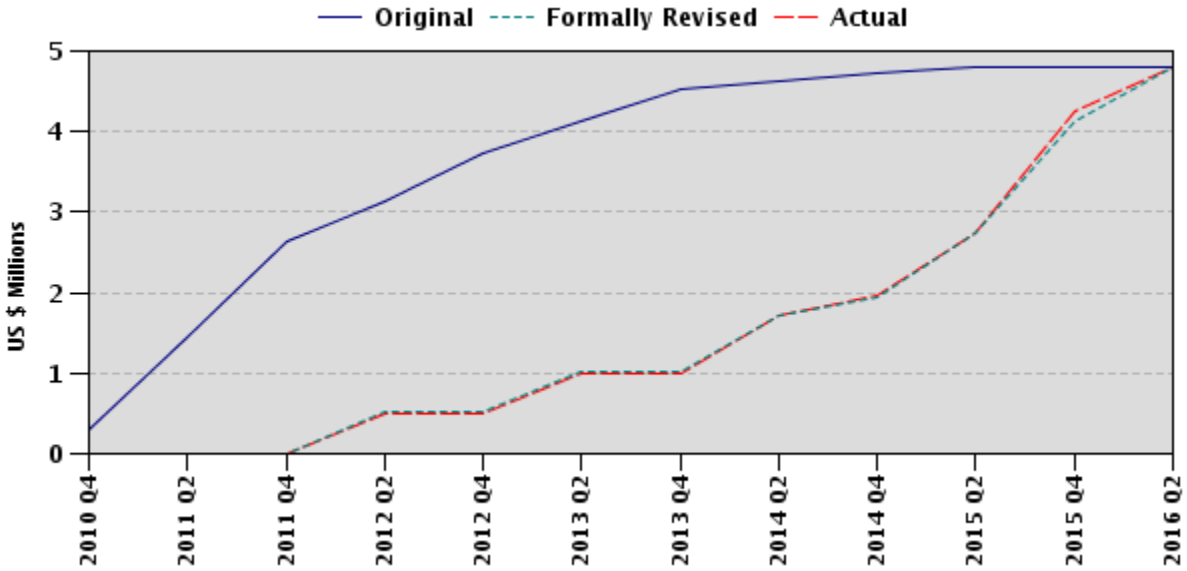
No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	06/28/2011	Moderately Satisfactory	Moderately Satisfactory	0.00
2	04/08/2012	Moderately Unsatisfactory	Unsatisfactory	0.50
3	11/12/2012	Moderately Unsatisfactory	Unsatisfactory	0.72
4	06/22/2013	Moderately Unsatisfactory	Moderately Unsatisfactory	1.01
5	12/19/2013	Moderately Unsatisfactory	Moderately Satisfactory	1.72
6	06/24/2014	Moderately Unsatisfactory	Moderately Satisfactory	1.97
7	10/30/2014	Moderately Satisfactory	Moderately Satisfactory	1.97
8	03/09/2015	Moderately Satisfactory	Moderately Satisfactory	3.41
9	07/14/2015	Satisfactory	Moderately Satisfactory	4.75

H. Restructuring (if any)

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		GEO	IP		
07/15/2013	N	MU	MU	1.01	Reasons for Restructuring: Project scope in three sub-components was changed, including technology applied in Part A.1, and location for Part B.1. Civil works in Part B.2 switched to non-Bank financing, and savings were reallocated to other components. Key Changes: (i) Update the descriptions of Parts A.1 and B.2, (ii) change

Restructuring Date(s)	Board Approved GEO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		GEO	IP		
					the location and the Project Implementation Agency for Part B.1, (iii) revise results framework, and (iv) reallocate funds.
06/17/2014	N	MU	MS	1.97	Reasons for Restructuring: Part A.3 was dropped because the land use certificate was expired. The closing date needed to be extended to complete all the remaining work. Key Changes: (i) Cancel Part A.3, (ii) reallocate funds, (iii) extend the closing date by 12 months, and (iv) revise the results framework.

I. Disbursement Profile



1. Project Context, Global Environment Objectives, and Design

1.1 Context at Appraisal

1. In the decade leading up to appraisal, Shanghai faced significant urban environmental challenges, in spite of its efforts to improve the urban environment by investing heavily in infrastructure. In the early 2000s, the interception of wastewater and storm water in the core city was less than 66 percent, and only 11 percent of sewage was treated to secondary treatment standards and safely disposed of. As a result of economic and agricultural development in surrounding areas in Jiangsu and Zhejiang, the water in the Huangpu River and the Yangtze River—the main sources of drinking water for Shanghai—had become so polluted that it did not meet the national standard for raw water quality. Moreover, nutrients flowing through the rivers and Tai Lake caused hypoxia and eutrophication, which became serious problems.[2]

2. Starting in 2003, the Shanghai municipal government (SMG), with support from the national government and the World Bank, embarked on an innovative financing framework to address complex environmental management challenges as part of a long-term, phased program called the Shanghai Urban Environmental Project Adaptable Loan Program (APL). Besides investing in high-priority infrastructure in the water supply, wastewater, and solid waste sectors, the first phase of APL (APL1) financed the Upper Huangpu Catchment Management Study (2005), which identified four major sources of water pollution:

- Livestock waste
- Untreated wastewater from households in rapidly urbanizing villages and towns in suburban areas
- Crop straw
- Non-point agricultural runoff fertilizers and pesticides

3. In response, the SMG formulated three-year action plans and implemented priority environmental projects to control livestock waste and agricultural and non-point source pollution. The Third Shanghai Three-Year Action Plan for Environmental Protection (Third TYAPEP, 2006–8) introduced key measures that included the following:

- Closure of small-scale livestock farms
- Establishment of organic fertilizer–producing facilities
- Stricter pollution discharge permits for livestock farms
- Promotion of land application of livestock manure
- Promotion of organic fertilizer use, integrated pest management techniques, and applications of low-toxicity pesticides
- A ban on open burning of agricultural wastes
- Comprehensive utilization of crop straw

4. Based on the successful implementation of the Third TYAPEP, the Fourth TYAPEP (2009–11) was designed to continue many of these measures, along with three more:

- Piloting of livestock waste treatment facilities and associated application systems in large farms

[2] In 2007 alone, sixty cases of marine red tides occurred in the East China Sea over a total area of about 9,800 km^2.

- Demonstration of livestock manure biogas projects
- Increased wastewater collection and treatment in rural areas

5. The Fourth TYAPEP aimed to reduce the use of nitrogen-based fertilizer and chemical pesticides by ten percent, further improve environmental performance of thirty-eight large livestock farms, and treat wastewater from at least sixty thousand households to improve the quality of river water.

6. The Shanghai Agricultural and Non-point Pollution Reduction Project emerged as a response to the findings from the Upper Huangpu Catchment Management Study and formed a key part of the Fourth TYAPEP. The project was a standalone Global Environment Facility (GEF) project, but it also supported the broad program development objective of the APL, which was to improve environmental conditions in Shanghai by progressive development and implementation of integrated metropolitan environmental management measures. The project was aligned with GEF's focus on reducing pollution in the large marine ecosystems of East Asia and with GEF's Strategic Program 2 under Strategic Objective 2, "reducing nutrient over-enrichment and oxygen depletion from land-based pollution of coastal waters in Large Marine Ecosystems consistent with the Global Program of Action." The project also directly contributed to the Bank's China Country Partnership Strategy (CPS, 2006–10) Pillar 3, which focused on managing resource scarcity and environmental challenges through piloting and scaling-up policies and mechanisms to address agricultural and non-point pollution.

1.2 Original Global Environment Objective (GEO) and Key Indicators

7. The original Global Environmental Objective (GEO) of the Shanghai Agricultural and Non-point Pollution Reduction Project was to demonstrate effective and innovative pollution reduction activities in Shanghai's rural areas in order to reduce the rural and agricultural pollution load (especially nutrients) in the surface water flowing to the East China Sea. The GEO in the grant agreement was identical.

8. The following were the key project outcome indicators:

- Demonstration of pollution reduction technologies
- Reduced pollution in terms of total nitrogen (TN, total phosphorus (TP), biological oxygen demand (BOD), and chemical oxygen demand (COD) discharged from subproject sites from a livestock waste management technology demonstration component
- Reduced pollution of ammonia nitrogen (NH3-N), TP, BOD, and COD discharged from subproject sites from a wetland demonstration for pollution reduction component
- Increased replication farm area using demonstrated technologies
- Development of a replication strategy for disseminating demonstrated technologies

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

9. The GEO was not revised, but targets for the key project outcome indicators were revised in the restructuring paper of June 2013 due to changes in or cancelation of some subprojects or to set more realistic goals (see Section 1.7 for more details). Moreover, three core indicators were added at the intermediate results level to comply with the World Bank's requirements:

- Volume (mass) of BOD pollution load removed by treatment plant under the project
- Technologies demonstrated in the project areas at the project outcome/GEO level
- Client days of training provided (disaggregated by gender)

1.4 Main Beneficiaries

10. The project appraisal document (PAD) was silent regarding main beneficiaries of the project. Nevertheless, the project scope made clear that the original main beneficiaries were people living in rural areas of Shanghai, whose water quality would be improved. In particular, primary beneficiaries included the following:

- Shanghai Bright Holstan Jinshan Dairy Farm, Shanghai Shenye Cooperative, and Qianwei Village, from the demonstration of livestock and agricultural waste management
- Households connected to wetland wastewater treatment systems in Qingpu District, Jinshan District, Jiading District, and Chongming County of Shanghai Municipality
- The Shanghai Agricultural Technology Extension and Service Center (SATESC), from the demonstration of integrated agricultural pollution reduction techniques
- The Shanghai Agricultural Broadcasting Television School (SABTS), from the dissemination activities
- Farmers in the rural Shanghai areas who participated in demonstration activities or received training and information through the project

11. Secondary beneficiaries who were implementers of the project and indirectly benefited from it were the Shanghai municipal government, the Shanghai Agricultural Commission, and the Shanghai Environmental Protection Bureau.

1.5 Original Components

12. The project consisted of four components, as summarized with their subcomponents below.

Component 1: Livestock Waste Management Technology Demonstration (base cost US$9.748 million; GEF grant US$2.408 million)

(a) *Livestock waste management on a large-scale farm*. This subcomponent would support the establishment of a dairy waste treatment facility with a capacity of 256 tons per day on Shanghai Bright Holstan Jinshan Dairy Farm in Jinshan District, which has about 5,000 dairy cattle. The facility would consist of a primary solid-liquid separator, an acidification tank, a 22-day hydraulic retention time (HRT) mesophilic anaerobic completely stirred tank reactor (CSTR), and a "wet"-type scrubbing biogas collector. Biogas would be combusted in two 250 kW reciprocating engine generators to generate electricity for energy sale to the local grid.

(b) *Livestock waste management on a medium-scale farm*. This subcomponent would support building a livestock waste treatment center on Shanghai Shenye Cooperative in Chongming County, which has about 1,600 dairy cattle. The treatment center would comprise two independent systems would be (i) a solid waste management system using a composting and pelletizing process, capable of treating 50 tons of livestock waste per day; and (ii) a liquid waste management system, composed of a series of anaerobic and

facultative lagoons, with a 40-day HRT capable of treating 30 tons of livestock wastewater per day before final disposal through land application

(c) *Integrated livestock and agricultural waste management*. This subcomponent would support livestock and agricultural waste treatment using an integrated approach in Qianwei Village of Shuxin Town in Chongming County. The proposed facilities would consist of a main system (a series of interconnected digesters) and an auxiliary system (a gasification plant and a small biomass briquetting plant) to treat the waste from about 4,000 standing pigs, 2,500 tons of crop straw, and 1,100 tons of rice chaff and 800 tons of municipal solid waste annually.

Component 2: Wetland Demonstration for Pollution Reduction (base cost US$3.343 million; GEF grant US$0.95 million)

(a) *Rural town river-network wetland demonstration*. This subcomponent would support river-network wetland ecological restoration engineering and the construction of a vertical submerged wetland to collect and treat household sewage. It would cover a total area of about 66.5 hectares and restore a total of about 4,850 meters of river courses, including Gujing, Miaojing, and Lianqi and natural interconnected waterways. The work would consist of the following: (i) construction of river side belts and vegetation buffers (47,300 m^2); (ii) restructuring of river beds (88,600 m^2); (iii) connection of dead-end waterway and expansion of river cross section (265 m); and (iv) construction of a vertical submerged reed-coarse sand wetland to collect and treat household sewage (105 residents in 30 households).

(b) *Village wetland sewage treatment systems*. This subcomponent would support construction of six village wetland sewage treatment systems in four villages of Qingpu District, located downstream of the Taihu basin. Each proposed treatment demonstration system would consist of sewage collection networks, a regulation tank, trickling filter pretreatment, a secondary settling tank, and an artificial wetland for a treatment process. The design capacity of the systems are 82 m^3 per day (Qianwan), 156 m^3 per day (Beiwangbang), 117 m^3 per day (Jintian), and 147 m^3 per day (Xiezhuang).

Component 3: Integrated Agricultural Pollution Reduction Techniques (base cost US$20.412 million; GEF grant US$0.9 million)

(a) *Demonstration of the use of organic fertilizer*. This subcomponent would demonstrate innovative techniques to reduce utilization of chemical fertilizers by promoting the alternative use of organic fertilizer at three selected demonstration sites in Jinshan and Qingpu Districts and Chongming County, as well as other farms, to partially replace chemical fertilizers. It would also promote accurate fertilizer application and the use of crop-specific and nutrient-customized fertilization to improve the efficiency of chemical fertilizer and develop more ecologically friendly and sustainable agriculture. Manure application techniques would be demonstrated.

(b) *Demonstration of the scientific application of agricultural chemicals*. This subcomponent would promote the use of eco-friendly chemicals and technologies to reduce pollution from agricultural chemicals (insecticides and pesticides) at the same three demonstration sites in Jinshan and Qingpu Districts and Chomgming County. In particular, the following would be used: (i) high-efficiency, low-toxicity, and low–residual effect

chemicals; (ii) eco-friendly biological pesticides; (iii) upgraded sprayers; and (iv)nonchemical technologies for insect and pest control, such as insect nets, moth-killing lamps, sticky paper, and sex-alluring agents

(c) *Monitoring and extension*. This subcomponent would set up about 120 checkpoints at the three demonstration sites for onsite experimentation and to collect samples for laboratory testing to monitor the effectiveness of the technologies demonstrated in Component 3.

Component 4: Project Management and Dissemination (base cost US$1.176 million; GEF grant US$0.53 million)

(a) *Project management*. This subcomponent would support a project coordination group and the Shanghai project management office (PMO) at the municipal level, working groups at the county or district level, and the project implementing agencies (PIAs) at the participating entity level for efficient project management and implementation through provision of adequate budgets for technical assistance, consultant services, training, and incremental operating expenses.

