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Report No: ICR00002361

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-090336)

ON A

GLOBAL ENVIRONMENT FACILITY TRUST FUND GRANT

IN THE AMOUNT OF

US$ 5.0 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

GEF NINGBO WATER AND ENVIRONMENT PROJECT

May 18, 2012

China and Mongolia Sustainable Development Unit
Sustainable Development Department
East Asia and Pacific Region

CURRENCY EQUIVALENTS

Exchange Rate Effective May 1, 2012

Currency Unit = Renminbi
US$ 1.00 = RMB 6.1

FISCAL YEAR
January 1 - December 31

ABBREVIATIONS AND ACRONYMS

BOD	Biological Oxygen Demand
CMSC	Cixi Municipal Sewerage Company
COD	Chemical Oxygen Demand
CPS	Country Partnership Strategy
CTW	Cixi Treatment Wetlands (in the Wetlands Center)
CW	Constructed Wetland (at the north WWTP)
CWMC	Cixi Wetlands Management Company
EEC	Environmental Education Center
EMP	Environmental Management Plan
GEF	Global Environment Facility
GEF NWEP	Grant-financed Ningbo Water and Environment Project
GEO	Global Environment Objective
HBNZA	Hangzhou Bay New Zone Administration
ISR	Implementation Status Report
KPI	Key Performance Indicators
LME	Large Marine Ecosystems
MOF	Ministry of Finance
NMG	Ningbo Municipal Government
NMPMO	Ningbo Municipal Project Management Office
NWEP	Ningbo Water and Environment Project (Loan 4770)
PAD	Project Appraisal Document
PDO	Project Development Objective
RAP	Resettlement Action Plan
WMC	Wetlands Management Consultant (Consortium)
WWTP	Wastewater Treatment Plant

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CHINA
GEF Ningbo Water and Environment Project

CONTENTS

A. Basic Information

Country:	China	Project Name:	GEF-Ningbo Water and Environment Project
Project ID:	P090336	L/C/TF Number(s):	TF-56692
ICR Date:	06/11/2012	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	NINGBO MUNICIPALITY
Original Total Commitment:	USD 5.00M	Disbursed Amount:	USD 5.00M
Revised Amount:	USD 5.00M		
Environmental Category: B		**Global Focal Area: I**	
Implementing Agencies: Ningbo Municipal Development and Reform Commission			
Cofinanciers and Other External Partners:			

B. Key Dates

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	07/12/2005	Effectiveness:	09/01/2006	12/12/2006
Appraisal:	03/27/2006	Restructuring(s):		
Approval:	06/29/2006	Mid-term Review:	12/08/2008	02/23/2009
		Closing:	12/31/2010	12/31/2011

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Moderately Satisfactory
Risk to Global Environment Outcome	Substantial
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 Satisfactory	Government:	Moderately Satisfactory
Quality of Supervision:	Moderately 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):	No	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)		
General water, sanitation and flood protection sector	100	100
Theme Code (as % of total Bank financing)		
Biodiversity	25	25
Pollution management and environmental health	50	50
Water resource management	25	25

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Pamela Cox	Jemal-ud-din Kassum
Country Director:	Klaus Rohland	David R. Dollar
Sector Manager:	Mark R. Lundell	Keshav Varma
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F. Results Framework Analysis

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

GEO: To mobilize international and domestic financial resources to demonstrate an innovative wastewater treatment technology – wetland treatment – to reduce land-based pollution to East Asia'a Large Marine Ecosystems (LME).

PDO: To reduce land-based pollution along the Cixi coast and the East China Sea, promote the replication of innovative low cost wastewater treatment techniques, and encourage coastal zone conservation.

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

Objectives were not revised.

(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 :	BOD, N and P reduction in wastewater discharge (tons/year)			
Value (quantitative or Qualitative)		Both WWTPs: BOD:10,000 T-Nitrogen:2000 T-Phosphorous:200 Of Which North Constructed Wetland: BOD: 300 T-Nitrogen:400 T-Phosphorous:25 Enhanced Wetland Plot A1: T-Nitrogen:175		BOD:1583 T-Nitrogen:240 T-Phosphorous:52 Wetland: BOD: 20.6 T-Nitrogen:30.7 T-Phosphorous:4 400g
Date achieved		12/31/2010		12/31/2011
Comments (incl. % achievement)	Largely achieved. Pollution levels in the river decreased due to treatment efficiency of the NWEP financed WWTP and so the absolute targets were not achieved. However, the goal was for the treated effluent to reach Class 1A discharge which it did.			
Indicator 2 :	Number of domestic and international workshops			
Value (quantitative or Qualitative)		Participation in 4 international and 4 domestic workshops		4 international workshops and several domestic workshops. Several local governments visited

				the CTW & WWTP.
Date achieved		12/31/2010		12/31/2011
Comments (incl. % achievement)	Achieved. The number of CTW is growing, such as the recently approved Huai River Basin Marine Pollution Reduction Project approved in February 2012.			
Indicator 3 :	Number of visitors to the Wetland Center			
Value (quantitative or Qualitative)		100,000		79,800
Date achieved		12/31/2010		12/31/2011
Comments (incl. % achievement)	Largely achieved. The target is expected to be achieved by October 2012, once the EEC is fully operational when 5D virtual experience and other facilities for education and research are completed.			
Indicator 4 :	Increased abundance of bethnic fauna in tidal wetlands and mudflats.			
Value (quantitative or Qualitative)		25% increase in bethnic fauna productivity over 2007 baseline.		No monitoring data available
Date achieved		12/31/2010		12/31/2011
Comments (incl. % achievement)	Not achieved. Inter-tidal mudflats were not rehabilitated due to lack of government policy on conservation of the area, so changes of benthic fauna could not be attributed to the project.			
Indicator 5 :	Increased bird abundance and species diversity.			
Value (quantitative or Qualitative)		25% increase in bird sightings and number of species		243% increase in bird species
Date achieved		12/31/2010		06/30/2011
Comments (incl. % achievement)	Target Exceeded. Freshwater wetlands have so far attracted 212 species of birds, 13 of which were endangered. From baseline, bird population also increased by 37% and number of bird families increased by 77%.			

(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 :	Constructed wetland completed, and wastewater treatment meets Class 1A discharge standard.			
Value (quantitative or Qualitative)		Constructed wetland with habitat value completed Construction wetland in		Constructed wetlands were in operation at the end of the project. Compliance with Class 1A discharge

		production Compliance with effluent standard		standard achieved.
Date achieved		12/31/2010		12/31/2011
Comments (incl. % achievement)	Achieved. Sixty ha (70%) out of the originally proposed 86 ha were constructed. The subplot of 2 ha were not built but class A1 discharge was still achieved without it.			
Indicator 2 :	EEC completed; Wetland areas restored and enhanced, and financially sustainable			
Value (quantitative or Qualitative)		(i) Wetland Center: Wetland Center Buildings and Ecological Enhancement completed (ii) Wetland Center operational (iii) Revenues from user fees and contributions sufficient to meet operational costs		EEC center structure completed but finishing works are still on going Plot A1 wetland fully enhanced Plot A3 and A5 were not restored Wetland Center open to visitors User fee revenues and contributions from HBNZ sufficient to meet costs
Date achieved		12/31/2010		12/31/2011
Comments (incl. % achievement)	Partially achieved. i) EEC expected to be operational by Oct 2012 and be financially sustainable. (ii) Wetlands completed to high standard, attracting migratory and domestic bird species. Wetland Center is now open to visitors.			

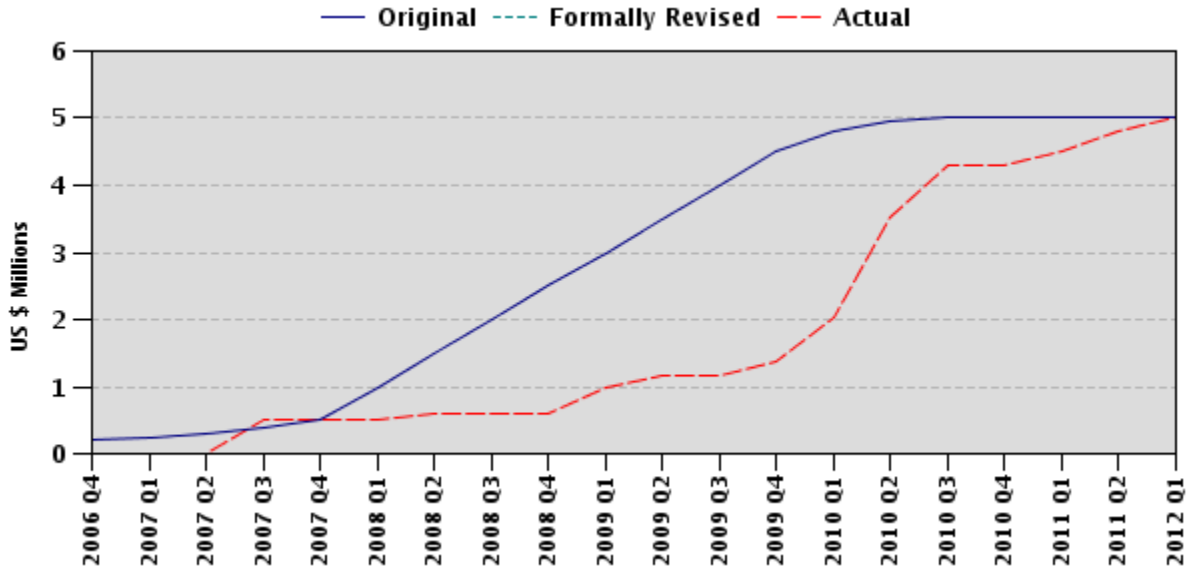
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	06/28/2007	Satisfactory	Satisfactory	0.50
2	06/29/2008	Satisfactory	Satisfactory	0.61
3	06/25/2009	Satisfactory	Satisfactory	1.35
4	06/23/2010	Satisfactory	Satisfactory	4.29
5	06/28/2011	Moderately Satisfactory	Moderately Satisfactory	4.80
6	12/26/2011	Moderately Satisfactory	Satisfactory	5.00

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Development Objectives and Design

1.1 Context at Appraisal

With rapid economic growth and deepening urbanization, Ningbo was facing two key environmental challenges at the time of appraisal: marine pollution arising from non-point sources of urban and agricultural run-off and loss of coastal wetlands. Ningbo, a port city located on China's east coast, in Zhejiang Province, is an economic power house. The Hangzhou Bay Bridge completed in 2008 (at 36 km is the world's longest bridge), links the city directly to Shanghai, further increasing foreign investment and the economic integration of the two cities. The East China Sea which borders Ningbo to the north, was the country's most polluted sea as reported in the 2004 *Environmental Quality Report on Near-Shore Ocean Areas of China*. Non-point pollution sources from urban and agricultural runoff, especially nitrogen compounds and phosphates, were the principal contaminants because limited means for controlling non-point source pollution were available.

Another challenge facing Ningbo was inappropriate wastewater treatment technology, further aggravating coastal pollution. The central government's initial focus, which Ningbo adopted, was on control of point sources, mostly discharges from cities and large industries. Treatment facilities were generally designed with advanced technologies but with insufficient consideration for financial and operational aspects. Consequently, treatment facilities were not being efficiently utilized due to budget constraints or lack of technical expertise.

At appraisal, land reclamation, aquaculture and environmental pollution arising from rapid population growth and economic development had led to the loss of 46 percent of Ningbo's coastal wetlands in just 40 years. China had the fourth largest wetland area in the world, at 650,000 km2, amounting to about 10 percent of the world's total wetlands, but over half of its coastal wetlands has been lost. Bordering the north of Hangzhou Bay, Ningbo Municipality has 788 km of coastline, including 1,000 km2 of inter-tidal mudflats and marshes. This area and the nearby estuary waters have essential ecological functions as an important natural habitat for fish species, benthos, migratory and indigenous water birds, and wetland vegetation which help maintain biodiversity. They are also important in controlling floods, removing pollutants and play an important economic role for the fishing community nearby. However, unregulated aquaculture harvesting for snails, crabs and fish in the coastal wetlands were eliminating the natural habitat for wetland flora and fauna. There was, therefore, an urgent need to protect the wetlands from further degradation and loss.

