Document of
The World Bank

Report No: ICR1962

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-53183)

ON A

GRANT FROM THE GLOBAL ENVIRONMENT FACILITY (GEF)

IN THE AMOUNT OF US$17.0 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

HAI BASIN INTEGRATED WATER AND ENVIORNMENT MANAGEMENT PROJECT

December 23, 2011

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

CURRENCY EQUIVALENTS

(Exchange Rate Effective November 15, 2011)

Currency Unit = RMB Yuan
1.00 = US$ 0.157
US$ 1.00 = RMB Yuan 6.38

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

CDD	Community Driven Development
COD	Chemical Oxygen Demand
CPMO	Central Project Management Office
ET	Evapotranspiration
GEO	Global Environmental Objective
HBC	Hai Basin Commission
IWEMP	Integrated Water and Environment Management Plan
KM	Knowledge Management
MEP	Ministry of Environment Protection
MOA	Ministry of Agriculture
MOC	Ministry of Construction
MOF	Ministry of Finance
MWR	Ministry of Water Resources
NDRC	National Development and Reform Commission
O&M	Operations and Maintenance
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
RS	Remote Sensing
SAP	Strategic Action Plan
SEPA	State Environment Protection Administration
SNWT	South-North Water Transfer Project
SOA	State Oceanic Administration
SS	Strategy Study
TUEP II	Tianjin Urban Development and Environment II Project
WCP	Water Conservation Project
WUA	Water User Association
YSLME	Yellow Sea Large Marine Ecosystem
ZWN	Zhang-Wei-Nan (Canal) River Basin

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Country Director:	Klaus Rohland, EACCF
Acting Sector Manager:	Paul Kriss, EASCS,
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CHINA
Hai Basin Integrated Water and Environment Management Project

Implementation and Completion Result Report

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Maps: IBRD 32710

DATA SHEET

A. Basic Information			
Country:	China	Project Name:	Hai Basin Integrated Water and Environment Management Project
Project ID:	P075035	L/C/TF Number(s):	TF-53183
ICR Date:	12/22/2011	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	PEOPLE'S REPUBLIC OF CHINA
Original Total Commitment:	USD 17.00M	Disbursed Amount:	USD 16.96M
Revised Amount:	USD 17.00M		
Environmental Category: C		**Global Focal Area: I**	
Implementing Agencies: MWR and SEPA Beijing Water Affaris Bureau and Environment Protection Bureau Tianjin Water Resources Bureau and Environment Protection Bureau Hebei Water Resources Bureau and Environment Protection Bureau			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	09/03/2002	Effectiveness:	09/29/2004	09/22/2004
Appraisal:	11/24/2003	Restructuring(s):		
Approval:	04/15/2004	Mid-term Review:	12/20/2007	12/10/2007
		Closing:	06/30/2010	06/30/2011

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Highly Satisfactory
Risk to Global Environment Outcome	Low or Negligible
Bank Performance:	Satisfactory
Borrower Performance:	Highly Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance			
Bank	**Ratings**	**Borrower**	**Ratings**

Quality at Entry:	Satisfactory	Government:	Highly Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Highly Satisfactory
Overall Bank Performance:	Satisfactory	**Overall Borrower Performance:**	Highly 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	Highly Satisfactory		

D. Sector and Theme Codes

	Original	**Actual**
Sector Code (as % of total Bank financing)		
Central government administration	35	30
Irrigation and drainage	15	40
Sewerage	35	10
Sub-national government administration	15	20
Theme Code (as % of total Bank financing)		
Environmental policies and institutions	20	30
Pollution management and environmental health	40	20
Water resource management	40	50

E. Bank Staff

Positions	**At ICR**	**At Approval**
Vice President:	James W. Adams	Jemal-ud-din Kassum
Country Director:	Klaus Rohland	Yukon Huang
Sector Manager:	Paul Kriss	Mark D. Wilson
Project Team Leader:	Liping Jiang	Douglas Olsson
ICR Team Leader:	Liping Jiang	
ICR Primary Author:	Clive William Lyle	
	Liping Jiang	

F. Results Framework Analysis

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

The overall objective is to catalyze an integrated approach to water resource management and pollution control in the Hai Basin in order to improve the Bohai Sea environment. Specifically, the Project will (i) improve integrated water and environment planning and management in the Hai Basin, (ii) support institutional aspects related to effective local, municipal/provincial, and basin-wide water and environment planning and management, (iii) enhance capacity building in water and environment knowledge management and implementation, and (iv) reduce wastewater discharges from small cities along the rim of the Bohai Sea.

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

There were no revisions of the Global Environment Objectives and Key Performance Indicators (KPIs) throughout the project implementation period.