(b) *Replication strategy development, monitoring, and evaluation*. This subcomponent would establish monitoring and evaluation systems at all the PIAs. An independent monitoring team hired by the PMO in accordance with terms of reference acceptable to the Bank would monitor the results of project outcome indicators. This subcomponent would also finance development of a project replication strategy.

(c) *Training and dissemination*. This subcomponent would be implemented by the Shanghai Agricultural Broadcasting Television School (SABTS), which would provide training for participating entities, local farmers, students, professionals, and government officials throughout the project implementation period and disseminate information and experience obtained from overall project implementation. Dissemination would take place within the scope of the project, as well as through sector-wide coverage and to the general public in Shanghai and China through the SABTS's satellite broadcasting network, an online course on the Internet, and traditional classroom and onsite channels. It would also include development of a website and a project video program and the organization of workshops and an international conference.

1.6 Revised Components

13. The following changes were made to the scope of the project:

- *Component 1(a): Large-scale farm.* Instead of biogas power generation, which was considered too technologically advanced and expensive, the project financed (i) the expansion of an existing dedicated wastewater treatment plant from 450 tons per day to 800 tons per day and (ii) the expansion of a cattle waste composting yard and procurement of equipment for organic fertilizer production.
- *Component 1(c): Integrated waste management*. This subcomponent was canceled because the land use clearance for "scientific research" expired during implementation.

1.7 Other Significant Changes

14. The project was restructured twice, in July 2013 and June 2014, respectively, to accommodate the changes in project scope (see Section H of the datasheet). Changes were made to financing arrangements, grant proceeds were reallocated, the results framework was updated, and the closing date was extended by twelve months. A summary of changes to components is as follows:

- *Component 2(a): Rural river-network wetland demonstration*. The original location in Jiading District was dropped due to a change in the land use master plan. It was replaced with a new site in Shuxin Town of Chongming Island. Although the scale was reduced from 66.5 ha to 2.2 ha of wetland, the grant allocation to this subcomponent was increased from US$300,000 to US$650,000 because counterpart funding at this site was limited.
- *Component 2(b): Village wetland sewerage treatment system.* The subcomponent switched to non-Bank financing, as it was implemented with government funds by May 2010. It was changed because of slow project preparation and availability of government funds to implement the subcomponent. Of the original allocation, US$150,000 was retained to purchase equipment for maintenance and water quality monitoring, and the remainder was reallocated to other components.
- *Component 3: Agricultural technical service center*. An additional grant of US$360,000 was reallocated to this component to support technical assistance for water-soluble fertilizer application and disposal and recycling of vegetable stems.
- *Component 4: Project management and dissemination.* An additional grant of US$190,000 was reallocated to this component to carry out environmental awareness dissemination activities and to hire an experienced consultant in support of the PMO and the development of the replication strategy.
- *Targets in results framework*. Targets in Components 1 and 2 were calculated incorrectly, with some mistakes in TN, in particular. Moreover, reduction of the pollutant load contributed by solid waste treatment (composting) was not counted at appraisal. These targets were revised in the first project restructuring.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design, and Quality at Entry

15. *Soundness of the Background Analysis.* Water pollution of the Huangpu River and the Yangtze River was a major issue for Shanghai. The Upper Huangpu Catchment Management Study provided the scientific basis for the project by identifying four major sources of pollution to the Yangtze River and the East China Sea—livestock waste, untreated wastewater from households in rapidly urbanizing villages and towns in suburban areas, agricultural waste, and non-point run-off fertilizers and pesticides—and recommended possible actions to reduce pollution. The project design incorporated lessons learned from the Bank's livestock, wetland, and rural environmental operations, the Livestock, Environment and Development Initiative Area-wide Integration Pilot Project in China, and other government programs, including lessons regarding the need for the following:

- Considering the appropriateness of technical solutions
- Having a strong institutional coordination of efforts by various stakeholders, including farmers, private enterprises, academics, and governments

- Obtaining strong government commitment to compliance, enforcement, and provision of incentives and full involvement of key stakeholders in project preparation and implementation to ensure ownership and sustainability
- Providing a well-developed replication strategy to ensure adoption and replication by government

16. Three alternatives were also considered:

- Using exclusively regulatory forces for livestock farms
- Involving all eligible villages, farms, and districts
- Focusing on single agricultural and non-point pollution source

17. These last three approaches were rejected because of (i) the potential for economic, social, and political problems by enforcing reducing the number of farm animals or closing down existing livestock farms; (ii) the complexity of project coordination and management, and the diminishing of the project's leverage over participating entities; and (iii) the provision of a comprehensive pollution management to achieve the GEO.

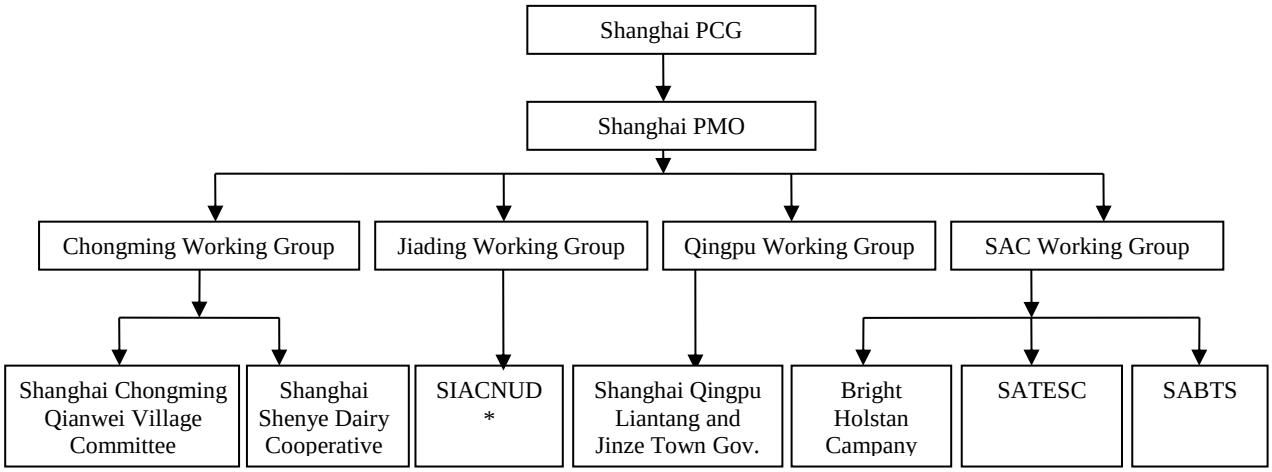
18. Thus, overall, the background analysis of the project was sound.

19. *Assessment of the Project Design.* The PDO focused on demonstration of pollution reduction activities and techniques to reduce pollution loads in the water environment of Shanghai, which was appropriate given the deteriorating quality of raw water for the city. It was phrased sensibly to acknowledge the project's small but possibly transformational role as a "demonstration" project. Each subcomponent proposed a technique that was innovative, yet proven, in the context of Shanghai, which was reasonable for demonstration purposes.

20. Moreover, a subcomponent under Component 3 had a monitoring and evaluation (M&E) budget, separate from that for the project monitoring. This was for onsite examination and to collect samples from 120 checkpoints in the three pilot locations (that is, Jinshan and Qingpu districts and Chongming Island) for lab testing to monitor the effectiveness of the demonstration technologies under Component 3. The results framework also placed emphasis on measuring the effectiveness and innovation of the introduced technologies.

21. Procurement assessment and financial management assessment were done during project preparation, and they were found satisfactory. Nevertheless, the project scope could have been more focused on fewer technologies. The number of techniques proposed and the number of PIAs and other institutions involved were relatively large for this small project, with its grant of US$4.78 million.

Figure 1: Institutional and Implementation Diagram (from the PAD)



* SIACNUD: Shanghai International Automobile City New Anting United Development Company Ltd.

22. *Adequacy of Government's Commitment*. At the Shanghai municipal level, the Shanghai Development and Reform Commission (SDRC) showed its ownership and leadership during project preparation. The PMO, which was also managing the Bank-funded Shanghai APL program, was directly under the SDRC and was headed by a director from the commission. The director chaired most of the meetings with the project implementing agencies (PIAs), commented on details of project design, and participated in site visits.

23. The PMO had experience in implementing Bank-financed projects, including APL. At the participating entity level, however, the project had some difficulties. There was a total of seven small PIAs whose capacity and knowledge of the project were limited, and they were unfamiliar with the Bank's policy and guidelines.

24. Furthermore, the PMO found it challenging to maintain commitment from some PIAs during the preparation as well as the implementation of the project, as it took almost three years from the approval of the Project Identification Form (PIF) by GEF (October 2007) to its approval by the World Bank Board (June 2010). This was because, first, the APL3 was prepared at the same time as this project, and both the client and the Bank team were more focused on delivering the loan project; and, second, the task team leader was changed twice during the preparation. Moreover, the PMO's technical knowledge of agricultural development and non-point source pollution was limited, and it had no experience in working with the key stakeholders.

25. The project had little leverage over the PIAs, as the grants allocated to them were so small, and their low commitment at the beginning resulted in some subcomponents being dropped during implementation.

26. *Assessment of Risks.* Risks for implementation were assessed as "moderate," with all risks rated "moderate" after mitigation. Some were correctly identified, including the following:

- Various activities dispersed in four districts, supported with limited resources ("substantial" or moderate risk)
- Operational failure risk, resulting from (a) lack of ownership and local community support and (b) operational and management support not available or inadequately assessable

- Lack of practical and efficient operation and maintenance (O&M) arrangement (moderate)
- Failure in scaling up demonstration activities due to (a) lack or weak enforcement of agricultural and non-point source pollution control policies and (b) change of government financial subsidy policy (moderate)
- Failure in replication by farmers due to lack of interest in new environmentally friendly modern agricultural pollution control techniques, such as safe chemical use and use of biopesticides and nonchemical technologies (moderate)

27. Risks associated with implementing agencies' capacities, commitment, and ownership, however, which were rated as moderate, were underestimated. For example, biogas power generation to be implemented on the large-scale livestock farm of the livestock waste management component should have been rated substantial or even high risk because of its high investment cost and the company's lack of technical capability to operate and maintain the plant. Moreover, the PMO's technical capacity to manage a complicated agricultural project seemed to be overestimated, as the PMO had experience in water supply and wastewater management projects in urban Shanghai but not in rural or agricultural projects.

28. *Quality at Entry.* Although the project was based on sound background analysis and a realistic PDO, its design was overly ambitious in scope for a relatively small demonstration grant project. Besides the complexity of its design and implementation arrangements, the project could not maintain a high level of commitment from all the PIAs because the preparation took a long time. Hence, the rating for the Bank's performance at the Quality of Entry is "moderately unsatisfactory" (see sections 3.1 and 5.1).

2.2 Implementation

29. *Overall Implementation*. During project implementation, the Bank team, the PMO and the PIAs worked jointly to successfully overcome major implementation challenges, including a slow start, multiple changes in project scope and two restructurings, which ultimately brought the project back from unsatisfactory to moderately satisfactory rating of implementation progress. Sections 3.6 and 5.1(b) describe the appreciation from the client as well as the assessment of Bank's performance during implementation.

30. *Effects of Project Restructuring.* The project had two Level 2 restructurings, in June 2013 and July 2014. Both addressed the changes in subprojects effectively by reallocating grant funds, revising targets for results indicators, and extending the closing date by twelve months. After the restructuring, the project successfully upgraded ratings for progress toward achievement of the GEO from moderately unsatisfactory to satisfactory and for overall implementation progress from unsatisfactory to moderately satisfactory. The disbursed amounts at the time of the two restructurings were US$1.01 million and US$1.97 million, respectively. The remaining US$2.81 million, or 58 percent of the grant, was fully disbursed after the second restructuring. Although an earlier first restructuring arguably would have been even better, it was delayed because the PIAs and the PMO took time to select alternative solutions for each subcomponent, despite intense supervision by the Bank team.

31. *Midterm Review.* Although no formal midterm review was conducted, the equivalent was carried out in May 2012. The Bank Implementation Support Team identified major implementation issues in early 2012 and downgraded the project to problem status with a rating

of moderately unsatisfactory in April 2012. After a few supervision missions, the Bank and the PMO agreed on an appropriate restructuring plan, which eventually got the project back on track.

32. *Multiple Changes in Project Scope.* Being a demonstration project with innovative technologies, changes are to be expected to try out these technologies and provide valuable lessons for future scaling-up efforts. Under this project, nine out of eleven subprojects were either changed or dropped. Among the changes in project scope, three major ones that affected implementation concerned Component 1(a): Livestock waste management—large-scale; Component 1(c): Integrated livestock and agricultural waste management; and Component 2(a): River-network wetland.

33. First, Shanghai Bright Holstan Jinshan Dairy Farm, the PIA of Component 1(a), expressed concerns about the technology that was appraised—anaerobic treatment and biogas power generation—because the biogas power generation was technologically too advanced and too expensive an investment. It was replaced with aerobic reactor technology, which was equally effective for pollution reduction but less innovative.

34. Second, Component 1(c) was dropped right after the first restructuring because a land use permit for "scientific research" had expired and the land taken back by the government for "basic farming." Components 1(a) and 1(c) accounted for a large proportion of grant allocation, and the delay hindered project implementation.

35. Third, the original location for Component 2(a) was dropped soon after grant effectiveness because of changes to a land use master plan. It took almost two and a half years to identify a new location, prepare bidding documents, and commence the construction because of the difficulty of finding a suitable river, as many small rivers had concrete beds and embankments.

36. Beside these changes, the village wetland sewage treatment system under Component 2(b) was switched from Bank-financing to non-Bank financing and implemented by May 2010, following the government "open competition" procedure, similar to the Bank's National competitive Bidding. The main reason for the change was due to the slow project preparation, and the PIA needed to complete the implementation by using the local government funds. The grant allocation was used for procuring maintenance equipment. PIAs and the PMO were advised to strengthen their coordination with local bidding and tendering centers to ensure the Bank's procurement requirements were met whenever there was a policy gap between local requirements and those of the Bank.

37. In sum, as a result of changes in the scope of the project, its total cost was reduced from US$34.68 million to US$29.7 million.

38. In part, as mentioned in Section 2.1, the multiple changes in the project scope were the result of having many subprojects with small PIAs, which increased the complexity of coordination and management. The PIAs' commitment levels, capacity to manage and implement their subcomponents, and knowledge of the Bank's policy and guidelines varied so significantly as to increase the burden on the PMO and the Bank. Moreover, three out of the four working groups did not seem to be actively involved during project implementation. They were never present at meetings with the Bank team during project supervision. Therefore, it was difficult to assess their performance towards coordinating between the PMO and PIAs and supervising project implementation. The Shanghai Agricultural Commission (SAC) was the only working group that participated in project management, coordinating the efforts of the PMO with those of Shanghai Bright Holstan Jinshan Dairy Farm, the SATESC, and the SABTS from the middle of

implementation. Nevertheless, these changes had less impacts towards achievements of the GEO, and the project achieved or even exceeded the revised targets by project closing.