The Partnership Investment Fund for Pollution Reduction in Large Marine Ecosystems of East Asia (the Fund) was established by GEF and the Bank in 2005 to address the degradation of the region's coasts, estuaries and rivers, and consequent impacts on the region's large marine ecosystems. Its main objective is to reduce land-based pollution discharges impacting East Asian seas by leveraging investments in pollution reduction. As the first project under the Fund, this operation was originally conceived as part of an IBRD-financed loan, Ningbo Water and Environment Project (NWEP), approved in 2005 and closed in December 2010 (see ICR number 1747). NWEP was designed to expand the quality of water and wastewater services in an economically efficient and environmentally sustainable manner and included three components: Ningbo Water Supply (US$ 157.9 million); Cixi Wastewater (US$ 128 million) and Institutional Development (US$ 4.5 million). The GEF operation was intended to complement the Cixi component by introducing ecological enhancements. Cixi City, which is under the administrative authority of Ningbo Municipality, is located along the northern coastline, bordering Hangzhou Bay and has an area of 1,100 km2 and a population of one million.

The rationale for Bank support was that the project was consistent with its priority to reduce land-based pollution in East Asia and Pacific Region and its corporate strategy. Through the GEF grant, it could further enhance the outcomes of the NWEP investments by supporting Cixi's efforts to manage its coastal resources and adopt simple and ecologically friendly wastewater treatment methods that could be replicated and managed in a sustainable manner. The project design drew upon the Bank's considerable experience in working with China on environmental issues, including those related to wastewater treatment and wetland conservation as well as the implementation of other GEF projects. The Project supported the third pillar of the Country Partnership Strategy (CPS), "managing resource scarcity and environmental challenges." Specifically, it addressed the CPS objective to mitigate against the environmental impacts of human activity, promoting good corporate practices in environmental management and expanding urban wastewater treatment in a cost effective manner. Finally, it directly supported China's national policy on wetland conservation.

1.2 Original Global Development Objectives (GEO) and Key Indicators

The GEO was to mobilize international and domestic financial resources to demonstrate an innovative wastewater treatment technology – wetland treatment – to reduce land-based pollution to East Asia'a Large Marine Ecosystems (LME).

The PDOs were to reduce land-based pollution along the Cixi coast and the East China Sea, promote the replication of innovative, simple and effective wastewater treatment techniques, and encourage coastal zone conservation.

The key performance indicators agreed at appraisal were: (i) reduction in BOD and nutrients for two wastewater treatment plants, and nitrogen removal in Plot A1 of the Wetlands Center; (ii) number of visitors to the Wetland Center; (iii) number of domestic and international workshops in which Ningbo participates or organizes; (iv) increased productivity of tidal mudflats; and (v) increased abundance of birds and species variety.

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

Not applicable.

1.4 Main Beneficiaries

The main beneficiaries of the project were (a) the one million residents of Cixi City whose quality of life would improve due to better water quality and reduced pollution discharges to the environmentally sensitive Hangzhou Bay; (b) visitors to the Wetlands Center (including environmentalists, students and tourists from around the world) who would learn about the wildlife habitats to further conserve and protect such areas; and (c) the Wetlands Center which benefited from the technical assistance regarding wetland management.

1.5 Original Components

Component 1: Constructed Wetland (US$ 7.12 million, 42 percent of total): to provide tertiary treatment for the NWEP-financed 100,000 m3/d North Cixi wastewater treatment plant (WWTP), on 86 ha of reclaimed land, using vegetated submerged gravel bed and free surface water wetland systems.

Component 2: Establishment of a Wetlands Center (US$ 8.0 million, 48 percent of total): to (a) enhance the ecological functions of the area; (b) serve as an educational and research center for wetland

management; and (c) improve water quality in surrounding canals by natural wetland treatment. The Center was to be established on a 43.5 km2 area designated as wetlands by the Cixi City Government and comprising plots with different ecological functions including buffer zones, marsh lands and tidal mudflats (see annexed IBRD map 34441R1 for details). The project supported (i) construction of the Environmental Education Center (EEC) for wetland education and research, and (ii) enhancement and restoration of the natural wetland area.

Component 3: Design and Management Assistance (US$ 2.0 million, 12 percent): (a) engineering design of the Constructed Wetland and the Wetland Center; (b) management assistance for the Wetland Center; and (c) training and dissemination of project experience.

1.6 Revised Components

Not applicable.

1.7 Other significant changes

Key institutional changes led to inadequate counterpart funding and delays in implementation. First, implementation responsibility was transferred from the Cixi Construction Bureau to the Cixi Tourism Bureau in 2007, one year after project effectiveness because the Wetland Center was perceived as a tourism site, expected to attract over 100,000 visitors per year. It was thought the Tourism Bureau would be better suited to manage and promote the facility. Second, administration of the Cixi coast, including the wetlands, was transferred from Cixi Municipal Government to the Hangzhou Bay New Zone Administration (HBNZA), established by and reporting to Ningbo Municipal Government in 2009, prompting Cixi Municipality to terminate its counterpart financing. Negotiations with HBNZA continued for a year on the new administrative and financial arrangements, during which period, no counterpart funds were available. Therefore, the grant had to be extended by one year to accommodate these changes and delays.

Size of constructed wetland at the Northern WWTP was reduced. Project design consisted of 86 ha of constructed wetlands divided into two sub-plots. The Cixi Municipal Sewerage Company (CMSC) decided to reserve the 26 ha wetland site for future expansion of the Northerwn WWTP, thus limiting the area of the constructed wetland to 60 ha. Given the efficiency of the plant and effectiveness of the 60 ha wetland, there was no need for the additional wetland which can be built in the future, if the need arises.

Inter-tidal mudflats were not restored. Due to the lack of a clear government policy on the conservation and development of the inter-tidal mudflats, restoration of these inter-tidal mudflats and resettlement of fishermen – planned activities under the project – were not carried out, despite the Bank's efforts. The inaction failed to stem the expansion of unauthorized fish farms in the inter-tidal mudflats, making it impossible to monitor the productivity of bethnic fauna, a key performance indicator.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

The project was consistent with Chinese Government policies on restoration and conservation of wetlands, broader GEF objectives for reducing pollution discharges to East Asia's LME, and Bank policy on reducing land-based pollution through investments, technical assistance and capacity building activities.

The GEO and PDO appropriately addressed the two key environmental challenges Ningbo was facing: demonstrating cost effective and innovative techniques for wastewater treatment and conserving wetlands from rapid loss. In retrospect, the objective to reduce land based-pollution along the Cixi coastline was overly ambitious given the limited scope and financing of the project and the many sources of pollution, especially as defined by the KPIs.

The project's background analysis was comprehensive and covered most sources of land-based pollution that were contributing to degradation of the coastline and the East China Sea. It analyzed the inefficiencies and under-performance of the multitude of wastewater plants constructed using modern technology, and the relatively high cost of tertiary treatment to remove nitrogen and phosphorus. In response, demonstration of a lower cost option through natural wetland treatment was proposed as an alternative to costly and commonly used tertiary treatment facilities.

The analysis on wetlands was equally comprehensive and included a review of:

- national, provincial and municipal policies for promotion, conservation and restoration of wetland areas;
- sources of pollution to Hangzhou Bay and the East China Sea;
- Cixi City's land reclamation plans;
- wildlife habitats in the area (birds species and migration, benthos resources and vegetation, fish species, etc); and
- local communities that derive their livelihoods from the wetlands and mudflats.

Project design introduced an innovative and integrated approach that was little known at appraisal. In addition to demonstrating the design of a simpler, less costly technology for tertiary wastewater treatment, it also recognized the ecological and economic value of wetland conservation and management by integrating public education and research on wetlands with tourism. Highly appropriate and necessary international technical assistance was provided so that best practices in design and management of wetlands and ecological conservation could be assured. Facilities for education and research on wetlands, training and promotion of tourism were included to ensure the sustainability of the Center. Project design also adequately reflected the Bank's considerable experience in China on environmental issues, including those related to wastewater treatment, wetlands conservation, and experience from other GEF-financed projects in China and the region.

Nevertheless, project preparation overlooked key issues. First, a comprehensive and long-term trend analysis of the water quality for the Sanba Canal was not carried out which had a significant impact on the final design of the constructed wetlands in the Wetland Center and the targets for pollutant removal. This led to an overestimation of its treatment potential.

Second, although the municipal government demonstrated commitment to coastal conservation, project preparation did not sufficiently consider the role of key institutions responsible for the management of coastal wetlands such as the State Oceanic Administration, State Forestry Administration, Reclamation Bureau, Water Resources Bureau and Environment Bureau. Consequently, the participation of these stakeholder agencies was inadequate. Had they been more actively involved, the institutional arrangements for the project would have been more effective. The proposal to entrust the development and management of Component 2 of the project to the specially created private entity, Cixi Wetland Management Company (CWMC), appears to have been made without full consideration of the roles of these stakeholders and was not fully appropriate. The borrower also points out that ownership of the land was not established. Only 10 percent of the 43.5 km2 project area (plot A) was fully allocated to the CWMC, and as a result the project had limited influence in the remaining project areas. A higher level agency with authority over the whole area would have been preferable and more effective.

The project risk was assessed as 'modest', but did not adequately reflect all known risks. The risk of weak wetlands management was appropriately addressed through incorporation of international technical assistance for the Wetland Center to introduce best practices. Although the fragility of the 43 km2 area of the Wetland Center and land reclamation risks it was facing were well understood, risks associated with the *lack of clear provincial government policy* on land reclamation, especially in the adjacent Yue Yao county, were not taken into account. There was an implicit understanding that local authorities would no longer permit land reclamation, as the inter-tidal wetlands and mudflats were expected to be rehabilitated under the project, following removal and resettlement of fishermen. However, no formal agreement or covenanted action to protect the area as an ecological conservation zone was incorporated in the Project Agreements and land reclamation continued. The risk that the newly created CWMC would face challenges *in securing the support of institutional stakeholders* should have also been anticipated.

2.2 Implementation

Two key institutional changes resulted in delays of the establishment of the Wetland Center, requiring a one year extension of the Grant closing date. The CWMC was transferred from the Cixi Construction Bureau to the Cixi Tourism Bureau, but as the Tourism Bureau had not been involved in project preparation and lacked resources, it was not able to effectively oversee project implementation. Following the creation of the HBNZA, yet another decision was made to transfer the CWMC to HBNZA. Subsequently, the Cixi Municipal Government suspended its counterpart funding. The actual transfer did not materialize until early 2011, over a year after the decision was made.

Consequently, during this period of institutional uncertainty, **key staff for the Wetland Center were not recruited, trained and prepared to carry out their roles, resulting in implementation delays**. Until June 2010, the Center had only four core staff; however, by August 2010, 15 of the planned 24 staff were recruited. An additional 60 contractual personnel were hired for maintenance, security and visitor services. Although on-the-job training was provided by the Wetlands Management consultant on various aspects of ecology and management for the staff and managers, a formal training program initially planned was not implemented due to staffing uncertainties during the transition.

Furthermore, during this interim period, the CWMC was forced to defer all works: (a) the shell of the EEC building was completed in June 2010, but internal finishing works, decorations, utility connections and equipment were ongoing at Grant closure; (b) funds were not available to test the performance efficiency of the CTW in Plot A1 until the last year of the project; and (c) decisions could not be made to carry out the engineering studies to address sedimentation being caused by continued land reclamation (see next paragraph).

Midterm review (MTR) was carried out in conjunction with NWEP's MTR in February 2009. Its main recommendation was to adequately address the sedimentation of the mudflats through a study commissioned by Ninbgo Municipality completed in 2010. Although the Bank endorsed the study's recommendations (referred to as the 'hybrid option,' see section 2.5 for details) and the HBNZA appeared to agree in principle, insufficient progress to date has been made to carry them out.

Constructed wetland at the Northern WWTP was partially completed, with some delays in operation. The CTW built on the 60 ha sub-plot was completed in late 2010, but operations were delayed due to an accident that ruptured the treated water supply pipeline from the WWTP to the wetland. It took time to establish liability for the accident and to effect the necessary repairs required to operate the system. These repairs and vegetation planting were completed in the third quarter of 2011. Monitoring of the system began in October 2011 and early results demonstrate its efficiency in reducing nitrogen

and phosphorus, and testing is on-going for further confirmation of performance efficiency. The second CTW to be built on the 26 ha sub-plot was not built but there are plans to do so once the output of the WWTP reaches 100,000 m3 from its current operating capacity of 58 percent.

The inter tidal mudflats were not restored due to lack of clear government policy on land reclamation and conservation. Fish harvesting in this environmentally sensitive area has in fact increased and the number of fishermen increased significantly since appraisal, contrary to the plan to stop the practice. In fact, an increase in construction of fish ponds has been noted, with little or no enforcement for maintaining the area as a wildlife sanctuary and feeding ground, despite guidance of successive Bank missions to rehabilitate the area. A resettlement action plan was prepared early in the project to identify those harvesting fishery resources from the project area along with measures for restoring their livelihoods, but it was not carried out.

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

Design of the key performance indicators was not adequate for measuring project outcomes. Many of the outcomes identified can only be assessed well after project closure, especially those pertaining to pollution reduction and numbers of visitors to the Wetlands Center. The outcome indicators for pollution reduction were highly over-estimated due to lack of appropriate baseline data and high estimates of treatment capacity. However, as this was the first project of its type, setting appropriate targets was a challenge and provided valuable lessons (see Section 6). In contrast, outcome indicators for the ecological activities of the project were adequate.

Implementation performance monitoring was uneven. The WCMC was responsible for monitoring the ecological conservation aspects and the treatment wetlands in Plot 1A. Data on the ecological conservation aspects were regularly updated and effectively monitored. CWMC also benefitted from the support of the international consultants providing TA on wetland management aspects which contributed to high quality of the information collected. However, there were delays in data collection and testing of the treatment efficiency of the wetlands, for which final results were available only in September 2011, three months prior to closure. Although it then became apparent that the nitrogen reduction indicator could not be achieved, it was too late to revise the indicators. The CMSC was responsible for monitoring the constructed wetlands at the Northern WWTP. Monitoring and testing of the constructed wetlands were delayed until they began operating in October 2011 (see Section 2.2 for discussion on implementation delays) but are still on-going.

Utilization of monitoring and evaluation arrangements was uneven. The monitoring and evaluation system provided useful information for decision making in the ecological conservation area so that adjustments to site management could be made, such as tracking and culling of invasive plant species. In contrast, monitoring data for the CTW became available only at the end of the grant period so the monitoring and evaluation system did not provide adequate information to inform operational actions.

2.4 Safeguard and Fiduciary Compliance

Social Safeguards. Since the restoration of the mudflats in Plots A3 and A5 did not take place, those engaged in aquaculture were not displaced and their livelihoods were not affected by the project. Therefore, there was no need to implement the RAP as envisaged. Consultation activities envisaged in the RAP were, however, carried out and fishermen were offered compensation on a voluntary basis. Forty-eight fishmen, including 10 women have been employed at the Wetlands Center as wage laborers. Nevertheless, this compensation scheme has not had any impact on reducing fishing activity in the area.

Environmental Safeguards. This project was appropriately categorized as "B" and expected to have a significant net positive impact by improving ambient water quality in Cixi City and the Hangzhou Bay. The negative impacts were expected to be nonexistent or minimal, and were site specific, reversible and easily mitigated. The environmental assessment was carried out in accordance with the policies and procedures of China and the World Bank. The Environmental Management Plan (EMP) completed during project preparation was closely followed for supervision and monitoring of implementation.

Procurement. In general, procurement of works, goods and consultant services was carried out satisfactorily, in accordance with the legal covenants and the Bank procurement policy and procedural requirements. No waivers were needed; no misprocurement ever arose.

Financial Management. The project had adequate project financial management systems that provided, with reasonable assurance, accurate and timely information that the Grant is being used for the intended purposes. The project accounting and financial reporting are in line with the regulations issued by Ministry of Finance (MOF) and the requirements specified in the Grant Agreement. In addition, the withdrawal procedures and arrangements for flow of funds were appropriate throughout project implementation. The grant proceeds were disbursed to the project in a timely manner.

2.5 Post-completion Operation/Next Phase

The future of the natural wetlands and the mudflats along the Hangzhou Bay depends on the government's commitment to conserve the wetlands for future generations. A balanced approach is necessary to accommodate the multiple objectives of HBNZA's vision for economic development, promotion of tourism and ecological conservation. This requires urgent action by HBNZA and Ningbo Municipality *to address the increasing sedimentation and human activity in the Bay* through detailed design and implementation of the recommendations of the 'the hybrid option.' The study recommended the following combination of investment and regulatory measures: (a) construction of a new outer dyke with a gate to the sea; (b) converting the sedimented area into expanded freshwater wetlands and reservoirs; (c) maintaining a third area as brackish water wetlands; and (d) designating a 4,200 ha area as a protected ecological conservation zone comprising the 1,200 ha of the project site and an additional 3,000 ha of inter-tidal flats north of the project site to prevent encroachment. The Bank supported this option and recommended urgent action to commence detailed designs. Although the HBNZA has accepted the hybrid option in principle, the Water Resources Bureau reportedly wants a larger fresh water reservoir for the city's supply than what is now provided in the hybrid option. No progress is expected until a compromise is reached on the issue. The cost of implementing the interventions is estimated at US$40-50 million.

Hangzhou Bay New Zone, established by NMG as a hub for economic development, officially began operations in 2006, with a focus on industrial development (automotive, electronic information, chemical fiber, medical equipment, pharmaceutics, alternative energy and food stuffs etc), export processing and warehousing facilities. A large number of foreign investors have already established their operations there, including Volkswagen, generating significant economic benefits for the city.

The zone is managed by the HBNZA (and reports to the municipality) drawing its financing from the economic activities within it. Moreover, the HBNZA considers the Wetland Center an important asset in attracting investors which bodes well for the Center's future. HBNZA has allocated an annual operations and maintenance budget for the Wetlands Center to complement income from visitors and associated programs. The Wetland Center now has adequate staffing with the requisite skills and tools for managing the site. The ecological management plan and business development plans prepared under the project will provide appropriate guidance for several years to come. Support in the form of grants from the HBNZA will continue to be an important source of income for the next few years.

Overtime, the CTW are expected to significantly contribute to pollution reduction as they are an integral part of the treatment facility. At present, operating at 64 and 58 percent of their design capacity, the WWTPs, in the east and north respectively, are highly effective in treating wastewater. But as they reach their combined capacity of 150,000 m3 sewage per day, their treatment ability will decline. However, it is expected that the CTW will ensure that the discharge standard of Class 1A of the Chinese standard will continue to be met. The sewerage companies now have the capacity to monitor the effectiveness of the CTW and to maintain and operate them. Likewise, the treatment wetlands at the Wetlands Center are of world class standard, and will continue to be maintained with support from the HBNZA, which has incorporated them into their development plan. The CTW are being well maintained through a contractual agreement with a specialized company.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation Rating: Highly Satisfactory

The objectives of reducing land-based pollution to the Hangzhou Bay and the East China Sea, and demonstrating simple and effective wastewater treatment techniques were highly relevant at appraisal, as discussed in Section 2.1 above and remained relevant and consistent with the Country Partnership Strategy (CPS) through to completion. The project's objectives continue to be relevant to the new CPS which highlights (scheduled for Board discussion July 2012) "supporting greener growth," "demonstrating sustainable natural resource management approaches," and "demonstrating pollution control measures." The discharge treated through the CTW now exceeds China's Class 1-A standards, successfully demonstrating their effectiveness. The CTW are now attracting specialists from various parts of China interested in replicating the technology. The project successfully leveraged an additional US$12 million in counterpart financing to demonstrate innovative wetland wastewater treatment technology, meeting the GEO and a further US$6 million for the completion of the EEC building. Project design appropriately included the rehabilitation of 370 ha of freshwater wetlands that perform critical ecological functions as a habitat for wildlife and treatment of wastewater to reduce land based pollution to the East China Sea.

3.2 Achievement of Global Environment and Project Development Objectives
Rating: Moderately Satisfactory

With the US$ 5 million in GEF grant funding, the project successfully mobilized additional resources to demonstrate innovative wetland wastewater treatment technology, a key part of the GEO. At project closure, Cixi City Government and HBNZA had contributed US$18.76 million of their own resources, exceeding the appraisal expectations of US$11.51 million. The increased financing enhanced the quality of the ecological restoration works and facilities for the EEC.

The project successfully demonstrated low cost techniques for reducing land based pollution. Under component 2(b), 75 hectares of constructed wetlands were completed in 2009 for sub surface treatment of polluted water from the Sanba Canal before entering Hangzhou Bay and the East China Sea. Under Component 1, a 60 ha CTW of the planned 86 ha was built and with its treatment capacity of 90,000 m3, it is able to treat 90% of the discharge from the Northern WWTP, operating at maximum capacity. (The 26 ha parcel is still available for future CTW or expansion of the Northern WWTP). Preliminary results indicate that the unit cost of wastewater treatment using constructed wetlands is below 0.1 yuan/ton, much lower than the 0.40-0.50 yuan/ton of conventional tertiary treatment. The Cixi constructed wetlands at both sites are clearly an effective means of tertiary treatment as treated discharge now exceeds China's Class 1-A standards where WWTPs on their own meet Class 1B discharge standards. This has made Cixi a showcase for CTW and municipal leaders from around China have

visited the site to learn from this experience and are adopting the approach in new projects, i.e., GEF Huai River Basine Marine Pollution Reduction just approved on February 23, 2012. In short, at a time when CTW was a relatively unknown technology, the project demonstrated that it is a low cost and efficient option for treating wastewater. The fact that the absolute appraisal targets for tons of pollutants removed were not achieved is not of overriding concern, as these targets were unrealistic primarily because of a lack of prior experience in such programs.

The project has successfully restored world-class freshwater wetlands in Plot A in an area that had lost its natural wetlands, thereby successfully promoting coastal zone conservation and catalyzing sustainable development of large marine ecosystems, key aspects of the PDO and GEO. Wetlands were successfully established in a 330 ha area on reclaimed coastal land, creating a variety of wetland habitats supporting biodiversity of the area. Subzones were established for waterbird scrapes and roost areas, reed bed systems, deep water zones for ducks and Milu deer (an endangered species) conservation. This has ensured the establishment of a new wintering population center with excellent viewing facilities for endangered birds, such as the black-faced spoonbill (see Annexed pictures), which is one of the 50 rarest birds in the world and is attracting many international bird watchers. An existing experimental forestry plot was also remodeled into a wetland. This effort led to an increase in bird species by 243 percent, bird families by 77 percent and bird populations by 37 percent compared to the baseline period. It has also become a haven for globally endangered species such as the Milu deer. Recognizing this success, the Central Government declared the project area a National Wetlands Park in December 2011. This will ensure the future protection of the area. The restoration and preservation of the wetlands have also improved quality of life in Cixi City as the wetlands were the defining geographical feature of the city's historical and cultural development. It is now a showcase for wetland restoration both in China and globally, fulfilling a key objective of the GEF Fund.