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

39. *M&E Design.* The project's results framework was well designed. Both the PDO and intermediate outcome indicators were logical and sound, and they adequately measured the achievements toward the GEO and the progress of intermediate outcomes in each component. Good indicators were included to measure both the actual pollution reduction results of the pilots and the capacity-building components. It would have been better, however, if a clear definition and measurement methodology had been included in the PAD for each indicator to avoid confusion or misunderstandings at the beginning of project implementation.

40. Moreover, some targets for livestock waste management and wetland demonstration indicators were miscalculated and needed to be revised. Targets for the livestock waste management seemed to take into account only the reduction load from liquid waste management and not from solid waste load reduction (that is, from composting). Targets for the wetland demonstration indicators were established based on four villages, but the subproject was expanded to nine additional villages. These targets were revised in the first project restructuring, but some of them were still conservatively set, particularly those for the wetland demonstration, due to uncertinities of the performance of the technology.

41. *M&E Implementation.* At the time of the first project restructuring, the underestimated targets were revised to reflect both liquid and solid waste load reduction. Moreover, four core sector indicators were added, including gender-disaggregated information on training. In terms of data collection, the PMO and PIAs had some difficulties, except for the indicators related to village wetland sewage treatment systems, due to the lack of clear definitions. After the PMO hired an M&E consultant around June 2014, data collection and analysis improved.

42. *M&E Utilization.* M&E results were utilized during project implementation for decision making regarding livestock management and domestic sewage management at the village level. Results of these indicators were among the measurements critical to the large- and medium-scale farms under the livestock waste management component for keeping their business licenses by meeting the national standards of discharge set forth by Environmental Protection Bureau. They succeeded in complying with these requirements after implementing the project.

43. Moreover, the technology demonstrated under the village wetland sewage treatment system component, which was low cost and low maintenance, was found effective to remove pollution load, such as NH3-N, TP, BOD, and COD. Using the information gained from the demonstration, the Qingpu District government set O&M standards in the official opinion it issued in 2011 (see Section 2.2.2.2 in Annex 7 for details). Consequently, the technology was replicated to other parts of Qingpu District during project implementation.

44. Hence, the M&E design, implementation, and utilization are all rated substantial.

2.4 Safeguards and Fiduciary Compliance

Safeguards

45. *Environmental and Social Safeguards.* The project was Category B for environmental purpose. At appraisal, it triggered three safeguard policies: Environmental Assessment (OP 4.01), Pest Management (OP4.09), and Involuntary Resettlement (OP4.12).

46. Environmental assessments (EAs) and environmental management plans (EMPs) were prepared for each subcomponent and revised during project implementation. The English versions of the original and revised EAs and EMPs were disclosed in the InfoShop on May 6, 2009, and April 22, 2013, respectively, and the Chinese versions were disclosed locally on April 30, 2009, and April 25, 2012.

47. During project implementation, an external party carried out environmental monitoring independently. As some facilities were already in operation, monitoring covered both construction and operation stages. Implementation of the EMPs was found satisfactory, as was compliance achieved. In particular, noise, ambient air quality, farmland runoff, groundwater, surface water quality, and soil quality were monitored. The results showed negative impacts were managed, and no complaints were received.

48. For pest management, a pest management plan was prepared for the project and disclosed on May 6, 2009 (English version), and April 30, 2009 (Chinese version). During implementation, compliance with the pest management safeguard documents under integrated agricultural pollution reduction techniques was found satisfactory. The project pest management, implemented through an integrated approach, was considered good practice.

49. For involuntary resettlement, an abbreviated action plan was prepared for the wetland sewage treatment system component. The English version was disclosed on May 6, 2009, and the Chinese version on April 30, 2009. No resettlement took place, however, as the location of the subcomponent was changed, so compliance was satisfactory.

Fiduciary

50. *Procurement.* Although no substantial procurement deviations were identified during implementation, the PIAs had difficulty preparing qualified bidding documents due to weak capacity. The PMO hired an experienced consulting team from the Shanghai Municipal Engineering Design Institute, and it improved the quality and timeliness of bidding document preparation for most of the investment activities.

51. *Financial Management.* The project had no major issue with financial management. The financial management work by the PIAs was found generally satisfactory during implementation. Counterpart funds were allocated as planned, and the project had no outstanding audits. Unaudited internal financial reports were submitted to the Bank with some delays, however, due to the consolidation process.

52. Another issue was slow disbursement, which was mainly caused by delays in implementation of some of the major components and the unfamiliarity of PIAs with grant withdrawal application procedures and requirements.

2.5 Post-completion Operation/Next Phase

53. *O&M Arrangements.* Following the successful completion of construction, two PIAs took measures to strengthen their O&M capabilities.

54. First, the Qingpu District government established O&M standards as well as funding arrangements, including subsidy level, based on the pilot constructed under the village wetland sewage treatment system subcomponent; and it expanded the application of the technology to wider areas. The Qingpu District government also outsourced the O&M functions to a private company with technical skills.

55. Similarly, the owner of the large-scale livestock waste management works at Jinshan Dairy Farm considered outsourcing the O&M functions of the expanded wastewater treatment plant to a private operator. Since the outsourcing agreement had not been concluded as of grant closing, the farm extended the contract with the existing contractor to operate and maintain the facility.

56. These actions will help ensure the sustainability of the project assets for these subcomponents. For the other demonstration projects, the PIAs had the technical and financial capacities to operate and maintain the facilities by themselves.

57. *Implementation of the Replication Strategy.* Unlike many other demonstration projects financed by the Bank, this project had a specific subcomponent for developing a replication strategy to scale up the techniques demonstrated in Shanghai beyond the project period. In accordance with this strategy, the effectiveness and efficiency of the demonstrated technology were carefully verified based on implementation records and a comprehensive project M&E report. The experience and lessons learned throughout project implementation were also summarized.

58. Most importantly, the replication strategy made suggestions on the financing, institutional, and O&M arrangements critical to the scaling up of the demonstrated techniques. This strategy was circulated and commented on by the PIAs during project implementation. To maintain momentum, it is important for the key stakeholders, including the SAC, to follow up on its implementation. Apart from scaling up the demonstrated technologies, this replication strategy also would serve as a guide for the SDRC and SAC to manage non-point pollution reduction in rural areas of Shanghai.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design, and Implementation

Relevance of Objectives: High

59. The GEO remained highly relevant and consistent with the environmental policies in Shanghai, with the CPS, and with the GEF Strategy through completion of the project. Over the course of implementation, the issue of agricultural and non-point source pollution became an important topic on China's agricultural development and environmental protection agenda, although it was not recognized as a serious development challenge at the time of project preparation.

60. In 2010, the national government acknowledged in its official statement that agriculture and rural settlements had surpassed industry and urban areas as the most important sources of water pollution in the country. According to the *First National Pollution Source Survey Report*, issued by the Ministry of Environmental Protection, National Bureau of Statistics, and the Ministry of Agriculture of China in 2010, agricultural sources, including crop waste, livestock

waste, and aquaculture, contributed 44 percent, 57 percent, and 67 percent of China's total COD, TN, and TP discharges, respectively, in 2007.[3]

61. The national strategy announced by the Ministry of Agriculture in 2015—"one, control; two, reduction; and three, basics"—encourages farmers to control the water consumption of agricultural production, to reduce fertilizer and pesticide consumption, and to improve basic management of livestock waste, agricultural films, and crop residues. This project helped the SMG and the key stakeholders in the agricultural sector improve their understanding of the scale and impacts of agricultural and non-point source pollution and take early actions to address the issues.

62. In Shanghai, improving the water quality of the Upper Huangpu catchment and Yangtze River remains a huge challenge for the city and adjacent provinces. The national government imposed stricter discharge standards for these areas; and cities, as well as enterprises—including livestock farms—were obliged to invest more in updating facilities to comply with the requirements. The project was also aligned with the Fifth TYAPEP (2012–14) and the Sixth TYAPEP (2015–17), which included agricultural non-point source pollution control and large-scale livestock and poultry breeding farm pollution reduction.

63. The project also supported green growth, which was one of the priority strategies in the Bank's CPS for China (2013–16) and a recent country engagement report. The CPS emphasized supporting greener growth by promoting sustainable agricultural practices (Outcome 1.4) and demonstrating pollution management measures (Outcome 1.6). The project contributed directly to achieving the indicators—for example, in areas where innovative sustainable practices and cleanup and pollution reduction measures were successfully demonstrated. Green development was also one of the six priority reforms in *China 2030: Building a Modern, Harmonious, and Creative Society* (2013), a joint report from the Development Research Center of the State Council of China and the World Bank.

64. The project also remained consistent with the current GEF Strategy, GEF-6. It supported a specific strategy of "enhanc[ing] multi-state cooperation and catalyz[ing] investments to foster sustainable fisheries, restore and protect coastal habitats, and reduce pollution of coasts and large marine ecosystems (IW3)" under the International Water Focal Area. In particular, the project was in line with Strategic Program 5, "reducing nutrient pollution causing ocean hypoxia."

Relevance of Design and Implementation: Modest

65. As mentioned in Section 2.1, the project successfully identified innovative, yet proven, techniques suitable for the context of rural Shanghai to provide a comprehensive approach to reducing agricultural and non-point source pollution, and therefore to fulfill the GEO. Most of the techniques, except for the use of biogas power generation systems, were low cost, which made them affordable and attractive for local governments, farmers, and dissemination entities to replicate. The results framework was also well designed, with a clear intervention logic and indicators designed to capture the effectiveness of treatment as well as the usefulness of the information disseminated.

[3] Source: The PAD of the Guangdong Agricultural Pollution Control Project (P127775/ Ln. 8311-CN).

66. The project was, however, arguably overdesigned for the size of the grant, as mentioned in Section 2.1. The eight techniques were scattered across seven locations in four districts of rural Shanghai, including Chongming Island. Having small subprojects scattered in various locations made implementation challenging, not only in terms of supervision to ensure the quality of construction but also with regard to keeping the PIAs engaged with the project and compliant with the requirements of the Bank. Their lack of experience in implementing a Bank-financed project and varying levels of commitment and ownership made the challenge even greater. In fact, some reviewers at the concept review meeting advised reducing the number of components to make the project more focused, but the comments were not incorporated into the design. Nevertheless, through focused and intensive supervison support from the Bank team, the PMO and the PIAs successfully implemented the activities and achieved the GEO.

3.2 Achievement of Global Environmental Objectives Rating: Substantial

Demonstrate Effective and Innovative Pollution Reduction Activities: Substantial

67. The project originally sought to demonstrate eight technologies that were effective yet innovative in the context of rural Shanghai and in China. The technologies had already been implemented in other parts of the world and their effectiveness in reducing pollution proven, and they therefore had potential for scaling up. During project implementation, one subcomponent was dropped, and another subcomponent was changed the technology, as mentioned in sections 1.6 and 1.7, and six were retained. The effectiveness of each technology and its contributions toward achieving the GEO are described below.

(i) Effectiveness and Innovation in the Livestock Waste Management Component

68. For the large- and medium-scale farms combined, the livestock waste management systems that were constructed successfully treated 360 tons of solid and liquid waste per day by project completion and reduced pollutants comprising 536.8 tons of TN, 163.8 tons of TP, 2,442.9 tons of BOD, and 4,828.5 tons of COD per year. These figures exceeded the revised targets, which included the reduction load from solid waste treatment (that is, from composting). Looking at the liquid load reduction only, the project also exceeded the original targets, excluding the contribution from the dropped subcomponent (see table 1). These technologies were, therefore, very effective in reducing pollution.

Table 1: Liquid Load Reduction for Component 1

(Unit: ton/yr)

	TN	TP	BOD	COD
Target in the PAD	30.6	7.8	606.5	1,347.6
Revised Target Excluding Qianwei (Dropped Component)	21.96	1.96	329.10	792.80
Liquid Load Reduction at Project Completion	73.73	4.95	398.56	638.92

69. In terms of technical innovation, however, the component contributed less, as the biogas power generation technology and the integrated agricultural and livestock waste management were dropped. Nevertheless, according to the replication strategy, the demonstrated technology was new to the area and has now becomes “regular technology” that will be widely used to treat the livestock waste in rural areas.

70. Looking closely at each subcomponent, Jinshan Dairy Farm (a large-scale farm) expanded a wastewater treatment plant with an aerobic reactor and a composting yard and successfully demonstrated their effectiveness in reducing pollutants. Besides achieving pollution reduction, Jinshan Farm produced 24,000 tons of organic fertilizer in 2014, which, except for 7,000 tons used on the farm, was sold to farmers with government subsidies, outside of Shanghai, and to the Green Forages Company.

71. On the other hand, Shenye Cooperative (a medium-scale farm) completed the construction of composting and pelletizing systems as well as a series of anaerobic and facultative lagoons. In 2014, the farm produced 6,000 tons of organic fertilizer and 976.86 tons of organic liquid fertilizer. Both were applied to the farmland, resulting in savings of RMB 1.07 million (about US$168,000) that would have been spent on chemical fertilizer.

72. Two dropped demonstration technologies were biogas power generation at Jinshan Dairy Farm and integrated livestock and agricultural waste treatment in Qianwei Village. Although these technologies were canceled, their absence did not affect achievement toward the GEO, as demonstrated above.

(ii) Effectiveness and Innovation in the Wetland Demonstration for Pollution Reduction Component

73. The river-network wetland and village sewage treatment systems were completed, and they demonstrated innovative wetland treatment technology. In particular, the technology demonstrated under the village wetland subcomponent proved very effective, as the installed systems reduced NH3-N by 16.6 tons, TP by 2.2 tons, BOD by 90.7 tons, and COD by 173.4 tons per year, far exceeding the targets. Since these targets were established before the M&E consultant was hired and might have been conservatively set due to uncertainties regarding the performance the technology, the results at project closing exceeded the targets by three- to eightfold.

74. Originally, four villages in Qingpu District were identified for demonstrating the technology, but by project closing, nine additional village sewage treatment stations in Shuhe and Huimin villages in Chongming District had been constructed, for a total of thirteen systems. The total capacity of the systems was 260 m3/d, with a service area of 185,000 m^2 for 917 households. The artificial wetland was financed by counterpart funds, while operation equipment was financed by the GEF grant.

75. The river-network wetland, which involved the construction of artificial wetland and the ecological restoration of river embankment and beds, was finished in May 2015. Since it was only a month before the project closing, there was not enough time to measure its effectiveness, and no monitoring data for pollution reduction were available. Nevertheless, this subcomponent was innovative in the context of rural Shanghai, with little precedent.