The world class Environmental Education Center (EEC) currently being finalized will make the area a premier attraction for promoting conservation in East Asia. The structure of the EEC building was completed using Grant funds in 2010, a year later than anticipated due to HBNZ's desire for a more sophisticated design (which largely explains the 220 percent cost increase) and delays in obtaining domestic and World Bank approvals and awarding contracts. Interior finishing works (plumbing, electrical wiring, partitioning, ceilings and decorations) and a hi-tech exhibition facility are now being completed with HBNZA's own financing of US$6 million (RMB 40 million) and the facility is expected to be finalized during the third quarter of 2012. The 6,000m2 EEC includes exhibition space, public demonstration areas, restaurants, gift shops, educational facilities for students (laboratory and classrooms), office space and a 5D virtual experience of bird migration. Once completed, the EEC is expected to draw a large number of visitors given its experiential approach and use of highly innovative media for educating the public on birdlife. The Wetland Center has become a member of Wetland Link international, a network of wetland centers worldwide, providing a forum for sharing its experiences and promoting the EEC.

Without the project's interventions, the Cixi wetlands would have likely disappeared (see annexed before and after photos), putting at further risk endangered species whose habitats are ever shrinking; some such species, such as the Milu deer, could not have been reintroduced to their native habitat. The project area would not have been designated a National Wetlands Park by the central government without the dramatic restoration achieved. Water pollution and treatment costs would have been higher without the tertiary treatment provided by the wetlands. Finally, there would be fewer tourists and economic resources coming into the area. Some international investors, such as Volkswagen, might have also gone to other areas if it were not for the HBNZA's attention to environmental management.

Despite these successful outcomes, achievement of the PDO is rated moderately satisfactory. Specifically, the tidal mudflats were not restored and the continuing sedimentation and lack of policy on

land reclamation puts at risk the remarkable achievements of the project. Although CTW are functioning well, the higher efficiency of the WWTP financed under NWEP meant that pollution levels are lower than at appraisal, and therefore the planned targets for the CTW could not be reached. Finally, the delay in the operations of the EEC has meant that the education and research functions envisaged at appraisal could not be carried out during the life of the project.

3.3 Efficiency

Economic **Rating: Satisfactory**

Although no cost-benefit analysis was undertaken at appraisal, the PAD qualitatively identified some significant economic benefits associated with wetland conservation which remain valid: (a) maintaining the ecological health and aquaculture productivity of the coastline by restricting harvesting within the Wetland Center; b) habitat for birds, and facilitating bird watching to generate benefits for people who place value on healthy bird populations; and c) improving the quality of life in Cixi City by preserving wetland habitats.

The average annual income of the Wetlands Center from visitors is estimated at 5 million yuan per year based on the estimated cost of 50 yuan (20 yuan for admission and 30 yuan for on-site transportation) and the expected 100,000 visitors. The value of wetland protection is estimated at 95 million yuan per year based on the willingness to pay of Ningbo residents.

The annual economic value of environmental services for biodiversity conservation under the project amounts to 820,000 yuan applying an approach developed by Costanza[1] which estimates the value of wetlands in providing wildlife habitats at USD304/ha each year.

In addition, the fact that the 26 ha of CTW were not built is a savings for Ningbo as they would not have served any purpose given that the Class 1A standard is met without them.

Financial **Rating: Satisfactory**

The constructed wetlands offer a lower cost solution to wastewater treatment. According to preliminary estimates, the unit cost of wastewater treatment by constructed wetland is below 0.1 yuan/ton, much lower than the 0.40-0.50 yuan/ton of conventional tertiary treatment.

3.4 Justification of Overall Outcome Rating **Rating: Moderately Satisfactory**

While relevance is rated Highly Satisfactory and efficiency is rated satisfactory, achievement of GEO and overall outcome were rated Moderately Satisfactory as discussed in above Sections. While significant achievements were made in coastal wetland restoration, the shortcomings in the conservation of the tidal mudflats and the educational benefits of the EEC will be realized later than anticipated.

3.5 Overarching Themes, Other Outcomes and Impacts

[1] Costanza, R., dArge, R., et al., 1997. *The value of the world's ecosystem services and natural capital*. Nature 387 (6630), 253–260.

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

The project's social benefits include educating the public about the role of natural wetlands in providing wildlife habitats for bird species, ecology, and tourism, thereby making them aware of actions they need to take to protect the environment. Secondly, it also contributed to improving the overall liveability of Cixi for the population and through better ecology and wastewater treatment.

(b) Institutional Change/Strengthening

The Project effectively contributed to institutional strengthening, especially that of the CWMC and CMSC for the management of CTWs. The project financed a consortia of specialized firms for the engineering and design of constructed wastewater treatment wetlands, the ecological management of the wetlands center and options for addressing sedimentation. The consultants collaborated effectively together as well as with the CWMC leading to positive results.

The CWMC now has sufficient tools and capacity to manage the site. An Ecological Management Plan, using the internationally recognized Ramsar Convention guidelines and a sound business plan have been developed and are currently being applied. The staff has received sufficient classroom and on the job training.

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

A positive unintended outcome is the that the Wetland Center and EEC have become an icon for HBNZ. The authorities have prominently featured the ecological area in their masterplan, enabling them to attract potential investors who favor its unique eco-friendly qualities. This has the potential for promoting the economic development of Cixi City and Ningbo Municipality more broadly.

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

Not applicable.

4. Assessment of Risk to Development Outcome Rating: Substantial

The risk to development outcome is substantial due to the ongoing land reclamation, potentially leading to future loss of inter-tidal mudflats and impeding drainage of the CTW. Unless urgent action is taken, the wetlands could become an internal lake within a few years and lose their ecological function. Specific risks include:

(i) economic losses for fishing communities due to reduction of habitats for marine life;
(ii) loss of the tidal wetlands, fisheries, and the bird and wildlife habitat with consequent environmental impacts; and
(iii) increase in the risk of flooding of inland areas due to restricted drainage, including the CTW.

These risks can be mitigated by implementing the recommendations of a study carried out under the project and discussed in Section 2.5. Declaration of the 1,200 ha of the Wetlands Center (Plot 1A) as a National Wetland Park provides added incentives to implement the recommendations of the study but the designation needs to be expanded to include the full 4,200 km2 of the Wetland Center. HBNZA has committed to implementing the hybrid option (See Annex 5 for a copy of the commitment letter).

Another risk is the uncontrolled establishment of fishing ponds in the mud flats and lack of government action to stop land reclamation, affecting the ability of the area to become a wildlife sanctuary due to excess human activity and reduced natural environment. Removal and resettlement

of fishermen, and effective enforcement measures have not been implemented by CWMC, who must balance this economic activity against ecological function of the area.

The risk that the EEC will not be completed as planned is low. The HBNZA views the EEC as a major asset that distinguishes it from other development zones and which enables it to attract investors concerned with environmental sustainability. It has already allocated the funds for completion; contractors have been hired and completion is well underway. Further demonstrating its commitment, the HBNZA has also allocated funds for the management of the Wetlands Center. A well developed business plan supported under the project will enable it to work towards financial sustainability.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

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

The Bank seized the opportunity to design the first operation financed under the Partnership Investment Fund for LME, one which was well aligned with the Bank's CPS and Provincial and Municipal government strategies.

Nevertheless, **overall, Bank performance to ensure quality at entry is rated moderately satisfactory, due to shortcomings in project design, assessment of risks, monitoring and evaluation and implementation arrangements**. These shortcomings were in part due to the speed with which the project was prepared – nine months from concept review to Board approval. The Bank team possessed the appropriate skill mix for a project of this type and included a widely regarded international wetlands expert. The Bank adequately identified the right environmental challenges Ningbo was facing and introduced innovative approaches for addressing them in a manner consistent with its fiduciary role. However, the PDO and GEO were ambitious given the relative small size of the project and the wide sources of pollution. The Bank should have also better anticipated risks and designed corresponding mitigation measures.

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

The Bank supervised the project twice a year covering project implementation, safeguards, procurement and financial management aspects. The Bank proactively (and repeatedly) raised concerns and urged action on the need to:

a) expedite completion and operation of the constructed wetlands;
b) restore counterpart funding during the period of institutional transition to avoid implementation delays;
c) carry out early testing of the performance of the CTW;
d) address the sedimentation issue in the Wetlands Center; and
e) designate the 4,200 ha as a protected ecological conservation area.

However, the supervision missions were normally brief as they were carried out in conjunction with supervision of the much larger NWEP operation and due to the very limited GEF supervision budgets. Much of the communication was with the NWEP PMO, although the bulk of the work was done by CWMC, limiting the level of direct interaction that could take place. As the Bank did not have in-house expertise in wetland management, it had to hire consultants to visit the site. Bank missions did not always include specialists on constructed wetlands and conservation, in part due to the limited supervision budget (approximately US$ 40,000 per year as per GEF availability).

Safeguards Compliance. Environmental and social safeguards specialists based in the Beijing office supervised implementation of all safeguards issues specified in the Grant Agreements. The team carried out adequate field visits to review progress and ensured timely submission of the external monitors' report on safeguard implementation. There were no complaints on environmental and social safeguards issues during implementation.

Fiduciary Compliance. Procurement and financial management specialists based in the Beijing office supervised implementation of all fiduciary aspects of the project specified in the legal agreements and carried out adequate field visits to review physical progress. No particular issues were observed.

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

Although safeguards and fiduciary compliance were rated satisfactory, overall Bank performance was moderately satisfactory due to shortcomings in quality at entry and weaknesses in technical supervision and communications.

5.2 Borrower Performance

(a) **Government Performance** **Rating: Moderately Satisfactory**

The NMG and the Cixi City Government were fully supportive of the larger national and global environmental impacts on rivers and seas from land-based pollution, and ecological conservation of a fast diminishing natural resource. However, they were unable to take action to restore the mud flats, stop fishing and construction of new fishing ponds in environmentally sensitive areas and to provide the counterpart funds during the institutional transition period.

HBNZA, which reports to NMG, took over responsibility of the Cixi wetlands during the last year of project implementation, as it was consolidating its many functions. The HBNZA has shown enthusiasm for the wetlands, successfully appealing to the central government to obtain National Wetlands Park status. The development plan for the zone highlights the wetlands as a conservation zone and thereby reflects the HBNZA's commitment to preserving the wetlands with all its wildlife. As already mentioned, they have allocated operating budget for the WCMC so that it can continue its function as a guardian of the wetlands and educator of the public. Finally, the HBNZA has allocated over US$6 million for finishing works of the EEC, hiring one of the best national firms for the 5D exhibition hall. The EEC is considered an integral part of the Wetlands Center where visitors can come into direct contact with wildlife.

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

The overall performance of CMSC was moderately satisfactory due to implementation delays for reasons beyond its control. Although the structure for the CTW was completed, it could not be operated due to an accidental rupture of the delivery pipeline caused by another utility company. This led to a dispute over liability that dragged on for nearly a year. As result, vegetation could not be planted or the performance efficiency tested until October 2011, two months prior to Grant closure. Nevertheless, the CMSC is now managing the CTW well under a contractual agreement with a specialized company. The CMSC complied with all Bank fiduciary requirements.

The overall performance of CWMC was moderately satisfactory due to implementation delays, some of which were beyond its control. CWMC has effectively improved the facilities and publicity around the wetlands which has enabled it to increase the number of visitors. However, it was less effective in operating the CTW as it delayed testing of the system for one year, fearing the high cost of

pumping water. When testing was finally completed in September 2011, it was discovered that there was no more time to amend the performance indicators to reflect lower pollution loads. Furthermore, CWMC has not yet taken action to stop fishing and construction of fish ponds and encroachment on the sedimented land. It took no action to restore the tidal mudflats. Moving forward, CWMC would have to strike a balance between its desire for tourism development with the primary vocation of the center to preserve the ecological function of the area. The CWMC has complied well with all Bank fiduciary and safeguards requirements as well as all the covenants, albeit with some delay.

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

The overall performance of the Borrower is rated moderately satisfactory because the original components were not fully completed even with the 12 month extension of the Grant closing date. Achievement of outcomes was not fully realized, but obtaining national wetland status for the Wetlands Center was a creditable achievement.

6. Lessons Learned

It is possible to successfully restore lost wetlands. At the time of appraisal, the wetlands in the project area had all but disappeared. With the introduction of appropriate ecological measures, nature is capable of reviving itself within a relatively short period even in a highly developed urban area. The transformation of the area is dramatic and this can replicated throughout East Asia where wetlands are disappearing.

Constructed wetlands can be used for enhanced treatment of wastewater. The NWEP and GEF projects together demonstrated the feasibility of nitrogen removal using the simple and effective technique of wetlands. This technique enables wastewater companies to meet the higher discharge standard of Class 1A at lower cost, which is particularly opportune in a climate where wastewater tariffs are not revised regularly, and where higher wastewater discharge standards have been mandated by the central government.

The project has also demonstrated the importance of appropriate design for constructed wetlands. The prevailing thinking about "wetlands" was large water surfaces with some plants along the edges, that maybe aesthetically pleasing but have minimal treatment functions. The project illustrated that properly designed wetlands comprised of shallow water depth, adequate retention periods, through either surface flow or subsurface flow systems, and most importantly the correct vegetation, can absorb pollutants.

Thorough institutional analysis is required for the design of effective implementation arrangements. A key shortcoming of the project was inadequate assessment of key stakeholders in coastal zone management. Had the institutional environment been more thoroughly assessed, many of the delays and implementation challenges encountered may have been mitigated. A thorough stakeholders' analysis would have revealed the competing interests of different institutions and their positions with regards to land reclamation. This would have enabled the Bank to recognize the importance of the provincial government having an approved policy on land reclamation to govern issues around the tidal mudflats.

A results framework with measurable targets and well-defined baselines is critical to monitor project progress. The lack of appropriate baseline data combined with poorly designed performance indicators made it difficult to effectively capture project achievements. In retrospect, the intermediate outcome indicator of meeting Class 1A standard was a better measure for project outcomes than tons of pollutants removed. Intervening factors such as the NWEP-financed WWTP were also not considered in setting the targets.

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

(a) Borrower/implementing agencies

The Grant Recipient has raised some pertinent issues in the Recipient's ICR, regarding indicators and communication of Bank Aide Memoires:

(i) The Grant Recipient states that the project outcome indicators were not adequately defined with quantitative targets, and did not include output indicators. The task team concurs as discussed throughout this ICR.

(ii) The Grant Recipient has complained about delayed responses from the Bank, especially in the receipt of mission Aide Memoires. As a routine practice, draft Aide Memoires are supplied to the PMO within a day or two after the mission. The task team acknowledges that in some cases, there may have been delays in the transmission of the management letter with finalized Aide Memoires. Translation of the Aide Memoire by the Provincial Project Management Office also required time before these can be transmitted to the implementing entities.

(iii) The Recipient states that members of the task team did not have enough technical knowledge about wetlands. It is correct that the Bank does not have in-house expertise. However, this was compensated by a world renowned expert hired as a Bank consultant to advise and guide the Recipient. Records indicate, however, that some of the advice provided by this expert was not accepted by the local design institute engaged by the Recipient. Despite these shortcomings, the joint efforts of the Bank and the Recipient have helped create world class wetlands replete with flora, fauna, rare and migratory bird species, and the rare Milu deer.

(b) Cofinanciers

Not Applicable

(c) Other partners and stakeholders

Not Applicable.

Annex 1. Project Costs and Financing

CHINA: GEF Ningbo Water and Environment Project

(a) **Detailed Project Cost by Component (in USD Million)**

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
1. NORTH WWTP CONSTRUCTED WETLAND			
Civil works for wetland construction	7.12	7.12	100.00%
Sub-total	***7.12***	***7.12***	100.00%
2. CIXI WETLAND CENTER			
Ecological Restoration Works	3.77	6.12	162.33%
Environmental Education and Research Center	3.64	8.01	220.05%
Resettlement	0.59	0.51	86.44%
Sub-total	***8.00***	***14.64***	183.00%
3. DESIGN AND MANAGEMENT ASSISTANCE			
Wetland Center Management Assistance	1.30	1.30	100.00%
Ecological Engineering and EEC Design	0.50	0.50	100.00%
Training and Experience Sharing	0.20	0.20	100.00%
Sub-total	***2.00***	***2.00***	***100.00%***
Total Project Costs	**17.12**	**23.76**	**138.79%**

(b) **Financing**

Source of Funds	Type of Co financing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Global Environment Facility		5.00	5.00	100.00%
Ningbo Municipal Government		0.61	0.00	0.00%
Cixi City Government and Hangzhou Bay New Zone		5.39	12.64	234.51%
Cixi Municipal Sewerage Company		6.12	6.12	100.00%
Total		**17.12**	**23.76**	**138.79%**

Annex 2. Outputs by Component

CHINA: GEF Ningbo Water and Environment Project

Overview of Project Outputs

Project Outputs	Plan at Appraisal	Actual Completed
Component 1: Constructed wetland at the northern wastewater treatment plant to improve water quality	100,000 m3/d, 86 hectares divided into two subplots of 60 and 26 ha	90,000 m3/d at the 60 hectares subplot constructed. Treatment efficiency is now at Class 1A standard. Construction of the CTW on the 26 ha subplot has been deferred to a future when the WWTP reaches maximum capacity and its treatment efficiency somewhat declines.
Component 2 (a) Construction of visitor center (EEC)	One 6,000 m2 building.	Building 6,000 m2 completed and finishing works are ongoing. Expected to be operational in October 2012.
Component 2 (b) Enhancement and restoration of Wetland Center's natural wetland area. Treatment wetlands in Plot A1, to be ecologically enhanced and establish fluctuating levels of fresh water wildlife, bird ponds and surroundings or high and low tide habitat for migratory birds. And also pilot ecological engineering measures for removing non-point source pollutants from the Sanba River. Tidal mudflats restored (Plot A3 and A5)	330 ha A3 (1.8km2) A5	330 ha of wetlands restored. A constructed treatment wetland of 75 ha built and currently operating, providing over Class 1A treatment standard. 255 ha are retained as wildlife wetlands, treating the discharge from the CTW before it flows into the sea. Mudflats not restored due to lack of policy on land reclamation.
Component 3 Design and Management Assistance	(i) Engineering design of constructed wetland and Wetland Center (ii) Management Assistance of for Wetland Center	All tasks completed. (a) Final Design of Constructed Wetlands (b) Final Design of Environmental Center (c) Final Design of Enhanced Natural Wetland (d)Bidding document preparation (e) Construction supervision. All tasks completed. (a) Wetland Center Ecological Plan (b) Business Plan (c) Guidance in Ecological

	(iii)Training and dissemination of project experience	Restoration Design and Operation and (d) Support operations of Wetland Center.

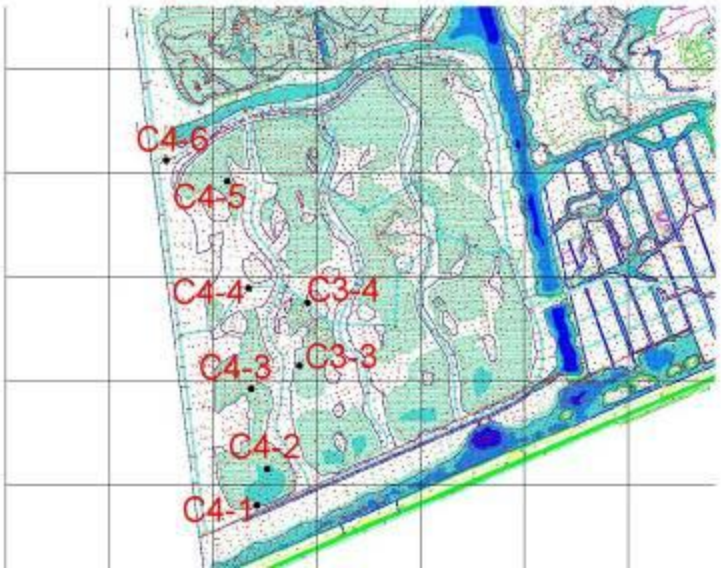
Constructed Wetland (CW) at the Northern WWTP. A 60 ha CW was designed by the Center of Environmental Engineering Research and Design of the South China Institute of Environmental Sciences (SCIES) (Guangzhou) with a maximum treatment capacity of 90,000 m3/day. The design incorporated both sub-surface flow wetland technology (horizontal and vertical beds) and a large surface flow system of open and vegetated water. Construction of the site began in early 2009 and infrastructure was completed in June 2010. Operation of the wetland was delayed by an accident that ruptured the pipe from the WWTP, which was repaired in mid-2011. By grant closure, vegetation had been planted, and the wetland was operating, achieving Class 1A discharge standard by March 2012.

The original plan was for the GEF grant to finance constructed wetlands at both wastewater treatment plants in Cixi. However, due to the delay in the approval of the GEF grant, only one wetland was supported. The grant provided US$1.0 million towards construction of the wetland for the northern WWTP; the wetland for the eastern wastewater treatment plant was financed under loan 4770 for NWEP.

Table 1: Overall WWTP and Constructed wetland discharge reductions in 2011 in Tonnes

	NSTP	ESTP	ECW	NCW (annualised)	Total	Overall target	% of target	Total for CW	target for CW	% of target
Parameter										
BOD reduction tonne/yr	866	697	20.58		1583.22	10000	15.83%	20.58	300	6.86%
TN reduction tonne/yr	146	63	20.35	10.365	240.02	2000	12.00%	30.715	400	7.68%
TP reduction tonne/yr	36	12.3	2.13	1.89	52.05	200	26.03%	4.02	25	16.08 %

Cixi Treatment Wetland (CTW) in Plot A1 of the Wetland Center. The earlier plan to construct a 330 ha of treatment wetlands was modified during detailed design to include a 75 ha treatment wetland (see diagram below) and 255 ha of a series of wildlife wetlands, completed in 2009. The tidal mudflats (Area A1) including the 75 ha constructed wetland is one of the largest such systems in the world for wetland treatment, wildlife habitat and recreation/tourism. Testing of the wetlands started in February 2011 and was completed in September 2011 by pumping about 40,000 m3/d of water from the Sanba River. Calculations based on this test confirmed that nitrogen removal efficiency amounted to about 10 tons/year- only about 6% of the projected target. However, this was largely due to the much lower nitrogen levels in the Sanba River thanks to the effectiveness of the NWEP financed WWTP which made the (Total Nitrogen) TN removal target unachievable.



Plan of the Treatment Wetlands in the Wetlands Center

Environmental Education Center (EEC) at the Wetland Center. The actual building for the Wetland EEC, with an area of 6,000 m2, was completed in June 2010. It is one of largest in China and will be used for education, dissemination of information on wetlands and wildlife habitat. The EEC had not been put to use by grant closure, because the internal decorations, fittings and equipment were not completed due to shortage of funds arising from the change of administrations.

Restoration and enhancement of the tidal wetlands (Plots A3 and A5) were not undertaken. Plot 1A, however was fully restored as wetlands where an increase in the migratory and resident bird species has been documented. A total of 213 species of birds (from **44** Families) have been recorded within all habitat zones at the Hangzhou Bay Wetland Centre (as of June 2011). Of these, a total of 179 species of birds have been recorded within the man-made, freshwater wetlands (Zone A) created at the Hangzhou Bay Wetland Centre. Bird occurrence is both seasonal, and dependent on the habitats available, and a break-down of the seasonal occurrence, and habitat preferences for species recorded in Zone A is provided in Table 1.