(iii) Effectiveness and Innovation in the Integrated Agricultural Pollution Reduction Techniques Component

76. This subcomponent was effective as well as innovative, not only in demonstrating different techniques, such as the use of organic fertilizer, low-residue and low-toxicity pesticides, and green pest control techniques, but also in attaining measurable results for these techniques. Detailed monitoring records helped prove their effectiveness and contributed to their promotion. The techniques were implemented in four different pilot areas, and usage rates reached 100 percent, which exceeded the target. Besides conducting the planned activities, the SATESC,

which was the PIA, also implemented testing for water-soluble fertilizer application and disposal and recycling of vegetable stems, which is innovative in the current agriculture in Shanghai.

77. Although a market for organic food has not developed fully in China, it is growing steadily, particularly in major coastal cities like Shanghai. The demonstrated technologies have been promoted in Shanghai, as the demand for safe food is growing in the city.

(iv) Effectiveness and Innovation in the Training and Demonstration Subcomponent

78. Under this component, all the planned activities were implemented successfully, including training courses, dissemination materials, video production, website construction, organization of workshops, and participation in an international conference. Twenty-four kinds of training courses were conducted, with 2,870 training days. More than 1,300 farmers and other stakeholders participated in the training, and over 121,000 copies of dissemination materials were prepared and distributed. The SABTS participated at the Seventh GEF Biennial International Water Conference in 2013, where it presented the project outcomes at the conference together with the Bank team.

79. The SABTS also organized a project-closing seminar, "Achievement Promotion and Exchange Seminar," in June 2015. Participants included representatives from PIAs, the PMO, the SAC, the Shanghai Development Reform Commission (SDRC), and the Shanghai Finance Bureau (SFB). Besides project stakeholders, the PMO of the Zhejiang Rural Water Supply and Sanitation Project, another Bank-financed project, participated in the seminar to exchange information about the demonstrated techniques and share experiences of project implementation (see Annex 6 for details).

Reduction of Rural/Agricultural Pollution Load to the East China Sea: Substantial

80. In total, the project successfully reduced the pollution load by 536.5 tons of TN, 166 tons of TP, 2,533.6 tons of BOD, 5,001.9 tons of COD, and 16.6 tons of NH3-N per year. Moreover, the project made some positive impacts beyond the outcomes captured in the results framework.

81. First, the ratio and usage of organic fertilizer and chemical fertilizer at rural Shanghai were gradually optimized as a result of the successful production and promotion of organic fertilizer through the project. According to statistics in the Borrower's ICR Report, the use of organic fertilizer, compound fertilizer, and high-concentration dedicated fertilizer increased, while that of chemical fertilizer decreased. Moreover, nitrogen use efficiency on rice crops increased by three percent, and 400,000 tons of commercial organic fertilizer were consumed. This means 1.2 million tons of livestock waste were used to produce the organic fertilizer.

82. Second, the accuracy of short-term as well as long-term forecasting with regard to insects and pests was improved to 90 percent and 85 percent, respectively, which resulted in better forecasting of crop diseases related to insects and better management of pesticide.

Table 2: Total Reduction of Rural and Agricultural Pollution Load

(Unit: ton/yr)

	TN	TP	BOD	COD	NH3-N
Component 1	536.50	163.80	2,442.90	4,828.50	
Component 2		2.20	90.70	173.40	16.60
Total	536.50	166.00	2,533.60	5,001.90	16.60

83. Admittedly, however, considering the size of the project intervention and the geographical location of Shanghai at an estuary of the Yangtze River, where it receives pollution from upstream towns, the actual impacts of the project in improving the water quality of the East China Sea were marginal. Nevertheless, the project fully succeeded in demonstrating the technologies that could be widely applied in other parts of Shanghai and beyond and that the pollution load could be reduced, which was the primary focus of the project.

84. Moreover, the project had a positive influence on agricultural development and environmental protection policy in Shanghai, as the technologies demonstrated are now considered "regular technologies," or useful options, and they have already been implemented in other parts of the city. The replication strategy will help disseminate the project outcomes within Shanghai, as it will become a guide for the SDRC and SAC to manage non-point pollution reduction in the rural areas. Although not part of the project scope at appraisal, this policy-level impact was a positive outcome of the project. It would yield more positive outcomes to reduce rural and agricultural pollution load in Shanghai beyond the project period.

85. Therefore, the GEO of demonstrating effective and innovative pollution reduction activities to reduce agricultural and non-point source pollution load was substantially achieved.

3.3 Efficiency **Rating: Substantial**

Economic and Financial Analysis

86. At the time of appraisal, different economic analysis methodologies were applied to different project activities. Cost–benefit analysis based on "with- and without-project" scenarios was applied to the livestock waste management technology demonstration, while cost-effectiveness analysis was carried out for the wetland demonstration for pollution reduction component. The analysis for the integrated agricultural pollution reduction techniques, implemented by the SATESC, was restricted to an analysis of organic fertilizer at project appraisal because the component yielded limited tangible economic benefit. The economic analyses at project closing applied the same methodologies as at appraisal.

87. *Economic Analysis for the Large-scale Farm under the Livestock Waste Management Technology Demonstration Component.* The main economic benefits considered at project appraisal for this subproject were those of organic fertilizer, biogas, and electricity production and reduction of CO_2. The benefits of the subproject at project completion included the production of 13,000 tons of organic fertilizer from manure. The other two benefits—biogas and electricity production and reduction of CO_2—did not materialize due to the change in the technology applied (see sections 1.6 and 2.2 for more details).

88. The change in subproject scope reduced the total benefits of this subproject by roughly 37 percent relative to the value at appraisal. At the same time, its total investment cost was reduced by about 55 percent. Moreover, the market price of organic fertilizer increased over the life of the project by 90 percent. Considering these factors, the economic internal rate of return (EIRR) of this subproject at project completion was 14.1 percent, as compared to 15 percent at project appraisal, which demonstrated equal economic viability.

89. *Economic Analysis for the Medium-scale Farm under the Livestock Waste Management Technology Demonstration Component.* The main economic benefits considered at appraisal for this subproject were those of organic fertilizer. The benefits at project closing included the production of 5,077 tons of solid organic fertilizer and 7,742 tons of liquid organic fertilizer, which constituted 116 percent of the benefits expected at project appraisal. Although the investment costs of this subproject increased by 1.6 percent, its EIRR at project completion was 12.2 percent, as compared to 13 percent at appraisal, which demonstrated similar economic viability.

90. The main reason for the slightly lower EIRRs relative to those at appraisal of these two subprojects is that their construction and the realization of their benefits were delayed.

91. *Economic Analysis for the River-network Wetland Demonstration under the Wetland Demonstration for Pollution Reduction Component.* The main benefit of the subproject of the rural town river-network wetland demonstration was the reduction of pollutants. While the total wetland area completed was much less than planned, the investment incurred was more than estimated. Although it is less likely that the subproject is cost-effective, it is too early to conclude, as the subproject was recently completed and it is too early to measure its environmental benefits and effectiveness. It will be further assessed by SMG and Chongming County.

92. *Economic Analysis for the Village Wetland Sewage Treatment System Subproject.* Construction for the village wetland sewage treatment system subproject was fully funded by local government under a program for rural wastewater treatment, ongoing from 2008 to 2020. The total investment cost of this subproject was 101.35 percent of the project cost estimated at appraisal, which leads to the conclusion that the investment was as cost effective at project completion as it was at appraisal, if not more, taking into account the changes in foreign exchange rates and inflation (which rose 28 percent over the ten years from 2005 to 2014). Moreover, the subproject yield more environmental benefits than original expected. Therefore, the subproject is considered cost-effective.

93. *Cost-effectiveness Analysis on Integrated Agricultural Pollution Reduction Techniques Component.* At project completion, three demonstration sites with a total area of about 685 ha and 120 checkpoints had been established. These three demonstration sites are also the monitoring sites for the Shanghai municipality's long-term early-warning system for epidemics of plant disease, insects, and pests.

94. *Financial Analysis.* The financial analysis at project completion showed that the revenues generated by the subprojects under the livestock waste management technology demonstration component could cover the expenditure, including depreciation. Hence, the component achieved financial sustainability. The subprojects under the wetland demonstration for pollution reduction component will be operated by professional operators and financed by local government.

95. *Financial Incentive Efficiency Analysis on Organic Fertilizer Promotion.* The SMG launched a program to subsidize the use of organic fertilizer. It has promoted the application of organic fertilizer and reduced the use of chemical fertilizer by twelve percent. As a result of long-term efforts, the mixture of fertilizers in the suburbs of Shanghai has been gradually optimized. The nitrogen use efficiency on rice crops, for instance, increased by three percent. Annex 3 provides more details.

96. Overall, four out of six subprojects were in line with or above the appraisal estimates supporting the conslution of substantial efficiency.

Efficiency in Implementation

97. The project was successfully implemented, but with twelve months' delay. In particular, it suffered from the slow start between 2011 and early 2013. The delay was due to the unfamiliarity of the small PIAs with the Bank's policies and guidelines and the inadequate staffing of the PMO for managing the complex agricultural project. It is reasonable to assume that many projects that involve demonstration of new technologies and new arrangements may run into delays as lessons are being learned during implementation. Revisions to the strategy and the technologies involved would also be expected. The implementation progress improved significantly after the first restructuring in mid-2013. Moreover, hiring individual and firm consultants, as well as involving the SAC to support project management, was a smart decision, as it accelerated the progress significantly.

98. Considering the above results, the efficiency of the project is rated substantial.

3.4 Justification of Overall Outcome Rating
Overall Rating: Moderately Satisfactory

99. The major contribution of this pollution control project was to bring positive environmental impacts, which were successfully demonstrated. The GEO of demonstrating effective and innovative pollution reduction activities for agricultural and non-point source pollution remains highly relevant in the current context. Although the design of the project was over ambitious and resulted in the need for significant implementation support efforts, the technologies that were demonstrated were highly relevant to the Shanghai context, effective, and are being replicated and scaled up already

100. Economic and financial analysis at the time of project completion showed the project to be cost effective and financially sustainable. Despite its complex design, the project fully achieved the GEO, albeit with some delays. Therefore, the overall outcome is rated moderately satisfactory.

3.5 Overarching Themes, Other Outcomes, and Impacts

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

101. At appraisal, the project did not consider any poverty or social development issues in rural Shanghai, and there were no monitoring indicators to measure its impact in these respects. Nevertheless, the primary beneficiaries of the project were farmers and residents in rural Shanghai, and they are known to be less affluent than the 22 million people in other parts of Shanghai.

102. Similarly, the project's impacts on gender issues were limited. No specific actions were taken to involve female farmers for training or to promote their participation. Participation by women was tracked, however, as part of the results framework, so it is known that around 20 percent of the training participants were women.

(b) Institutional Change/Strengthening

103. The project did not have any technical assistance component to support institutional development of the PIAs, but through the experience of project implementation, they

strengthened their capabilities for project management. In the project completion workshop held in June 2015, PIAs made presentations about their subcomponents and exchanged views on the project outcomes and benefits. Although the project experienced some delays at the beginning and multiple changes, the PIAs made considerable efforts to complete the activities with support from the Bank team.

(c) Other Unintended Outcomes and Impacts (*positive or negative, if any***)**

104. As mentioned in Section 2.5, the contracting out of O&M functions for constructed facilities to private operators was an unintended but positive outcome of the project that serves as an additional demonstration. The outsourcing arrangements not only allowed the constructed facilities to reduce pollution loads to the Yangtze River; they also demonstrated that the two PIAs (that is, Jinshan Dairy Farm and Qingpu District government) understood the effectiveness of the approach as well as the technical complexity of O&M.

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

105. As mentioned in sections 3.2 and 3.5(b), the project closing and dissemination seminar was organized by the SABTS. The seminar was well attended, with representatives of the PIAs, the PMO, the SFB, the SDRC, the SAC, and the Zhejiang PMO present. The following main points were discussed at the seminar:

- Driven by the GEF Project, the Sixth TYACEP, launched in Shanghai in 2015, focuses on environmental treatment in rural areas. Shanghai will continue to make efforts for river rehabilitation and livestock pollution control and push forward the development of recycling agricultural waste.
- The project not only demonstrated various techniques but also initiated environmental monitoring, replication, promotion, training, and publicity and other campaigns to form a complete project system.
- Some subprojects, such as those involving Jinshan Dairy Farm and Shenye Cooperative, were completed a few years ago, but they yielded great effects, which have been widely appreciated by the local people.
- The project had small-scale subprojects, spread over a great time span, resulting in difficulties in project implementation, but the PIAs completed them successfully in close consultation with the Bank team.
- In the future, a project should be focused on single projects (supplemented by supporting projects), be more concentrated in its efforts, and have more pertinence.
- The Bank team should take into account that many entities had no experience with a World Bank project, which led to difficulty in complying with the Bank's policies and guidelines.

4. Assessment of Risk to Development Outcome **Rating: Low**

106. *Country and Sector Risks: Low.* The project is in line with the current government's development strategy to control agricultural and non-point source pollution of Shanghai water sources and the East China Sea. Raw water quality continues to be an important issue for the social and economic development of Shanghai. Given the importance of the city, the national government pays attention to the issue and has invested heavily to increase the coverage of wastewater collection and treatment, as well as to upgrade the effluent water quality from

wastewater treatment plants. The facilities constructed under the project have shown satisfactory results by meeting the required environmental standards.

107. *Operational Risks: Low*. The technologies introduced in the project are now established and proven at the different sites, and no technical or environmental issues have arisen so far. For some subcomponents, sound O&M arrangements have been put into place by contracting with private companies, financed by the local government, and others are in the process of following a similar approach. Financially speaking, the demonstrated technologies are also affordable in terms of capital investment and O&M costs, so they can be replicated more widely. Moreover, some PIAs need these facilities to comply with the government's environmental standards, so their commitment to maintaining them is solid.

108. *Risk of Reduced Demand or Replication for Project Outputs: Low*. The risk of reduced demand for organic fertilizer is low, as long as the government provides subsidies to keep the price low. Due to increasing interest in food security and quality, market demand for organic food and organic fertilizer is growing, and the project trained farmers to meet the market demand. The Chinese government is also keen on food security issues, and subsidizing organic fertilizer is one strategy to address them. The risk of not being replicated is also low because most of the techniques are either replicated or considered as "regular technologies," to be applied in other rural areas of Shanghai.

5. Assessment of Bank and Borrower Performance

5.1 Bank

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

109. Following the successful engagement with Shanghai, the Bank team seized the opportunity to address the water quality issue there through this GEF project. The project had high strategic relevance, based on the sound background analysis of the upper water catchment of the Huangpu River. Most of the introduced technologies were sound, proven, and cost effective in other contexts.

110. The project was also under the umbrella of the Shanghai APL Program, for which the objective was to improve environmental conditions in Shanghai through progressive development and implementation of integrated, metropolitan-wide environmental management measures. Although this was a standalone project, it was closely connected with the activities under the APL. Many of the project's team members also worked on APL3, which was prepared around the same time, and they could apply the experience and knowledge they gained from the latter to the former.

111. The Bank performance in ensuring quality at entry also had some shortcomings, particularly in project design, assessment of risks, and implementation arrangements. The design was ambitious, given the relatively small size of the project and the wide range of technologies it tried to demonstrate. The team could have taken necessary steps to reduce the number of subcomponents so the project would have more focus and leverage to show its impact.

112. The Bank team also did not assess the readiness, commitment, and technical capacity of each subcomponent thoroughly enough. It took three years from the PIF approval to the Board

approval because both the client and the Bank team were focused more on the preparation for APL3, which was approved a year before. Moreover, the task team leader was changed twice during preparation, which also caused further delays.

113. Hence, the Bank performance to ensure quality at entry is rated moderately unsatisfactory.

(b) Quality of Supervision **Rating: Satisfactory**

114. The Bank supervised the project twice a year, covering implementation, safeguards, procurement, and financial management aspects, except for the first year of implementation. Smaller missions were also carried out to follow up on emerging procurement and construction work issues and to provide inputs and advice to the PMO and the PIAs. The Bank team followed up each issue patiently and persistently, particularly with regard to identifying an alternative technology for the large-scale livestock farm and finding a new location for the river-network wetland. Substantial support was given to the PIAs in producing good quality bidding documents, enhancing monitoring and evaluation capabilities, and strengthening project management.

115. Through the first project restructuring in 2013, the Bank team successfully made the project less complicated. SATBS said in a summary report that

> "…perseverance, unswerving efforts, patience, meticulousness and efficient work attitude of the World Bank management team deeply moved all project entities. Because of the insistence of the World Bank and joint efforts, this project met with great success finally. We are impressed with your work attitude and working method, which is one of the greatest harvests from this project (see Annex 6)."

116. This quote expresses the appreciation felt toward the project and the Bank team's performance during implementation. Although its closing date was extended by twelve months, the project got back on track, met or exceeded all its objective and intermediate objective indicators, and fully utilized the grant money for its intended purposes. The efforts the Bank team put forward to support effective implementation toward the achievement of development outcomes was commendable, considering the difficulties experienced by the project, especially at the beginning.

117. *Safeguards and Fiduciary Compliance*. Environmental and social safeguards specialists based in the Beijing Office supervised implementation of all safeguards issues in the grant agreements. The implementation of the EMP was reviewed in each mission, and there were no complaints regarding environmental safeguards issues during implementation.

118. On the fiduciary side, procurement and financial management specialists, who were also based in the Beijing Office, supervised implementation of all fiduciary aspects of the project specified in the legal agreement and carried out adequate field visits to review physical progress. Although most of the PIAs had no experience with Bank-financed projects, no substantive deviation from the guidelines was observed. Hence, the Bank performance to ensure quality of supervision is rated satisfactory.

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

119. Although the Bank performance in supervision, including safeguards and fiduciary compliance, is rated satisfactory and exemplary, overall Bank performance is rated moderately satisfactory due to shortcomings in quality at entry, particularly on the project design.

5.2 Borrower

(a) Government Performance
Rating: Moderately Satisfactory

120. The SDRC and SFB were supportive of the project and committed to the PDO of demonstrating effective and innovative technologies to reduce the pollution of rivers and the East China Sea. The key government entities had a lot of experience with Bank-financed projects, including Shanghai APL, and they were familiar with the Bank's guidelines and policies. Unfortunately, the project suffered from slow implementation at the beginning due to low ownership at the district and county government levels. Nevertheless, the government performance improved with additional support from an experienced project management consultant and an M&E consultant. The involvement of the SAC was also tremendously helpful in accelerating the implementation of the large-scale livestock waste management subcomponent.

(b) Implementing Agency or Agencies Performance
Rating: Moderately Satisfactory

121. The project originally had seven PIAs with mixed levels of readiness, ownership, and commitment for the project, and the number was later reduced to six after the integrated livestock and agricultural waste management subcomponent was dropped. The performance of some PIAs, such as the SATESC and the SABTS for components 3 and 4, was highly satisfactory. They implemented the subcomponents according to the agreement of project appraisal, they complied with the Bank's guidelines for procurement, and they followed environmental and pest management plans. Their monitoring records and project implementation records were updated and reported on time. Due to their good performance, they implemented more activities, with additional funds reallocated after project restructuring.

122. The performance of PIAs in components 1 and 2 was moderately satisfactory due to delays in project implementation. Nevertheless, their performance was greatly improved during implementation, with support from the consultants and the PMO. Except for those that were dropped, all the subcomponents were completed, in compliance with covenants and safeguards requirements.

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

123. Although the PIAs successfully completed all the planned activities and achieved the GEO, the overall borrower performance is rated moderately satisfactory because of some shortcomings in their capacities. Not all the agencies shared the same level of readiness, ownership, and commitment for the project, and that resulted in delays at the beginning of implementation and numerous changes in the project scope and technologies. Nevertheless, their performance was greatly improved toward the latter part of the project, which led to its successful completion.

6. Lessons Learned

124. **For a relatively small project, the design should be less complicated and should focus on implementing agencies that are ready and have adequate skill sets and ownership**. Having seven PIAs was neither efficient nor effective for project management, and their numbers should have been reduced to a manageable level. The borrower and the Bank team should have assessed the readiness of the PIAs carefully and acted upon these fundamental issues at project preparation. Regardless of the readiness of the PIAs, the Bank team should have intensified its supervision for the first few years until the project took off.

125. **It is important to align the project implementation arrangements with the institutional mandates and experiences.** For an agricultural and non-point source pollution project, the PMO should have been established under the SAC rather than under the Shanghai DRC. Although the PMO of this project had significant experience in implementing Bank-financed projects in water and wastewater sectors, it did not have adequate skills to manage a small but complicated agricultural and non-point source grant project. It was only after the SAC was brought into its management that the project started picking up speed and delivering results. The SAC should have been involved from the project preparation stage, and the PMO should have been placed under the direct supervision of the SAC.

126. **Demonstrated technologies should be aligned with beneficiaries' affordability and technical skills**. For example, Jinshan Dairy Farm originally requested biogas power generation technology, which was technically too complicated to operate and maintain and quite expensive to invest in. The farm later changed the technique to conventional aerobic treatment and decided to outsource the O&M function. The task team should have undertaken a comprehensive assessment of the adequacy and affordability of a particular technology for a PIA up front, taking into consideration the PIA's technical and financial capacities.

127. **Outsourcing O&M is a viable alternative to traditional O&M arrangements**. Two PIAs of the project recognized their shortcomings with regard to the technical knowledge necessary to operate and maintain the constructed facilities adequately, and they decided to outsource the O&M function during project implementation. This good practice should be encouraged for and adopted by other PIAs. Moreover, following an assessment of the capacities of the PMO and PIAs, O&M options— including outsourcing—should be discussed and included in the project design during project preparation.

128. **Using a river-network wetland to treat wastewater is an innovative idea for Shanghai and for China, but it requires further analysis to be applied widely**. Theoretically, artificial wetland technology is low cost and effective for reducing pollutants from domestic wastewater, and some successful examples of its application exist, such as the GEF Ningbo Water and Environment Project (TF090336). Making strict measurements of the effectiveness of river-network wetland is difficult, however, because input and output tend to be spread over a more extensive area. Moreover, it is hard to promote in a water system like that in Shanghai because it is difficult to find a suitable location for its implementation. Further analysis is needed to establish a monitoring method and application.

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

(a) Borrower/Implementing Agencies

129. Besides the Borrower's ICR, which is attached in Annex 7, the PMO reviewed the draft ICR report and provided detailed comments. Their comments were incorporated in this ICR report.

(b) Cofinanciers Not applicable.

(c**) Other Partners and Stakeholders** Not applicable.

Annex 1. Project Costs and Financing

(a) **Project Cost by Component (in USD millions equivalent)**

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Livestock Waste Management Technology Demonstration	9.748	3.746	38.43%
Livestock Waste Management on Large-scale Farm	5.467	2.588	47.34%
Livestock Waste Management on Medium-scale Farm	1.139	1.158	101.67%
Integrated Livestock and Agricultural Waste Management	3.142	-	-
Wetland Demonstration for Pollution Reduction	3.343	4.592	137.36%
Rural Town River-network Wetland Demonstration	1.468	2.691	183.31%
Village Wetland Sewage Treatment System	1.875	1.901	101.39%
Integrated Agricultural Pollution Reduction Techniques	20.413	20.397	99.92%
Demonstration of the Use of Organic Fertilizer	16.027	19.440	121.30%*
Demonstration of the Scientific Application of Agricultural Chemicals	3.444	0.527	15.30%**
Monitoring and Extension	0.941	0.43	45.70%
Project Management and Dissemination	1.176	1.141	97.02%
Project Management	0.3	0.269	89.67%
Replication Strategy Development	0.33	0.377	114.24%
Training and Dissemination	0.546	0.495	90.66%
Total Project Costs	34.679	29.875	85.63%
Total Financing Required	**34.679**	**29.875**	**85.63%**

Note: Project costs include base costs and contingencies.

* This subcomponent was fully financed by counterpart funds from the Shanghai government.

** At appraisal, the project expected to have contributions of $3.2 million from the Shanghai government and $0.23 million from the beneficiary. It was fully funded by the grant, however, whose allocation increased from $44,000 to $527,000.

(b) **Financing**

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower/Recipient		14.241	23.671	166.21%
Beneficiaries		15.65	1.416	90.48%
Global Environment Facility (GEF)		4.788	4.788	100%

Annex 2. Outputs by Component

Component	Planned	Actual	Description
1) Livestock Waste Mgt	(a) *Large-scale:* Solid and liquid waste treatment, equipment for biogas electricity generation (capacity: 500kW), and technical support	Expansion of a dedicated wastewater treatment plant from 450 tons/d to 800 tons/d; expansion of a cattle waste composting yard; equipment for organic fertilizer production	Technology was changed based on a request from the PIA Jinshan Dairy Farm, due to high investment costs of the biogas power generators (US$2.62 million), which were to be funded by counterpart funds (Restructuring Paper, dated July 10, 2013).
	(b) *Medium-scale:* Livestock waste treatment center (composting and pelletizing process) with a capacity of 50 tons/d of solid waste, a series of anaerobic and facultative lagoons to treat 30 tons/d of liquid waste, associated equipment, and technical support	No change	
	(c) *Integrated Livestock and Agricultural Waste Management:* Anaerobic digesters (mesophilic mixed concrete tank with separate gas storage and upflow anaerobic sludge blanket), biogas tank, biogas network pipe, and equipment for biogas electricity generation (capacity: 100kW)	Canceled	This subcomponent was dropped because the land use clearance for "scientific research" was expired, and the government took the site back and changed it to "basic farmland" (Restructuring paper, June 13, 2014).
2) Wetland Demonstration	(a) *River-network Wetland:* 66.5 ha of wetland ecological restoration engineering in Jiading District, construction of vertical submerged wetland to collect and treat household sewage; establishing 47,300 m^2 of	The original location was dropped due to a change in the land use master plan. A new location (Shuxin Township in Chongming Island) was identified. The investment included 2.2 ha of	(Restructuring paper, June 10, 2013)

	vegetation buffer; and technical support	wetland construction and equipment for maintenance.	
	(b) *Village Wetland:* Construction of wetland with biofilter tank, filter bed, water distribution, and discharge systems in Jinitian, Qianwan, Beiwangbang, and Xiezhuang villages of Qingpu District	The original outputs were funded by counterpart funds. The grant financed equipment for maintenance and water quality monitoring.	(Restructuring paper, June 10, 2013)
3) Integrated Agricultural Pollution Reduction Techniques	(a) *Use of Organic Fertilizer:* Promotion of use of organic fertilizer through provision of subsidy at three pilot demonstration sites. (b) *Scientific Application of Agricultural Chemicals:* Promotion of use of eco-friendly chemicals and technologies to reduce pollution (c) *Monitoring and Extension:* Data collection and monitoring, training, and workshops	All the planned activities were implemented. In addition, this subcomponent financed agricultural non-point pollution control technology research, technical assistance for water-soluble fertilizer application and disposal, and recycling of vegetable stems. A total of 21 kinds of training courses for farmers and 3 workshops were held.	In June 2014 restructuring, additional $360,000 was reallocated.
4) Project Management and Dissemination	(a) *Project Management* (b) *Replication Strategy Development* (c) *Training and Dissemination:* TV training materials development, participation in an international conference, and study tours.	All the planned activities were implemented. These included video production and distribution, setting up of an environmental education website, production of teaching materials, running of promotion campaign, organization and attendance of international workshops, compilation of reports, booklets, and training materials, setting up of distance learning courses, organization of training, development of replication strategy, and hiring of PM consultants.	In July 2013 and June 2014 restructuring, additional $150,000 and $40,000 were reallocated, respectively.

Annex 3. Economic and Financial Analysis

I. Economic Analysis

1. ***Project activities***: The project was appraised in August 2009. After six years of implementation with two restructurings, occurring in July 2013 and June 2014, respectively, the completed project activities under the four components consisted of the following:

- Component 1: Livestock Waste Management Technology Demonstration, including (a) livestock waste management on a large-scale farm and (b) livestock waste management on a medium-scale farm
- Component 2: Wetland Demonstration for Pollution Reduction, including (a) rural town river-network wetland demonstration and (b) village wetland sewage treatment system
- Component 3: Integrated Agricultural Pollution Reduction Techniques
- Component 4: Project Management and Dissemination

Following the practice at project appraisal, a cost–benefit analysis was carried out for the livestock waste management technology demonstration component, while a cost-effectiveness analysis was carried out for the wetland demonstration for pollution reduction component and the integrated agricultural pollution reduction techniques component.

2. ***Cost–benefit Analysis on Livestock Waste Management Technology Demonstration Component***

(a) *Type and Value of Benefit.* At project appraisal, the benefits of this component included organic fertilizer, energy (biogas, electricity), and environmental benefit. During the project implementation, the investment for energy was changed, as it was considered too technologically advanced and expensive. Also, due to the expiration of a land utilization permit, the investment for the subproject of integrated livestock and agricultural waste management was canceled. These modifications and cancelations resulted in changes to project benefits. The final benefits of the project at completion consisted of organic fertilizer and environmental benefits. Table 3.1 lists the project benefits at completion.