Table 1: Occurrence and distribution of birds in Plot A at the Wetland Center

	Occurrence at Hangzhou Bay Wetland Centre					**Habitat Preference**	
	Resident	Summer Visitor	Winter Visitor	Passage Migrant	Vagrant	Wetland	Non-Wetland
	Breeding Species		Non-breeding Visitors				
Number	40	24	57	56	2	76	103
%	22%	13%	32%	31%	1%	43%	57%

Resident species (i.e., those that stay at Hangzhou Bay Wetland Centre all year round and may breed there during the Spring/Summer months) account for 40 species (22% of total) recorded in

Zone A. During the summer months these may be augmented by the arrival of **Summer Visitors** (i.e., species that spent the winter months further south, and have returned to East China to breed, and may breed at Cixi). 24 species of Summer Visitors (13% of species recorded) have been recorded to date. Thus the number of bird species that could potentially breed at the Hangzhou Bay Wetland Centre currently stands at 64 species, or 35% of all birds recorded.

Other species recorded are either **Passage Migrants** (birds that stop-over for short periods to feed and rest at Hangzhou Bay Wetland Centre during their southward and northward migrations to-and-from the northern breeding areas), or **Winter Visitors** (species that breed to the north, but may not migrate any further south than Hangzhou Bay, and may spend the entire Winter period feeding and resting there). Passage Migrants usually pass through Hangzhou Bay during two migration periods, Autumn Migration (between August and October), when birds are flying south; and, Spring Migration (from March to May), when birds return north to breed. Passage Migrants and Winter Visitors make up 56 and 57 species respectively, or 31% and 32% of the birds recorded at the site.

Bird species of conservation significance

The freshwater wetlands in the Hangzhou Bay Wetland Centre support at least six rare and threatened bird species. Tables **2** and **3** show the numbers and species of bird that have been classified by IUCN – The World Conservation Union, as endangered, and, recorded at the Hangzhou Bay Wetland Centre. The IUCN Global Conservation Classes are:

- Critically Endangered (CR): The species is in imminent risk of extinction in the wild
- Endangered (EN): The species is facing an extremely high risk of extinction in the wild
- Vulnerable (VU): The species is facing a high risk of extinction in the wild
- Near-threatened (NT): The species does not meet any of the criteria that would categorise it as risking extinction, but it is likely to do so in the future
- Least Concern (LC): There are no current identifiable risks to the species.

Table 2: Rare and Threatened Bird recorded within Freshwater Wetlands (Zone A) at the HBWC

Vernacular Name	**Species**	**IUCN Conservation Status**
Falcated Duck	*Anas falcata*	NT
Reed Parrotbill	*Paradoxornis heudei*	NT
Baer's Pochard	*Aythya baeri*	VU
Baikal Teal	*Anas formosa*	VU
Grey-sided Thrush	*Turdus feae*	VU
Yellow-breasted Bunting	*Emberiza aureola*	VU

Table 3: Rare and Threatened Bird recorded within Inter-tidal Wetlands (Zone B) at the HBWC

Vernacular Name	Species	IUCN Conservation Status
Falcated Duck	*Anas falcata*	NT
Black-tailed Godwit	*Limosa limosa*	NT
Eurasian Curlew	*Numenius arquata*	NT
Far Eastern Curlew	*Numenius madagascariensis*	NT
Reed Parrotbill	*Paradoxornis heudei*	NT
Baikal Teal	*Anas formosa*	VU
Saunder's Gull	*Larus saundersi*	VU
Relict Gull	*Larus relictus*	VU
Dalmatian Pelican	*Pelecanus crispus*	VU
Yellow-breasted Bunting	*Emberiza aureola*	VU
Black-faced Spoonbill	*Platalea minor*	EN
Siberian Crane	*Grus leucogeranus*	CR

Restricted range and endemic species found in the Wetlands Center

Baer's Pochard (*Aythya baeri*) is an East Asian endemic, that breeds only in North East China and southern Russia and winters in East China, south of the Changjiang River. The population has been in serious decline in recent decades and coastal wetlands in East China are probably the main wintering area. The species was recorded in the newly created waterbird scrapes within Zone A during December 2010 and January 2011.

Reed Parrotbill (*Paradoxornis heudei*) is a resident reed-bed specialist, restricted to East China (Jiangsu, Shanghai, Zhejiang, and perhaps Hebei). It is a common resident of the reed-beds in the Cixi coastal zone.

Other East Asian endemic breeding species recorded at Cixi during the October migration (in the shelterbelt woodlands in Zone A) include:

a) Blue and White Flycatcher (*Cyanoptila cyanomelana*) which has a restricted breeding range in East Asia.
b) Chinese Flycatcher (*Ficedula elisae*), with a restricted breeding range in Hebei and Shaanxi Provinces.
c) Yellow-rumped Flycatcher (*Ficedula zanthopygia*) with a breeding range restricted to E and NE China, Korean peninsula and far-eastern Russia.
d) Grey-streaked Flycatcher (*Muscicapa griseisticta*) an East Asian breeding endemic.
e) White-throated Rock-Thrush (*Monticola gularis*) which breeds only in NE China, and from Lake Baikal to far-eastern Russia and Korea.
f) Grey-sided Thrush (*Turdus feae*), a scarce NE Chinese species, breeding only in Hebei and Beijing.
g) Grey-backed Thrush (*Turdus hortulorum*), endemic to continental East Asia.
h) Eastern-crowned Warbler (*Phylloscopus coronatus*) breeds only from Central and NE China, to Amurland and Ussuriland, Japan and Korea.

i) Sakhalin Leaf Warbler (*Phylloscopus borealoides*), several individuals recorded in October 2010 were tentatively identified as this species. Breeds only on Sakhalin Island, Kunashir, Hokkaido and mountains of central and N Honshu, Japan.
j) Pale-legged Leaf Warbler (*Phylloscopus tenellipes*), breeds only in continental East Asia from Amur River to NE China and N Korea.
k) Chinese Grey Shrike (*Lanius sphenocercus*), restricted to East Asia, and primarily NE China, Russian far-east and N. Korea, winters to coastal East China.

Technical Assistance Under the Project

Summary of Technical Assistance supported under the project	
Topic	Outputs
Surveys and conservation assessments in Wetland Center	Surveys of bird species and other wildlife (2008, 2009, 2010)
Ecological Management Plan	Technical considerations for introducing milu deer (2009) Creation and management of high tide roost sites (2010) Subplans for constructed wetlands, freshwater wetlands, natural inter-tidal wetlands, environmental education and interpretation (2010 and revised in 2011)
Business Plan Development	Business plan strategy (2009) Framework for business development plan (2009) National Eco-Tourism Agencies market analysis of the operations plan (2009) Business Plan (2010)
Ecological Restoration Design and Operation	Technical reviews of the concept design of Cixi Wetlands Center (2007-2009) Reviews and advisory services in the design of the EEC building (green building design, layout options, interior design etc) (2009) Detailed engineering design for CTWs (2009) Study to develop options for addressing coastal sedimentation issues and sustainability of the project ("Hybrid option report")
Operations Support to the Wetlands Center	Assessment and recommendations for managing invasive plants (2008) Manual for Environmental Education of teachers (2010) Testing and commissioning of the CTW (2010-2011) Quarterly Monitoring Reports (2008 to 2011) Assessment of fish resources and strategies for restoration (2011)
Constructed Wetlands	Detailed design of CTW at the Wetlands Center Detailed design of CTW for the northern wastewater treatment plant

Annex 3: Bank Lending and Implementation Support/Supervision Processes

CHINA: GEF Ningbo Water and Environment Project

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Greg J. Browder (TTL)	Lead Water and Sanitation Specialist	LCSUW	Water Resources
Lixin Gu	Senior Infrastructure Specialist	EASIN	Infrastructure
Jiang Ru	Environmental Specialist	EASER	Environment
Zhefu Liu	Senior Social Development Specialist	EASCS	Social Safeguards
Alex Horne	Environmental Engineer	Consultant	Wetland design
Zhentu Liu	Senior Procurement Specialist	EAPPR	Procurement
Peishen Wang	Senior Environmental Specialist	EAPCO	Environment
Yi Dong	Sr Financial Management Specialist	EAPFM	Fin. Management
Margaret Png	Lawyer	LEGEA	Legal aspects
Supervision/ICR			
Greg J. Browder (TTL)	Lead Water and Sanitation Specialist	LCSUW	Water Resources
Shenhua Wang (TTL)	Senior Financial Specialist	EASIN	Infrastructure
Meskerem Brhane (TTL)	Senior Urban Specialist	EASIN	Urban Planning
Lixin Gu	Senior Infrastructure Specialist	EASIN	Infrastructure
Yi Dong	Sr Financial Management Specialist	EAPFM	Fin. Management
Margaret Png	Legal Counsel	LEGES	Legal Documents
Daniel R. Gibson	Lead Social Development Specialist	ECSOQ	Social Safeguards
Ji You	Urban Specialist	EASCS	Urban Planning
Peishing Wang	Environmental Specialist	EASCS	Engineering
Zhefu Liu	Environmental Specialist	EASCS	Envir. Safeguards
Liu Xujun	Procurement Specialist	EAPPR	Procurement
Aihua Huang	Finance Assistant	EASCS	Financial Analysis
Yuan Wang	Procurement Specialist	EAPPR	Procurement
Zhuo Yu	Finance Analyst	CTRLN	Financial Analysis
Chunyan Li	Finance Assistant	CTRLN	Financial Analysis
Jian Xie	Sr. Environmental Specialist	EASER	Economic Analysis
Fang Zhang	Financial Management Analyst	EAPFM	Fin. Management
Jiang Ru	Sr. Environmental Specialist	EASER	Safeguards Policies

(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	1.79	22.7
FY06	21.70	119.1
Total:		**141.8**
Supervision/ICR		
FY07	6.84	37.2
FY08	5.77	69.9
FY09	7.18	36.6
FY10	4.60	36.8
FY11	9.43	48.8
FY12	3.0	20.2
Total:		**249.5**

Annex 4: Before and after pictures of the Hangzhou Bay Wetlands

Area prior to restoration

Area after restoration

Restored area with Honghzou Bridge in the background

The Environment Education Center

The area is now a habitat for rare birds


http://www.wwfchina.org/birdgallery/


http://www.wwfchina.org/birdgallery/
http://www.wwfchina.org/bbs/guanmao.htm

Annex 5: Commitment Letter

宁波杭州湾新区开发建设管理委员会

关于对全球环境基金宁波水环境项目——湿地保护的承诺

尊敬的 Lundell 先生，

我写这封信是要表达宁波市政府对世界银行帮助恢复杭州湾湿地的衷心感谢。2011 年 12 月关帐的全球环境基金宁波水环境项目项下的 GEF 赠款对湿地保护起到了重要作用。杭州湾新区管委会(HBNZA)领导层承诺确保继续对这些湿地进行保护。

HBNZA 非常关注由于湿地区域的逐步淤积正在危及湿地恢复，HBNZA 正在采取行动减缓这些风险。首先，通过我们的努力最近项目区的部分区域已经申报成为国家湿地公园，这一行动将有利于该区域的湿地保护。第二，HBNZA 在世行的支持下已经完成了一项对各种补救行动方案进行评价的研究，在此基础上具体的措施是指已经确定的“混合方案”。预期“混合方案”的实施将减缓对保护区域的负面影响。

HBNZA 承诺湿地中心大堤外 40 平方公里自然滩涂的围垦及土地利用方案将按照混合方案的框架实施，该项目力争于 2013 年开工建设。

谢谢您对宁波市和杭州湾新区的支持并期待继续合作。

宁波杭州湾新区管委会主任

2012 年 5 月 28 日

Letter of Commitment

For the GEF Ningbo Water and Environment Management Project -- Wet land protection

Dear Mr. Lundell,

I am hereby to express Ningbo Government's cordial acknowledgement for World Bank to help restore the Hangzhou Bay wetlands. The GEF grant under the GEF-Ningbo Water and Environment Management Project closed in Dec. 2011 and plays a critical role in protection of the wetlands. The management of Hangzhou Bay New Zone Administration (HBNZA) promises the continual protection of these wetlands.