Table 3.1 Economic Benefits

Subproject	Type and Value of Benefit (annually)	
	Organic Fertilizer	Environmental Value
Livestock Waste Management on Large-scale Farm	• Additional 13,000 tons organic fertilizer produced by manure which is only 63 percent of the total benefits at the value at project appraisal.	• Reduction of COD by 3,265.6 tons • Reduction of BOD by 1,607.6 tons • Reduction of TN by 351.3 tons • Reduction of TP by 121 tons
Livestock Waste Management on Medium-scale Farm	• Additional 5,077 tons solid organic fertilizer produced • Additional 7,742 tons of liquid organic fertilizer	• Reduction of COD by 886.5 tons • Reduction of BOD by 446.8 tons

	produced, which is 16 percent higher than the total benefits at the value at project appraisal.	• Reduction of TN by 101.4 tons • Reduction of TP by 31.1 tons

(b) *Economic Price.* Following the practice at project appraisal, the economic price of the organic fertilizer at project completion was measured by current prices in the national market. The trade of liquid organic fertilizer and COD is not popular in China, the prices applied at appraisal were used. Table 3.2 summarizes the economic prices used in the analysis.

Table 3.2 Prices Used in Economic Analysis

	Unit	Economic Price (RMB)
Solid Organic Fertilizer	Ton	800
Liquid Organic Fertilizer	Ton	5
COD	Ton	2,000

(c) *Calculation Period.* The calculation period was set at twenty years, and "with- and without-project" scenarios were applied.

(d) *Conclusions.* The EIRR of each subproject and of the whole project were calculated. The results are presented in table 3.3.

Table 3.3 Summary of Economic Analysis

Subprojects	**EIRR** At Appraisal	**EIRR** At Completion
Livestock Waste Management on Large-scale Farm	15%	14.1%
Livestock Waste Management on Medium-scale Farm	13%	12.2%
Component 1 as a Whole	**15%**	**12.4%**

Among other reasons, the EIRR was lower than that at appraisal because the construction and the realization of these two subprojects were delayed by at least three years.

3. *Cost-effectiveness Analysis on Wetland Demonstration for Pollution Reduction Component*

(a) *Rural Town River-network Wetland Demonstration.* At project appraisal, this subproject was to be implemented in Jiading District. After the restructuring, the project site was changed to Shuxin Town in Chongming District. Table 3.4 compares the results of the work with the work that was planned, including investment costs.

Table 3.4 Comparison of Project Activities and Costs

	At Project Appraisal	**At Project Completion**
Area of Wetland	66.5 ha	2.2 ha
Including:		
Total Length of River	4,850 m	1,971 m
Total Area of Vegetation Buffers	47,264 m^2	22,000 m^2
Project Cost	RMB 7.25 million	RMB 17.47 million
Unit Cost	RMB 109 thousand/ha	RMB 7,941 thousand/ha

The main benefit of the subproject of the rural town river-network wetland demonstration was the reduction of pollutants. While the total wetland area completed was much less than planned, the investment incurred was more than estimated. Although it is less likely that the subproject was cost effective, it is too early to conclude, as the subproject is recently completed and it is too early to measure its environmental benefits and effectiveness. It will be further assessed by SMG and Chongming County.

(b) *Village Wetland Sewage Treatment System.* At project appraisal, the subproject was to support the construction of a village wetland sewage treatment system. During the implementation, however, the system was constructed with local government funds, following the technical approach agreed on at project appraisal. The total investment for this subproject was about RMB 12.337 million, which was 101.39 percent of the cost estimated at project appraisal. A GEF grant was therefore used to support maintenance equipment for the system. The completed investment was as cost effective as that estimated at appraisal, if not more, taking into account the changes in foreign exchange rates and inflation (which rose 28 percent over the ten years from 2005 to 2014).

This subproject was also part of a program for rural wastewater treatment conducted by local government from 2008 to 2020, including Phase 1 from 2008 to 2012 and Phase 2 from 2013 to 2020. The total investment for this program was about RMB 272.2 million.

4. *Cost-effectiveness Analysis on Integrated Agricultural Pollution Reduction Techniques Component*

The purpose of this component was to demonstrate available and new agricultural pollution reduction techniques, such as the use of organic fertilizer. At project completion, three demonstration sites with a total area of about 685 ha and 120 checkpoints had been established. These three demonstration sites are also the monitoring sites for Shanghai municipality for long-term early warning of epidemics of plant disease, insects, and pests.

Trainings were provided for participating farmers and technicians. About 1,321 persons participated in training in the use of chemical fertilizers and insecticides and received information on pesticides development trends, with more than 121,000 copies of dissemination materials edited and printed.

According to PAD, one ton of organic fertilizer contains 12 kg of N, 9 kg of P2O5, and 21 kg of K2O, while one ton of urea has 460 kg of N, one ton of calcium superphosphate has 120 kg of P2O5, and one ton of potassium chloride has 600 kg of K2O. The current market prices for urea, calcium superphosphate, and potassium chloride are RMB 1,540/ton, RMB 28/ton, and RMB 2,300/ton, respectively. The direct economic value of one ton of organic fertilizer is RMB 124.

In addition, production of one ton of organic fertilizer reduced COD by 0.12 ton on average, which is equivalent to an additional economic value of RMB 240, according to the assumption at project appraisal. The total economic value of organic fertilizer at project completion, therefore, was about RMB 364/ton, which was greater than its economic cost (about RMB 345/ton); thus, the use of organic fertilizer is more cost effective than the use of chemical fertilizer.

The total project cost for this component at appraisal was about US$20.412 million, while the actual cost at completion was about US$21.529 million. In addition, three contracts with a total value of US$0.36 million were implemented.

II. Financial Analysis

Since this project is largely a public goods investment and involves several activities, the financial analysis focused on subprojects' financial profitability.

Financial Analysis of the Livestock Waste Management Technology Demonstration Component

Both subprojects under this component generated financial revenue that covered the financial expenditure (including depreciation). They achieved financial balance and hence financial sustainability. Tables 3.5A and 3.5B summarize the results of the analysis.

Table 3.5A Financial Revenue by Subproject

Subproject	Annual Financial Revenue
Livestock Waste Management on Large-scale Farm	**RMB 10.38 million** from: Sale of 25,000 tons of solid organic fertilizer at RMB 415.2/ton on average
Livestock Waste Management on Medium-scale Farm	**RMB 2.61 million** from: Sale of 5,796 tons of fertilizer at RMB 450/ton

Table 3.5B Assessment of Financial Sustainability (Unit: RMB 1,000)

	Annual O&M Cost	Annual Depreciation	Total Annual Cost	Annual Financial Revenue	Net Financial Revenue
Livestock Waste Management on Large-scale Farm	8,245	502	8,747	10,380	1,633
Livestock Waste Management on Medium-scale Farm	1,115	238	1,353	2,608	1,255

Financial Analysis of the Wetland Demonstration for Pollution Reduction Component

Since the subprojects under this component were public infrastructures and operated by local government, the analysis focused on the operating mechanisms of the systems for both.

(a) *Rural Town River-network Wetland Demonstration.* The river-network wetland constructed under the project is now operated and maintained by the Shuhe Village Committee. In the future, an independent third company will be selected through public procedures to operate and maintain this river-network wetland. Town government will finance the O&M cost.

(b) *Village Wetland Sewage Treatment System.* The village sewage treatment systems, including the systems under the project, are now operated and maintained by professional operators selected through public procedures. Since the operators do not collect tariffs from the villagers, local government provides subsidies to the operators, in the amount of RMB 200 per household per year.

Financial Incentive Efficiency Analysis of Organic Fertilizer Promotion

To promote the application of organic fertilizer, the Shanghai municipal government launched a program in 2004 to subsidize its use. The average financial subsidy is RMB 200 per ton, which accounts for about 50 percent of the local market price. The subsidies help local farmers reduce the cost of using organic fertilizer. To a certain degree, this financial subsidy policy has had an impact on the use of chemical fertilizer in Shanghai. The use of chemical fertilizer per hectare has declined more than 12 percent since the appraisal of the project. Table 3.6 shows the utilization of chemical fertilizer in Shanghai.

Table 3.6 Utilization of Chemical Fertilizer in Shanghai

	2000	2010	2012	2013
Total Sown Area (1,000 ha)	521.5	401.2	390.0	378.1
Reduction %		23.1%	2.6%	3.1%
Areas of Chemical Fertilizing (1,000 ha)	321.0	226.6	221.0	216.7
Reduction %		29%	2.5%	1.9%
Chemical Fertilizer Consumption (1,000 tons)	825.4	448.9	394.3	380.9
Chemical Fertilizer Utilization (tons per ha)	2.6	2.0	1.8	1.8
Reduction %		45.6%	12.2%	3.4%

Source: Shanghai Statistical Yearbook 2014.

The reduction of chemical fertilizer use provided room for organic fertilizer application. From 2012 to 2013, commercial organic fertilizers were popularized and about 400,000 tons were used in Shanghai, which meant 1.2 million tons of livestock and poultry waste were digested and consumed.

This financial subsidy policy has also promoted the sale of organic fertilizer produced by Shanghai Bright Holstan Company Limited (SBH). Since 2010, SBH has been one of the listed suppliers of organic fertilizer that can receive government financial subsidies. In 2010, when the project was appraised, SBH sold 5,000 tons of organic fertilizer. In 2014, when it started its construction work under the project, it sold 9,500 tons of organic fertilizer with government financial subsidies.

Due to the efforts to promote the use of organic fertilizer, the mixture of fertilizers in the suburbs of Shanghai has been gradually optimized. According to statistics, for example, nitrogen use efficiency on rice crops increased 3 percent (in Jinshan, 3.1 percent; Qingpu, 3.3 percent; and Chongming, 3.6 percent).

The provision of subsidies by local government has also had a side effect, however. Without subsidies, farmers are reluctant to use organic fertilizer. Due to the size of the grant, the project was not designed to provide professional advice on the promotion of organic fertilizer, including advice regarding the subsidy mechanism.

On the other hand, for the purpose of commercial business, SBH should go beyond the Shanghai market. The national market is much larger than the local market, and the price is higher in the former than in the latter. Again, due to the size of the grant, the project was not designed to provide professional help to SBH regarding market promotion for organic fertilizer.

III. Conclusion

The cost–benefit analysis shows that the EIRR for the livestock waste management technology demonstration component is 12.4 percent, with a robust EIRR for all subprojects ranging from 12.2 percent to 14.1 percent. The subprojects under the wetland demonstration for pollution reduction component have mixed results, while the integrated agricultural pollution reduction techniques component is cost-effective.

The financial analysis shows the subprojects under the livestock waste management technology demonstration component can achieve financial balance, and hence achieve financial revenues. The subprojects under the wetland demonstration for pollution reduction component will be operated by professional operators and financed by local government.

Local government's subsidies helped promote the production and application of organic fertilizer. The side effect is that, without subsidies, farmers are reluctant to use it.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team Members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Yiren Feng	Senior Environmental Specialist	GENDR	Environmental Safeguards Specialist
Yi Geng	Senior Financial Management Specialist	GGODR	Financial Management Specialist
Eddie Ke-Siong Hum	Consultant	GSURR	Municipal Engineer
Toyoko Kodama	Urban Specialist	GWADR	Operations Specialist
Nicolas Kotschoubey	Consultant	GENDR	Operations Support
Jiang Ru	Senior Environmental Specialist	GENDR	GEF Coordinator
Hiroaki Suzuki	Lead Urban Specialist	EAPDL	Task Team Leader
Dawei Yang	Consultant	EASTS–HIS	Procurement Specialist
Jun Zeng	Senior Social Development Specialist	GSURR	Social Safeguards Specialist
Weiguo Zhou		GSURR	Co-Task Team Leader
Takuya Kamata			Task Team Leader
Supervision/ICR			
Gang Qin	Engineer	GWADR	Task Team Leader
Takao Ikegami	Consultant	ECRJP	Task Team Leader
Weiguo Zhou	Consultant	GFADR	Consultant
Alexander V. Danilenko	Senior Water and Sanitation Specialist	GWASP	Monitoring and Evaluation
Huiying Guo	Program Assistant	EACCF	Program Assistant
Jingrong He	Procurement Specialist	GGODR	Procurement Specialist
Ning Yang	Senior Environmental Specialist	GENDR	Environmental Safeguards Specialist
Jun Zeng	Senior Social Development Specialist	GSURR	Social Safeguards Specialist
Hongwei Zhao	Program Assistant	EACCF	Program Assistant
Haixia Li	Senior Financial Management Specialist	GGODR	Financial Management Specialist
Isabel Duarte A. Junior	Program Assistant	GWADR	Program Assistant

(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		
FY05	3.25	24.18
FY06	3.53	21.79
FY07	2.78	40.85
FY08	5.14	39.78
Total:	14.70	126.60
Supervision/ICR		
FY09	19.78	130.21
FY10	8.51	93.31
FY11	7.90	64.53
FY12	8.75	43.01
FY13	4.12	14.60
FY14	4.33	24.01
FY15	5.98	34.78
FY16	-	-
Total:	59.37	404.44

Note: Supervision costs for FY15 and FY16 were financed by a trust fund.

Annex 5. Beneficiary Survey Results

Not available.

Annex 6. Stakeholder Workshop Report and Results[4]

1. Summary of Achievement Promotion and Exchange Seminar

On June 29–30, 2015, the Achievement Promotion and Exchange Seminar of the GEF Shanghai Agricultural and Non-point Pollution Reduction Project was successfully held in Anji, Zhejiang Province. This seminar was organized by the Shanghai Agricultural Broadcasting Television School. Relevant leaders of the Shanghai Municipal Agriculture Commission, Shanghai Development and Reform Commission, and Shanghai Municipal Finance Bureau attended. Also present were more than forty guests from the Bright Dairy & Food Co., Ltd., Shanghai Agricultural Technology Extension and Service Center, Shuxin Town of Chongming County, Shanghai Shenye Dairy Cooperative, Qingpu District Water Authority, Shanghai Academy of Environmental Sciences, Shanghai Environmental Protection (Group) Co., Ltd., Shanghai Agricultural Broadcasting Television School, GEF Project Office, and other entities. Leaders and experts from the World Bank Project Office in Anji and Anji Guoyuan Water Utilities Co., Ltd., were also invited to discuss and exchange views.

The seminar kicked off with a "Video Film on a Case Study from the GEF Shanghai Agricultural and Non-point Pollution Reduction Project." From it, all the attendees gained a comprehensive and real understanding of the construction details, technical overview, and project outcomes of various rural non-point source pollution control demonstration projects launched by the World Bank in Shanghai, as well as their important role in the improvement of the rural environment.