HBNZA pays much attention to the situation that gradual silting in the wetland is compromising the restoration of the wetland, and HBNZA is taking actions to mitigate such risks. First, under our efforts, some of the project area has recently been approved as a National Wet Land Park, which will facilitate wetland protection in this area. And second, with the support of the World Bank, HBNZA has finished an assessment of all remediation plans. Based on these, the specific measures described in the so called "Hybrid Option," are expected to diminish the negative effects on the protected area after the implementation.

HBNZA promises that the reclamation and land utilization plans for the 40 km^2 natural mudflat outside the area of the wetland center will be implemented in accordance with the framework of the "Hybrid Option." And we will make efforts to begin this program in 2013.

Thanks for your support to Ningbo and Hangzhou Bay New Zone, and we look forward to further cooperation with you.

Development, Building and Management Committee
of Hangzhou Bay New Zone, Ningbo

May 28, 2012

Annex 6: Summary of Borrower's ICR and/or Comments on Draft ICR

CHINA: GEF Ningbo Water and Environment Project

1. Project Context, Development Objectives and Project Design

Coastal wetlands at Hangzhou Bay have been classified as one of the eight nationally significant wetland areas under the National Engineering Plan for Wetland Conservation (2004-2030). It is foreseeable that this GEF project will become an integral part of China's efforts in reducing land-based pollution to East Asia's LMEs and in restoring the country's important wetland areas.

This GEF project is an environmental enhancement to the Cixi component of NWEP. Cixi City covers an area of 1,100 km2, with a population of around 1 million, and is located on the northern coastline of Ningbo Municipality bordering Hangzhou Bay. The proposed GEF project is designed to demonstrate simple and effective wastewater treatment methods – constructed wetlands – and sustainable wetland management approaches.

The rapid economic and population growth in Ningbo, as well as many other coastal cities in China, is increasing pollution from cities into neighboring seas. In addition, non-point source pollution from urban and agricultural run-off is a large and growing problem, and a significant contributor to marine pollution in China. Consequently, the coastline of Ningbo and its neighboring East China Sea are severely polluted. As reported in the 2004 Environmental Quality Report on Near-Shore Ocean Areas of China, the East China Sea is the worst polluted sea in China, and its major pollutants are nitrogen compounds and phosphates. More details are provided in the main text of this ICR and the Project Appraisal Document (PAD).

Development Objectives. The Global Environmental Objective (GEO) and Project Development Objective (PDO) are described in the main ICR.

Original Components. A full description of the project and details of the components are provided in the main text of the ICR and the Project Appraisal Document (PAD).

Revised components. There were no major changes to the project components, and no formal revision of the project document. However a number of significant changes in strategy were noted through the various supervision missions and related Aide Memoires.

Other significant changes. A number of significant changes occurred in the project as described in the main text of the Bank ICR, and are summarized below.

(a) **Size and Scope of Cixi Wetland Center**. The originally planned 330 ha wetlands was reduced area of 75 ha, as a constructed treatment wetland (CTW) within Plot A1 and focus the balance of the site on wildlife and visitor wetlands. This was done in agreement with the Bank in October 2007. It was agreed that with the treatment wetland focused in a reduced area the vegetation layout would be adjusted to increase the area of dense emergent vegetation and reduce the open water areas. *However this was not documented in the Aide Memoire and subsequently was not followed by the C1 consultant in finalizing the design.*

(b) **Size and Location of Northern Wastewater Treatment Plant Wetlands**. After appraisal, 86 ha of recently reclaimed land was reduced to 60 ha.

(c) **Change in Project Implementing Agency**. The implementing agency was changed from the Cixi Construction Bureau to the Cixi Tourism Bureau in October 2007 because it was perceived that the Wetland Center was more a tourism site.

(d) **Change in Administrative Responsibility for the Wetland Center**. In late 2009, the responsibility for the Wetland Center was transferred to the Hangzhou Bay New Zone Administration. This led to a virtual freeze of counterpart funds from February 2010 until February 2011, during which period, the design and fitting of the EEC Building interior was put on hold, and resulted in a significant delay in the delivery of this output. In addition, no new staff was recruited for management of the Wetland Center.

(e) **Physical Changes Due to Rapid Rates of Coastal Sedimentation**. The inter-tidal mudflats in the project area were rapidly silting up around 2008, due to reclamation projects in the adjacent county of Yue Yao to the south west. A final decision on the future development option for this area was expected by the end of 2011.

(f) **Removal and Resettlement of Fishermen from Inter-tidal Mudflats**. Due to lack of clarity over the future conservation or development strategy for the inter-tidal mudflats, the Cixi Wetland Management Company was not able to remove and resettle fishermen from the inter-tidal areas to undertake rehabilitation of the wetlands.

(g) **Wetlands Management Plan**. It was originally envisaged to develop a management plan for the entire 43.5 km^2 site. However, due to coastal reclamation plans for much of the inter-tidal area, that were only made known to the Project mid-way through the implementation, the Ecological Management Plan was ultimately restricted to the 4.3 km^2 area of reclaimed land. Also, the Resettlement Action plan was put on hold for this area (initially till October 2009 and subsequently till the end of the project period.

(h) **Improvement in the Water Quality of the Sanba River**. Testing undertaken during the project period has indicated that the pollution levels in the Sanba river did not reach 20mg/l of TN, assumed at project appraisal, making it impossible to achieve the target specified in the PAD.

(i) **Training of Wetland Center Staff**. It was not possible to devise and implement a comprehensive training program for Wetland Center staff, because the Cixi Wetland Management Company sub-contracted many of the tasks for management of the Center to external service providers.

2. Key Factors Affecting Implementation and Outcomes

Quality at Entry. There were a number of issues that should have been identified and considered in the project preparation and design. They include:

(a) The risk of siltation and coastal reclamation affecting the inter-tidal mudflats was not considered in the design.
(b) The trend and sources of pollution affecting the Sanba river which would be treated through the wetland center were not properly assessed.

(c) The complexity of institutions, and consultations with these agencies, were not given adequate attention in project design.

(d) The proposal to assign full responsibility of development and management of the project a specially created private entity (Cixi Wetland Management Company) was not fully appropriate.

(e) The differences of opinion between the local government and the project design scheme on the envisaged scale of the wetland centre were not adequately addressed.

(f) The ownership of the entire project area of 43.5 Km^2 was not clearly determined at the time of project formulation/appraisal.

(g) The outcome indicators as given in the PAD were generally poor. The proposed outcomes in terms of showcasing at both the national and international levels - innovative wastewater treatment techniques and sustainable wetland management practices and assisting the replication of such innovative techniques throughout China and East Asia; and providing a model for wetland management in China and the rest of the world, are considered over ambitious.

(h) The quality of feasibility studies conducted prior to project implementation was also variable, and some key feasibility studies appear to have been over-looked.

Potential Risks to Achieving the Intended Outcomes. The risks identified in the PAD were appropriate. Additional risks which were not identified during project design include the following:

(a) Given that the constructed wetlands are not fully operational, and are unlikely to act as showcases of low cost innovative waste water treatment.

(b) The promotion of the project focussed mainly on the development of the constructed wetlands for wildlife and conservation rather than the wastewater treatment aspects.

(c) There has been coordination between work at the two constructed wetlands managed by the Cixi Wetland Management Company and the Cixi Sewage Management Company

(d) The Resettlement Action Plan in relation to the inter-tidal mudflat areas has not been adequately implemented.

Implementation

Project management and coordination mechanisms involved the Project Management Office in Ningbo (PMO), the Cixi Wetland Management Company and the Cixi Sewage Management

Company. The World Bank make supervision visited once every six months (linked to supervision of the Overall Ningbo Water and Environment Project, NWEP) and, in general, spend about one day on each visit to look at issues related to the GEF project. However, there were a number of problems related to implementation including:

(a) The Cixi Wetland Management Company had limited personnel (four) for the first three years of the project and most staff was seconded from the Cixi Construction Bureau. (b) Shortly after the start of the project the CWMC was transferred from the Cixi Construction Bureau to the Cixi Tourism Bureau.

(c) One year after the start of the project there was a proposal to transfer the CWMC and the Center and the project area to the Hangzhou Bay New Zone Authority which was responsible for development of a new city and industrial zone on reclaimed land near to the Wetland Center.

(d) There were two changes of the World Bank Project Manager during the project and this caused some delays in resolving some of the management issues in the project.

(e) World Bank supervision was deemed adequate, but it was noted that (i) most Bank staff did not have the technical skills to deal with aspects of the project relating to wetlands and conservation; (ii) Bank procedures for procurement of equipment, finalization of bidding documents, etc were usually slow; (iii) dissemination of Aide Memoires from supervision missions were often delayed; (iv) during Supervision missions, significantly more time was spent on Loan related issues, and compared to the GEF Grant; and, (v) WB responses to CWMC requests relating to reclamation issues were slow, resulting in significant delays in the decision making process.

Quality and preparation of detailed designs of physical investments. The Wetland Center and constructed wetlands were designed by the C1 consultants. For the EEC Building and the wildlife wetlands the C2 consultants also provided significant input. The design of the wildlife wetlands and the EEC were of high quality and function. In general, the final designs for the EEC Building and wetlands at the Wetland centre were good and innovative. The treatment wetlands in the Wetland Center were designed to provide dual benefits of treatment and visitor attraction. This reduced their effectiveness for wastewater treatment as the density, pattern and type of wetland species planted were not the most optimal for pollution removal as some significant gaps in planting allowed for short circuiting. However given the new information on the relatively low level of pollutants in the Sanba River, this was not problematic.

For the sewage treatment plant wetlands, the design was undertaken by C1 with no input from the C2 consultant.

Delays in Land Acquisition or Availability. Acquisition of 330 ha. of land within Plot A1 of the Wetland Center was completed through reclaimed land prior to appraisal. However issues relating to land use and rights within Plots A3, A5 and the remaining 36 km2 of the inter-tidal zone were not fully resolved during the entire project period. As a result active protection and management as well as the Resettlement Action Plan implementation was suspended and the

development of aquaculture ponds and harvesting of aquatic resources was intensified during the project period.

In February 2011 the entire 43.5km2 was transferred to the Hangzhou Bay New Zone, and in December 2011 was declared as "National Wetland Park" with support from the State Forestry Administration.

Availability of counterpart funds. Insufficient counterpart funds were made available for the design and fitting of the EEC Building interior and displays; for environmental education and visitor facilities within the Public Demonstration Area (PDA); and, for any work pertaining to the restoration and protection of Plots A3 and A5 and adjacent inter-tidal wetlands. Both CMSC and CWMC faced problems in accessing financing especially in 2009-2010.

Compliance with project covenants. All three covenants were complied with, albeit with some delay.

Loan/credit utilization. The grant was almost fully utilized.

Implementation of the Project Technical Assistance. The project technical assistance was divided into two sub contracts:

(a) ***C1 Constructed Wetland and Wetland Center Engineering Design***. All tasks were completed – however there were some delays due to the later appointment of the consultant and the need for prolonged consultation with C2 and others on various key aspects before the design could be finalized.

(b) **C2 Wetland Center Management Assistance**. Tasks under this assignment were implemented over four years by a consortium comprising: Global Environment Center; Wetlands International-China; and East China Normal University

The four main tasks implemented were: Wetland Center Ecological Management Plan; Development of Business Plan; Guidance in Ecological Restoration Design and Operation; and Support for operations of the Wetland Center. All tasks have been completed or will be completed before the end of the contract period in December 2011.

A number of problems were faced in the administrative aspects of the work including long delays in processing payments, confusion over use of World Bank versus government procedures, etc. Most of these matters have been solved, but they led to some delays in the work implementation.

Financial Management. and Audit Compliance. Financial management for the project was generally smooth, although there were some delays in the payments to some of the consultants. Differences in understanding of World Bank versus Chinese procedures caused some delays especially on tax related issues. The project accounts complied with audit requirements.