Then Director Cheng of the World Bank Project Office in Anji introduced in detail the implementation situations of Zhejiang's "five treatment modes for water" under the loan granted by the World Bank, particularly the implementation effects of rural sewage treatment projects. He pointed out that the GEF Project initiated by Shanghai provided a model for the implementation of the projects in Zhejiang. Eight Shanghai-based contractors of the respective subprojects described the arduous course followed by the GEF Project in the eight to ten years since its preparation phase and sincerely expressed their joy and delight in the victory and successful completion of the project. Relevant leaders spoke highly of the implementation of various projects in Shanghai and further mentioned work requirements for strengthening the operation and management of the projects, doing a good job in routine maintenance, and effectively upgrading the efficiency of project implementation.

During this seminar, all attendees also conducted field research on the site of the Rural Domestic Sewage Treatment Construction Project in Shanchuan Township, Anji County, accompanied by staff from the World Bank Project Office in Anji. They explained the introduction from township- and village-level technical personnel. Leaders and experts from

[4] This section is based on summary reports prepared by the client.

related projects in Shanghai also made recommendations based on their work experience in Shanghai.

This seminar was not only the last event prior to the completion of the project, but also the final part of the project proposal submitted by Shanghai to the World Bank. Its success represented the comprehensive completion of the GEF Project in Shanghai. Members of various project entities, who had joined hands for many years, got together in the last two days of the project. Having achieved so many hard-won outcomes of the project, and looking back on the bumpy experiences, trials, and hardships over the years, they could not help but to convey their excitement, emotions, and happiness, which went beyond words. In their opinion, the implementation of the World Bank GEF Project not only brought real changes to the rural environment across Shanghai, but also helped all project entities keep abreast of the world-class project management philosophy and management methods introduced by the World Bank, which provided a demonstration and set a good example for these project entities to launch projects in a more standardized and orderly manner in the future.

Shanghai Agricultural Broadcasting Television School
June 30, 2015

2. Supplementary Description of the Achievement Promotion and Exchange Seminar

The Achievement Promotion and Exchange Seminar, held on June 29–30, 2015, mainly summarized and permitted an exchange of views by the various Shanghai-based entities from the subprojects. Their situations and jobs differed, but their feelings were the same. The later speakers, who had been engaged in the project for nearly eight years, were particularly emotional in their statements. These are summarized as follows:

1. The GEF Project implemented in Shanghai covers rural sewage treatment, comprehensive manure utilization on farms, "ecologicalization" governance of rural riverways, and other elements and plays a positive pacesetting role in promoting the construction of "rural ecological civilization" and beautiful rural areas in Shanghai. Driven by the GEF Project, "The Sixth Round of the Three-Year Action Plan for Environmental Protection," launched in Shanghai in 2015, focuses on the environmental treatment of rural areas. In the next three years, Shanghai will make more efforts toward riverway regulation and livestock pollution control and push forward the development of recycling agriculture.
2. The Shanghai-based GEF Project not only rolls out various environmental treatment demonstration projects, it also kicks off environmental monitoring, replication, promotion, training, publicity, and other campaigns to form a complete project system, which is of great importance for project quality assurance and project outcome expansion. Such project design provides Shanghai with a great model for planning future projects.
3. According to the Bright Dairy & Food Co., Ltd., Qingpu District Water Authority, Shanghai Agricultural Technology Extension and Service Center, and other entities, the project, which has been completed for only one or two years, has already started to demonstrate great effects that have been widely welcomed by the local people.
4. The biggest differences between the current GEF Project and previous World Bank projects are the current project's small scale and long time span, which have increased the difficulty of its implementation. During this period, the GEF Project had to navigate several twists and turns. But all project entities were deeply moved by the perseverance, unswerving efforts, patience, meticulousness, and efficient work attitude of the World Bank management team. Because of the persistence of the World Bank and joint efforts, this project ultimately met with great success. We are impressed with the Bank's work ethic and methods, which are one of the greatest harvests from this project.
5. To address the series of implementation difficulties encountered by a small-scale project running a long time span, it is expected the World Bank will, in the future, bring projects together in the design stage, focus on single projects (supplemented by supporting projects), make concentrated efforts, and improve project pertinence.
6. As many of the entities involved were undertaking a World Bank project for the first time, they knew nothing of and did not understand the processes and rules of the World Bank, which led to difficulty for them as well as for World Bank management. Attendees hoped that the World Bank could take this into account in the future, while they also expected to continue enjoying project support from the Bank.

Zhou Songliang (Shanghai Agricultural Broadcasting Television School)
November 12, 2015

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

1. Project Context, objectives and design

1. 1 Background

Shanghai Municipality has been China's premier economic, financial, and industrial center. Shanghai's economy maintained double-digit economic growth from 1992 to 2007. It faces serious environmental management challenges as a consequence of this rapid economic and population growth. One of the major environmental issues is degradation of water quality of two major rivers, Huangpu River and the Yangtze River, which are main sources of raw water supply for the municipality. Deterioration of water quality in the Yangtze and Huangpu rivers significantly affects the water quality of the East China Sea. Occurrence of marine red tides, caused by eutrophication of sea water, is also quite common in the East China Sea. There were 60 cases of marine red tides over a total area of about 9,800 km^2 in 2007. In rural Shanghai, where infrastructure lags behind the necessity level, household and agriculture wastes are discharged into a water environment without treatment, thus causing pollution. Rural areas account for some 60 percent to 70 percent of the loads of nitrogen, phosphorus, and other organic matters discharged into watercourses, and the pollutants eventually flow into the East China Sea. A study, "Upper Huangpu Catchment Management Plan," was conducted during the implementation of Shanghai Urban Environment Project APL1, the issue of agricultural and non-point source pollution in the rural areas was identified. The activities in the Shanghai Agriculture and Non-point Pollution Reduction (SANPR) are also in line with Shanghai's third TYAPEP (2006 – 2008), which aims to increase the treatment and recovery of livestock waste as a resource and reduce the dosage rate of chemical fertilizer by 10 percent and that of chemical pesticides by 8 percent. The SANPR project supported by GEF will make the efforts by mitigating agricultural and non-point source pollution discharged to a water environment. The SANPR project has got a total amount of 5million grant from GEF, in which 212,000 goes for the project preparation and 4.788 million for the project implementation.

1.2 Original objectives and key indicators

The project development objective is to demonstrate effective and innovative pollution reduction activities in Shanghai rural areas in order to reduce the rural and agricultural pollution load (especially nutrients) in the surface water flowing to the East China Sea. By the end of 2014, all the designed project targets have been successfully achieved.
The project designed indicators at appraisal, first and second restructuring stage and its corresponding actual outcome are shown as Annex 1.

1.3 Revised objectives

NA

1.4 Main beneficiaries

The main beneficiaries includes farmers, private enterprises, local communities, academics and governments at different levels. The tangible benefits, such as waste-to-energy, organic fertilizer, and reduced human health risks, are expected to yield especially for farmers and local communities.

1.5 Project components

The GEF Grant Agreement was signed on Sept. 15, 2010. On July 16, 2013, the first project restructuring was approved by the Bank, in which the sub-component b.1 was restructured and the new site of river-network had been identified in Huimin River located in Shuxin Town of Chongming County. On June 17, 2014, the second project restructuring was approved. The sub-component of A.3 was cancelled, the Closing Date of the Project was extended to June 30, 2015. The original project components, changes after restructuring and the corresponding proceeds of the grant allocated are shown as Annex 2.

It took about five years for GEF SANPR project from preparation stage to agreement signature and lasted almost 10 years from beginning to finish the project. The milestones of the project is shown as Annex 3.

2. Project Implementation and Outcome

2.1 Project Organization Structure

To ensure the SANPR project implementation effectively, a specific institutional arrangement with three levels has been made. The project institutional structure and implementation diagram after the second restructuring is shown as Fig.2.1-1.

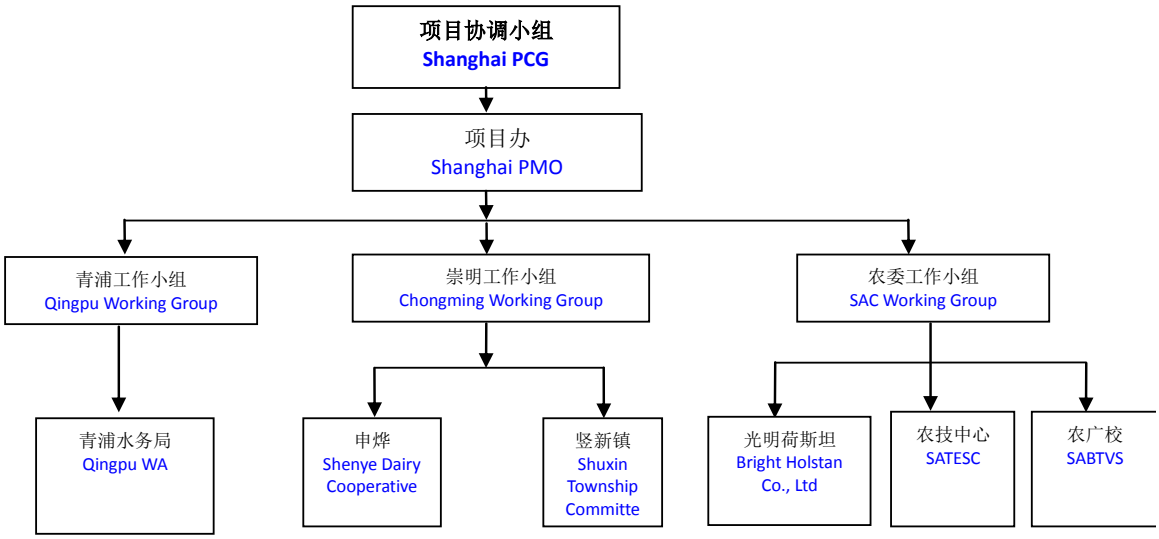


Fig 2.1-1 The project Institutional Structure and Implementation Diagram

Project implementation agencies (PIAs), which are the third level of the project organization structure and responsible for sub-component/project implementation activities, are shown as Annex 4.

2.2 Project description and Implementation Output

The GEF SANPR project consists of four components, (a)livestock waste management technology demonstration, (b) wetland demonstration for pollution reduction, (c) integrated agriculture pollution reduction techniques, and (d) project management and dissemination, replication strategy, M&E. The project cost estimate as of March 2015 is shown as table2.2-1.

Table 2.2-1 Project Cost by Component

No.	Component	Appraisal Estimate				Actual/Latest Estimate			
		GEF (US$10,000)	Government (US$10,000)	Beneficiaries (US$10,000)	Total (US$10,000)	GEF (US$10,000)	Government (US$10,000)	Beneficiaries (US$10,000)	Total (US$10,000)
A	Livestock Waste Management Technology Demonstration	240.8	541.5	192.5	**974.8**	200.8	23.1	141.6	359.72
A.1	Livestock waste management on large-scale farm	145.8	332.2	68.7	**546.7**	145.8	-	104.0	**244.0**
A.2	Livestock waste management on medium-scale farm	55	23.1	35.8	**113.9**	55	23.1	37.6	**115.7**
A.3	Integrated livestock and agricultural waste management	40	186.2	88	**314.2**	-	-	-	**-**
B	**Wetland Demonstration for Pollution Reduction**	95	127.5	111.8	**334.3**	79.6	379.6	0	**456.5**
B.1	Rural town river-network wetland demonstration	35		111.8	**146.8**	64.6	204.2	-	**266.1**
B.2	Village wetland sewage treatment system	60	127.5		**187.5**	15	175.3	-	**190.3**
C	**Integrated Agricultural Pollution Reduction Techniques**	90	715.5	1235.7	**2041.2**	123.0	1944.0	-	**2067.0**
D	**Project Management and Dissemination**	53	39.6	25	**117.6**	66.7	20.5	0.0	**87.2**
D.1	Project managemen	5		25	**30**	10	-	-	**10.0**
D.2	Replication strategy development, monitoring and evaluation	33			**33**	37.7	-	-	**37.7**
D.3	Training and dissemination.	15	39.6	0	**54.6**	19	20.5	-	**39.5**
	(1)远程推广课件与网络维护	5	1.2		**6.2**				
	(2)其他培训材料，培训与推广	10	38.4		**48.4**				
	Total	**478.8**	**1424.1**	**1565**	**3467.9**	**470.1**	**2367.1**	**141.6**	**2970.4**

Exchange rate: US$ 1 = RMB 6.5
Note: The actual figure is based on the disbursed amount at the time of project closing in June 2015.

2.2.1 Livestock Waste Management Technology Demonstration

This component consists of two sub-components, livestock waste management on large-scale farm and livestock waste management on medium-scale farm.

2.2.1.1 Livestock Waste Management on Large-scale Farm

This sub-component project is located on Shanghai Bright Holstan Jinshan Dairy Farm (SBH) in the Modern Agricultural Zone of Langxia Town of Jinshan District of Shanghai Municipality. It is implemented by Shanghai Bright Holstan Co., Ltd. The purpose of the project is to treat the cow wastes produced by the about 5000 cows on the farm and the wastewater generated during the production to meet the national environmental requirements. During the project appraisal, the treatment technology proposed is bio-gas power generation. Before it went into implementation, SBH took actions on rehabilitation of the existing wastewater treatment facilities and basically solve the wastewater problems. In addition, due to the government policy and the renovation of the compost technology, the organic fertilizer produced by SBH sold very well. So the Bank agreed the adjustment of treatment technology proposed by SBH: using the GEF grant 1) to increase the wastewater treatment capacity to 800 ton/day; 2) procure some equipment, such as shovels, etc. to increase the treatment capacity of the cow solid wastes.

The construction of this sub-component project started on January 16, 2014, its trial operation started in August 2014 and completed in December.

In 2014, 24000 tons of organic fertilizer was produced, of which 9500 tons were sold with government subsidies, and the price was 400; 1860 tons sold outside Shanghai with the price of 500 Yuan RMB/ton (buyer's delivery); 6000 tons sold to the Green Forages Company with the price of 100 Yuan RMB/ton; 7000 tons were used in the farm as cow bed mattress instead of sawdust with purchasing price of 620 Yuan RMB/ton.

There were about 225000 tons wastewater being treated in 2014 with pollution discharge reduction of TN 351.3 tons, TP121 tons, BOD1607.6 tons and COD 3265.6 tons. Now the treatment capacity of high concentration wastewater treatment system is 300 ton/d, capacity of

low concentration wastewater treatment system is 430 ton/d. The treatment system is operated by a specialized company (Wuxi Tsingda Biotech E.P.E Co., Ltd.).

By the end of June, 2015, 1.45 million USD had been withdrawn under this component. The summary of contracts implementation is shown on Annex 5.

2.2.1.2 Livestock Waste Management on Medium-scale Farm

The sub-component project is located in Chongming modern agricultural park. It is implemented by Shanghai Shenye Cooperative. The total cost of this project is at about 7.04 million RMB yuan, including GEF grant 0.55 million USD. The purpose is to treat 17500 tons of the livestock solid waste and 10500 tons of livestock liquid waste per year produced by 1600 cows on the dairy farm through construction of a livestock waste treatment center, which consists of two independent systems: (a) a solid waste management system of composting and pelletizing process, with a capacity of treating 50 tons of waste per day; and (b) a liquid waste management system, with a capacity of treating 30 tons of livestock wastewater per day.