Procurement Performance. In general the project complied with procurement requirements, but there were some problems and delays in the tendering and appointment of contracts, mainly due to lack of familiarity with bank procurement procedures by the lead local agencies.

Post Completion Operation Phase

Wetland center. The wetland centre area has significant value and use for wildlife conservation, education, tourism and water quality improvement. However, the delay in the completion of the EEC has reduced the level of usage. This is anticipated to be resolved with the formal opening of the EEC in August 2012.

Sewage treatment. The delays in the completion of the northern treatment plant wetlands (to October 2011) as well as the currently low volume of sewage treatment at the Northern Sewage Treatment Works (50% of capacity) mean that the constructed wetland is not being utilized optimally. However, as more collection sewers are completed and the volume of sewage being treated increases, the constructed wetlands will become more and more important for tertiary treatment of residual wastewater.

3. Assessment of Outcomes

Relevance of project objectives, design and implementation. The project objectives and design were highly relevant to the East Coast of China and the issues faced by coastal wetlands and the biodiversity using these wetlands.

Achievement of project objectives. Although ambitious, the objective to reduce land-based pollution appears to at least in part been met by the implementation of the IBRD-financed Ningbo Water and Environment Project (NWEP). The contribution of the Cixi Treatment Wetlands in meeting this objective has been minimal, but in time it is expected that the CTWs will become a more significant contributor to nutrient removal.

It is unclear whether the constructed treatment wetlands implemented under the project will promote replication of such techniques however, until full operation and testing indicate significant outcomes for these wetlands.

The project has particularly met its objective to encourage coastal zone conservation in Cixi County. Without the project intervention, the 43.5 km^2 area would eventually been fully reclaimed and used for alternative land use – probably industrial and agricultural. The development of the Wetland Center, and designation as a National Wetland Park, has in part contributed to the vision of the Hangzhou Bay New Zone to be an eco-development zone, and contributed to the decision to review further reclamation strategies in the New Zone and the future conservation of a significant portion of the coastline. The Wetland Center development and its increasing recognition at the National and International levels should continue to stimulate a decrease in development pressure on the Cixi County coastal zone.

Financial viability of Wetland Management and Sewerage Management Companies and Sustainability. Wetland Management Company: income from visitor use to Wetland Center

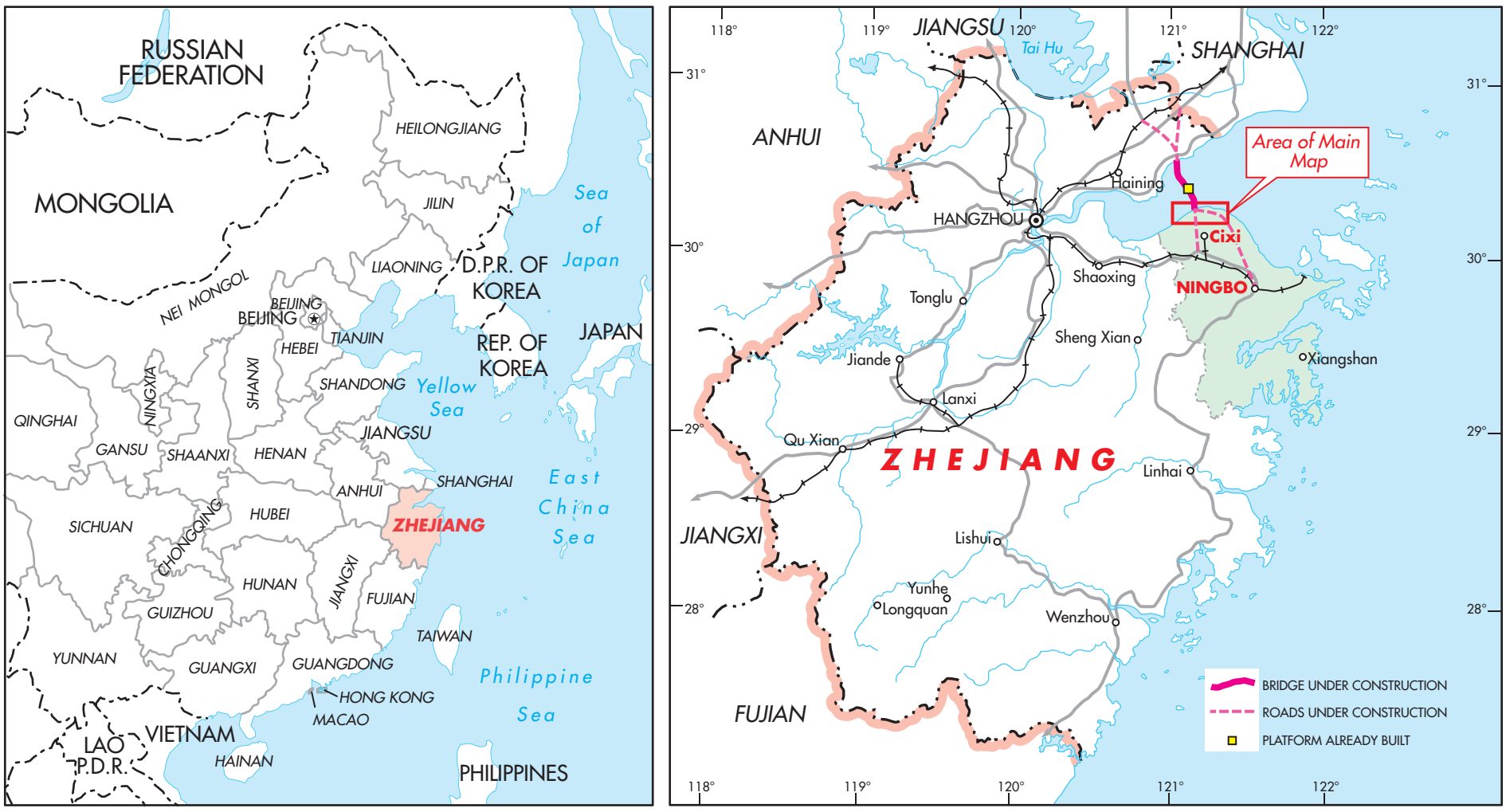
will not be sufficient to fully sustain operations and management. The income in year 2 was enough to cover the cost of subcontracted management services but not all management costs. Support in the form of grants from Government will continue to be an important source of income for the next few years.

Economic Efficiency. Whilst direct economic efficiency is not the focus of the Wetland Center development, it can certainly contribute to economic development of the Hangzhou Bay New Zone. The recognition of the Wetland Center at the National and International levels will stimulate interest and investment in the New Zone, and potential investors should appreciate the eco-friendly development focus of the HBNZA.

Annex 7: List of Supporting Documents

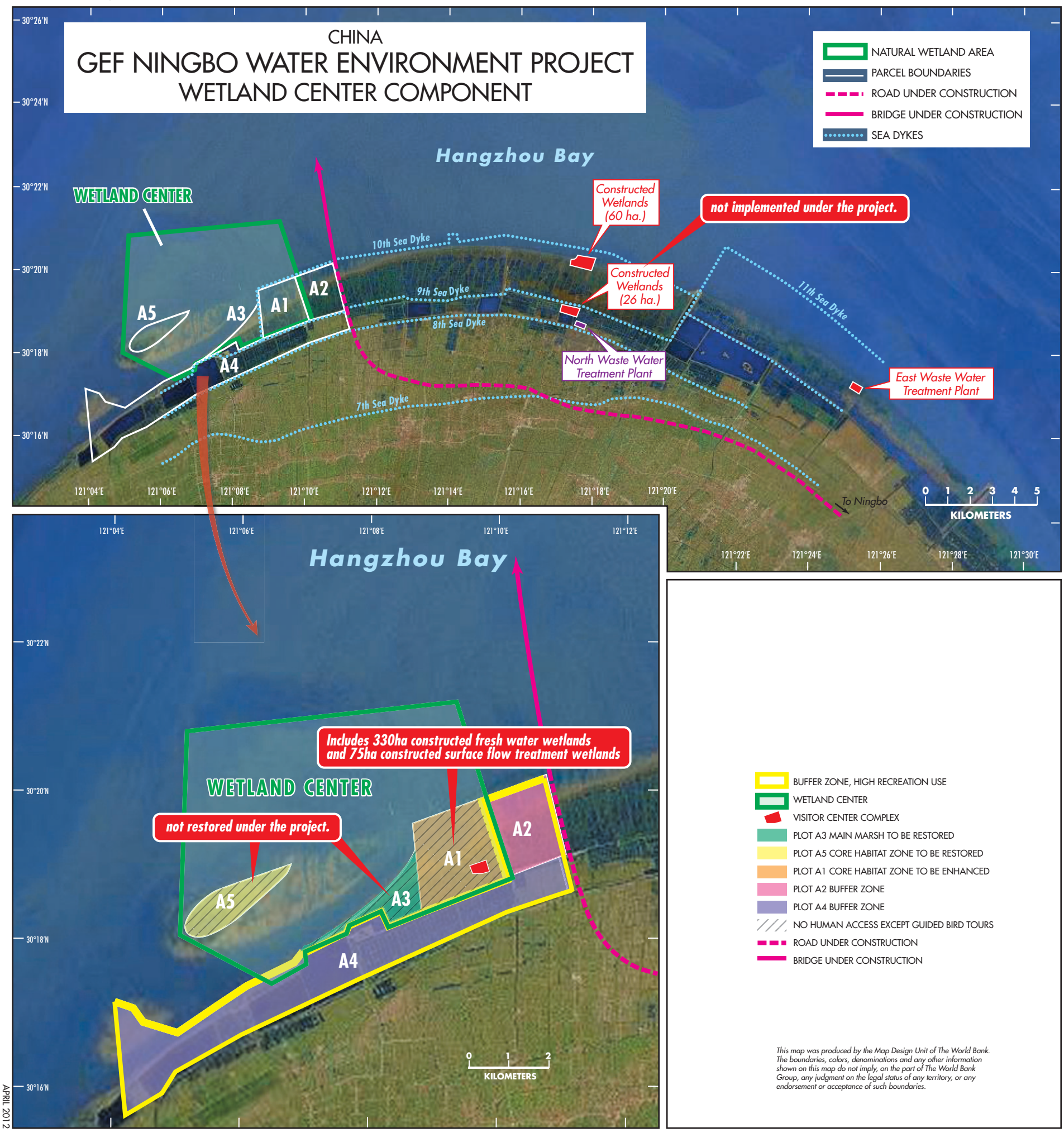
CHINA: GEF Ningbo Water and Environment Project

1. GEF Grant Agreement
2. GEF Project Appraisal Document
3. Resettlement Action Plan
4. Environmental Impact Assessment
5. Environmental Management Plan
6. Mission Aide Memoires and Back-to-Office Reports
7. Implementation Status Reports
8. Semi-annual Project Progress Reports
9. Assessment Report on Potential Impacts of Sedimentation within the Project Area of the Wetlands ("Hybrid Option") Center by Wetlands International-China, Global Environment Centre, and East China Normal University.
10. Summary Report on the testing of the 75 ha Constructed Treatment Wetland (CTW) at the Cixi Hangzhou Bay Wetland Centre by Wetlands International-China, Global Environment Centre, and East China Normal University.



CHINA

GEF NINGBO WATER ENVIRONMENT PROJECT
WETLAND CENTER COMPONENT



BUFFER ZONE, HIGH RECREATION USE
WETLAND CENTER
VISITOR CENTER COMPLEX
PLOT A3 MAIN MARSH TO BE RESTORED
PLOT A5 CORE HABITAT ZONE TO BE RESTORED
PLOT A1 CORE HABITAT ZONE TO BE ENHANCED
PLOT A2 BUFFER ZONE
PLOT A4 BUFFER ZONE
NO HUMAN ACCESS EXCEPT GUIDED BIRD TOURS
ROAD UNDER CONSTRUCTION
BRIDGE UNDER CONSTRUCTION

APRIL 2012

IBRD 34441R1