The construction of this project began at April 25, 2013 and completed in early May 2014. After the treatment center being constructed, 6000 tons of organic can be produced per year for 2727.3 mu farmland application, decreasing the use of 645.55 tons chemical fertilizer, saving the cost of 0.436 million Yuan RMB; and 10500 tons of organic liquid fertilizer for 4200 mu farmland application, decreasing the use of 979.86 tons chemical fertilizer, saving the cost of 0.63 million Yuan RMB. The total chemical fertilizer cost saving is 1.07 million RMB.

In 2014, pollution discharge reduction of TN is 101.4 tons, TP 31.1 tons, BOD 446.8 tons and COD 886.5 tons.

By now, about 0.44 million USD has been withdrawn under this project. The summary of contracts implementation is shown on Annex 5.

2.2.2 Wetland Demonstration for Pollution Reduction

This component consists of two sub-components, rural town river-network wetland demonstration and village wetland sewage treatment system (Qingpu).

2.2.2.1 Rural Town River-network Wetland Demonstration

This sub-component project has been restructured. The new site of river-network wetland has been identified in Huimin River located in Shuxin Town of Chongming County. By dredging rivers and thoroughly cleaning up of silt which had a more serious degree of eutrophication, the self-purification capacity of surrounding river channels can be improved greatly, thus improving water quality and creating favorable conditions for ecological restoration. The main contents of this project are restoration of town river bed of Dazhanghe, construction of ecological slope protection and vegetation buffers, and planting aquatic plants with 1827 m Dazhanghe river channel dredging, 22000 m^2 watercourse ecological restoration and 1425 m river wetland. It is implemented by the waterworks management office of Shuxin town in Chongming County.

The related project of this river-network wetland project is Shuhe and Huimin village sewage treatment system, which were constructed and put into operation in December 2013 funded by town government. 13 sewage treatment stations with self-flow oxygen enhanced ecological bed-integrated artificial wetland were built and 67250m sewage collection pipes of DN75-200 were paved. The total capacity of the system is 260m^3/d with service area of 185000m^2 for 917 households. The GEF grant is allocated for procurement of operation equipment or machines.

The operation of village sewage treatment stations are entrusted to an independent third company (Shanghai Weishi Environmental Engineering Company) through open bidding, following the principle of socialized management based on the O&M standards. In 2014, pollution discharge reduction of TN is 4.2 tons, TP 0.5 tons, BOD 19.7 tons and COD 34.0 tons.

The river-network wetland is now operated by river-cleaning group of Shuhe village committee and it will operated by an independent third company in the future.

The bidding documents of this sub-component got the NOL from the Bank on July 31, 2014. The construction work began in December 2014 and finished in May 2015.

By now, about 0.207 million USD has been withdrawn under this sub-component. The summary of contracts implementation is shown on Annex 5.

2.2.2.2 Village Wetland Sewage Treatment System (Qingpu)

The sub-component project is located in Jinze and Liantang Towns of Qingpu District. Both towns are located on the lakeshore of Dianshan Lake in downstream Tai Lake Watershed, which is the drinking water supply source and ecological conservation zone in the upstream Huangpu River for Shanghai. It is implemented by Qingpu Water Authority. This project is designed to use the compound bio-filter tank technology to treat the domestic water produced by 1155 households from 4 natural villages in Qingpu District. They are Beiwangbang, Qianwan and Jintian villages of Liantang Town, and Xiezhuang villages of Jinze Town. The design capacity is 502m^3/d. The purpose of this sub-project is to set up a demonstrative and replicable model to the other rural areas of Qingpu in terms of domestic wastewater treatment through the implementation of Beiwangbang's and Qianwan's project.

In order to improve the water environment in Tai Lake, Qingpu Water Authority speeded up the pace of rural sewage treatment. Qingpu Water Authority completed the construction of wetland sewage treatment systems (QP1.1-1.3) for the aforementioned four natural villages with its own fund and subsidy from Shanghai municipal government in May 2010, adopting the treatment technology agreed with the World Bank but following the national capital construction procedures and procurement procedures.

The bank supervision mission has examined those completed wetland sewage treatment systems, affirmed the projects quality meeting the expected target and complying with the principle of GEF. They are demonstrated and replicable in other places. It is agreed that these completed wetland sewerage treatment systems still forms a subproject of this GEF project and the Bank will allocate some GEF grant to support the procurement of equipment for maintenance of these systems. The check and acceptance of the equipment and the operation trainings have been completed by now. The summary of contracts implementation is shown on Annex 5.

Under the demonstration of the 4 villages project, rural sewage from 36564 households of three towns in the western of Qingpu district was collected and treated in 2008, achieving 80% sewage treatment rate, successfully achieving the phased target of integrated management of water environment in Taihu basin.

In 2011, the opinion of operation and maintenance of rural sewage treatment system in Qingpu district was issued by the district government, establishing the organization system with neighborhood committee or town as implementing entity and Water Authority, Agriculture

Committee, Environmental Protection Bureau and Finance Bureau as supervision and administration departments. The O&M standards and contents were clarified and funding policy of quota subsidy (200 Yuan RMB per household in one year) from the district government and final warrant from the town government was determined. The operation company is selected by government's purchasing service through open bidding to ensure the rural sewage treatment system running properly and O&M coverage rate being 100%.

2.2.3 Integrated Agricultural Pollution Reduction Techniques

This Component has been implemented by SATESC. The SATESC is a quasi-government body with functions of agricultural research, technology extension & training, laboratory service, and regulatory enforcement of the agricultural sector.

Three demonstration sites, which are Shanghai Jinshan Modern Agricultural Park with land of 2,417.55 mu, Zhujiajiao Production Base with land of 2,630 mu, with land of 3,725 mu, have been selected to demonstrate the use of organic fertilizer, high effective, low toxic, and low residual chemicals, eco-friendly biological pesticides, upgrading sprayers; and non-chemical technologies for insect and pest control to reduce the use of chemical fertilizers and reduction of pollution from agriculture chemicals and monitor the effect of the demonstration.

About 120 check points has been set up at the three selected demonstration sites for on-site examination and collecting samples for laboratory testing to monitor the effect of the demonstration of such technologies. The three demonstration sites under this component have also been selected as monitoring sites for Shanghai Municipal long term early-warning system for epidemics of plant disease, insects and pests. Trainings have been provided for participating farmers and technicians and successful experience has been extended to localities beyond the demonstration sites to other parts of Shanghai through training, workshops and SATESC extension network under this component.

From 2012 to 2013, SATESC organized 21 kinds of training courses for farmers, about 1321 person participating the training of chemical fertilizers, insecticides and pesticides development trends, more than 121000 copies of kinds of dissemination material being edited and printed.

Till June 2014, all the demonstration and monitoring activities have been finished. SATESC have organized and held three workshops, i.e. 2014 Shanghai New Pesticide Recommendation and Scientific Application Technology Workshop, Scientific Fertilizer Application and Agricultural Non-point Pollution Control Technology Workshop and the Agricultural Non-point Pollution Control Project Management Workshop and Check and Acceptance.

After GEF SANPR project's second restructuring, SATESC has got an additional reallocated 360,000.00 USD grant mainly for the payment of the new contracts, which are Agricultural Non-point Pollution Control Technology Research (AT6), Procurement of Water Soluble Fertilizer for Integrated Water & Fertilizer Application (AT7) and Workshop (AT8) under this component. The bid evaluation report of contract AT6 was submitted to the PMO on September, 12, 2014 and it was finished in May 2015. The procurement proposal of water soluble fertilizer was submitted to the PMO on September 12, 2014 and the fertilizer began to be delivered to farmers on December 2, 2014. Two courses of usage training were held on December 16 and 17, 2014, and this contract was finished on December 25, 2014. Contract of AT8 began at February, 2015 and finished in May.

By the end of March 2015, the accumulative withdrawal of the grant proceeds of this component is about 1.12 million USD. The summary of contracts implementation is shown on Annex 5.

During the implementation of sub-component, fertilization structure at suburb area has been gradually optimized in terms of "three increases, three decreases", which means the fertilization ratio of organic fertilizers, compound fertilizers and high concentration dedicated fertilizers increased while the fertilization ratio of chemical fertilizers, fertilizers which are consisted of one substance and low concentration fertilizers decreases. Farmer's fertilization level is improved. According to statistics, nitrogen use efficiency on rice crops increases 3% (Jinshan:3.1%; Qingpu:3.3%; Chongming:3.6%). From 2012 to 2013, 400,000 tons of commercial organic fertilizers were popularized and used, which meant 1.2 million tons of livestock and poultry waste were digested and consumed.

The early warning system for insects and pests has been established and improved, short term insects and pests forecasting accuracy of grain land is more than 90%, while the long term accuracy more than 85%. Annual insects and pests forecasting accuracy of vegetables reaches 90%. The application rate of low toxic, efficient and low-persistent pesticides in the demonstration bases reaches 100% by increasing the coverage rate of green control application and optimizing the structure of pesticides. The recommended pesticides in Shanghai for grain land are mainly low toxic pesticides and environmental friendly pesticides. Low toxic and slightly toxic pesticides account for 92.31% of the recommended pesticides; eco-friendly pesticides account for 50% of the recommended pesticides. Testing result states that qualified rates of pesticide residues in rice is 100% while in vegetables is 99.9%.

2.2.4 Project Management and Dissemination

This component consists of three sub-components， project management; replication strategy development, monitoring and evaluation; and training and dissemination.

2.2.4.1 Project Management

This sub-component will support Project Coordination Group and the Shanghai Project Management Office at the municipal level, Working Groups at county/district level and those at the project implementing agencies for efficient project management and implementation. The sub-component aims to develop and strengthen the overall implementation capacity of the various levels of project management entities in procurement, financial management, monitoring and evaluation (M&E), reports preparation, etc., through provision of adequate budgets for technical assistance, consultant services, training and incremental operating expenses.

The PMO has hired SMEDI for reviewing of the technical design and bidding documents. The daily project management consultant and financial management consultant has also been hired. Detailed consultant procurement and implementation activities are shown on Annex 6.

By the end of March 2015, accumulatively, it had withdrawn 0.037 Million USD.

2.2.4.2 Replication Strategy Development & Monitoring and Evaluation

(a) Replication Strategy Development

Shanghai Environmental Protection Cause Development Company Ltd. has been selected through procurement by Shanghai PMO to prepare the project replication strategy for the demonstrated technology. A draft replication strategy will be prepared in the first year of project implementation. This draft strategy will be tested for applicability and improvement during the

second year of project implementation. The replication strategy will be finalized at the completion of the project implementation. The final replication strategy will incorporate replication plans from all participating district/county Working Groups.

By now, the report of replication strategy (second stage) has been finalized.

By the end of June 2014, accumulatively, 0.105 Million USD has been withdrawn under this sub-component.

(b) Monitoring and Evaluation
Shanghai Academy of Environmental Sciences (SAES) has been selected through procurement by Shanghai PMO as an independent institute to provide external monitoring to the construction and equipment installation activities.

By the end of March 2015, SAES had submitted 3 semiannual progress reports and more than 10 monthly progress reports. The final monitoring work was completed in May and the report is on drafting.

2.2.4.3 Training and Dissemination
This sub-component project has been carried out by Shanghai Agricultural Broadcasting Television School (SABTS). The main purpose of this project is to disseminate and replicate the achievements and experience obtained from GEF SANPR project. It includes production and distribution of environmental education DVD, establishing a GEF agriculture environmental education website, maintenance of the information of the GEF agriculture environmental education website for three years, developing the educational case film of GEF SANPR and results dissemination and workshops. The work finished is shown as Annex 7. This project is divided into four contracts and implemented very smoothly as shown on Annex 5. The bank has agreed to increase an additional grant in the amount of US$20,000 through first restructuring to support the environmental awareness dissemination initiatives.

Shanghai PMO organized related person and attended two international conferences: one was held in Australia in 2009 and the other one was held in Manila in March, 2014.

The international workshop was held in December 7, 2013 and the summary report was submitted to the World Bank and the PMO and the related authorities.

The work of production of the educational case film is going-on but its progress has been constrained by the progress of other projects; and results exchange conference will be conducted on June 29-30, 2015.

So far, the accumulated amount disbursed under this sub-component is 0.121 million USD.

By the end of March 2015, the project had withdrawn about 3.37 million USD, accounting for 70% of the total grant (4.788 million USD).

3. Lessons learned
a. Too many projects have been selected under GEF SANPR with different scale, treatment technology, the beneficiaries' enthusiasm of coordination for project implementation varies

greatly due to different cost-benefit, and the speed of implementation is even slower because of lack of project management expertise and knowledge of WB procurement process.

b. The important factor resulting in project restructuring is land planning and obtaining. The sub-component project A.3 being cancelled and B.1 adjusted are directly related to the land. Much attention should be paid to the acquisition of project construction land at preparation stage.

c. No matter the GEF project scale is big or small, it should follow the national and the Bank's procurement process. Some contracts are too small and it has little attraction to potential bidders which results barriers for project implementation.

d. Since 2006, the team leader of GEF SANPR project have changed frequently, objectively leading to work lacking consistency and implementation delay.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Not applicable.

Annex 9. List of Supporting Documents

- Project Appraisal Document
- Grant Agreement, Project Agreement, and Their Amendments
- Mission Aide Memoirs and Back-to-Office Reports
- Implementation Status Reports
- Restructuring Papers and its Memorandum to Country Director
- Borrower's Implementation Completion Report
- Country Partnership Strategy for the People's Republic of China (FY2013–2016)
- GEF-6 Programming Directions (May 2014), https://www.thegef.org/gef/sites/thegef.org/files/webpage_attached/GEF6_programming_directions_final_0.pdf
- PAD of the Guangdong Agricultural Pollution Control Project
- ICR of the GEF Ningbo Water and Wastewater Environment Project
- ICR of the Shanghai Urban Environment Project (APL1)

Annex 10. Project Pictures[5]

Component 1: Livestock Waste Management Technology Demonstration

Expanded Wastewater Treatment Plant in Jinshan Farm

Cattle Waste Composting Yard in Jinshan Farm

Livestock Waste Treatment Center in Shenye Farm

Anaerobic Reactor in Shenye Farm

Lagoon in Shenye Farm

[5] These pictures were provided by PIAs.

Component 2: Wetland Demonstration Component—River-network Wetland Demonstration (in Shuxin)

Before Project

After Project

Before Project

After Project

Component 3: Integrated Agricultural Pollution Reduction Techniques

Insect Net Demonstration

Sales of Organic Fertilizer

MAP

IBRD 36378