(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 :	Reduced pollution loading to the Bohai Sea from pilot counties by 10% (,000 tons /year)			
Value (quantitative or Qualitative)	COD 164 NH3-N 19	COD 16.4 NH3-N 1.9	NA	COD 38.615 NH3-N 4.665
Date achieved	06/30/2004	06/30/2010	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: COD 135%; NH3-N 146%			
Indicator 2 :	Disposal of 2.2 million cubic meters of contaminated sediment in Dagu Canal in an environmentally safe manner (million m3)			
Value (quantitative or Qualitative)	Baseline Disposal: 0.00	2.2	NA	6.26
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: 285%			
Indicator 3 :	Reduced pollution loading to Bohai Sea from at least one Tianjin small city by 10,000 tons of COD and 500 tons of NH4 annually (,000 tons /year)			
Value (quantitative or Qualitative)	Baseline reduction: 0.00	COD 10 NH3-N 0.5	NA	COD 9.855 NH3-N 0.6205
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2010
Comments	Percentage of PAD: COD 98.5 %; NH3-N 124%			

(incl. % achievement)				
Indicator 4 :	Development of replicable practical approaches to reducing pollution to the Bohai Sea that can be used throughout the Hai Basin and in other Chinese basins			
Value (quantitative or Qualitative)	Baseline: traditional approach without cooperation and new technology	NA	NA	Approaches adopted elsewhere in China, including in State level policy
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: NA			
Indicator 5 :	A functioning inter-agency committee has been established at county level, resulting in improved cooperation and integration of WRM and pollution control activities with support from upper levels-prefectures, provinces, HBC, ZWN, MWR and SEPA (County no.)			
Value (quantitative or Qualitative)	Baseline: no inter-agency committee to provide coordination	10	NA	16
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: 160%;			
Indicator 6 :	Institutions implementing IWEM have adopted improved WRM and pollution control approaches at the county level (including ET and KM management, water rights and well permit administration, and discharge control) with support from upper levels.			
Value (quantitative or Qualitative)	Baseline: only individual plans without integrated water and environment plans	10	NA	16
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: 160%;			
Indicator 7 :	Improved small city wastewater management approaches have been implemented in Tianjin coastal counties, including collection, industrial pre-treatment, wastewater treatment, and wastewater reuse			
Value (quantitative or Qualitative)	Baseline: wastewater management and treatment was a big issue to be resolved	Improved wastewater management	NA	Sewage WWT plant completed in Yincheng City and management has been improved
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: 100%;			
Indicator 8 :	Discharge pollution load reduced by 10% (baseline: COD Loading 164,000 tons/year; NH4 Loading 19,000 tons/year) as a result of reuse in pilot counties			

	and coastal counties (,000 t/y)			
Value (quantitative or Qualitative)	COD 164 NH3-N 19	COD 16.4 NH3-N 1.9	NA	COD 38.615 NH3-N 4.665
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: COD 135%; NH3-N 146%;			
Indicator 9 :	Groundwater overdraft for irrigation purposed reduced by 10% (baseline: 420 million m3 /year) in pilot counties (million m3/y)			
Value (quantitative or Qualitative)	420	42	NA	265
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: 531%			
Indicator 10 :	Construction of two small city wastewater treatment plants in Tianjin, resulting in pollution reduction of 10,000 tons of COD and 500 tons of NH4 annually for each small city (on average)			
Value (quantitative or Qualitative)	Baseline reduction: Nil	COD 10,000 t NH3-N 500 t	NA	COD 9,855 t NH3-N 620.5 t
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: COD 98.5%, NH3-N 124%			
Indicator 11 :	Disposal of 2.2 million cubic meters of contaminated sediment from the Dagu canal, and achieve a onetime reduction of 10,000 tons of oil, 2,000 tons of zinc, and 5,000 tons of total nitrogen			
Value (quantitative or Qualitative)	Baseline reduction: Nil	Sediment: 2.2 m m3 Oil: 10,000 t Zinc: 2,000 t Total N: 5,000 t	NA	Sediment: 6.26 m m3 Oil: 28,670 t Zinc: 1,822 t Total N: 13,379 t
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: Sediment: 285%, Oil: 287%; Zinc: 91.1%; Total N: 268% The relatively smaller reduction in amount of zinc removed has been attributed to sampling error in setting the baseline value as other parameters are consistent with one another			
Indicator 12 :	Development of replicable practical approaches to improving water and environment management resulting in sustainable water resources use and management that can be used throughout the Hai Basin and in other Chinese basins			
Value (quantitative or Qualitative)	Baseline: traditional approach without good cooperation and new technologies	- 1 mechanism for IWRM at basin level - 1 new and innovative concept	NA	- 1 mechanism for IWRM at basin level - 1 new and innovative concept

		/approach for real water savings - 1 new technology for measuring ET as a tool for M&E		/approach for real water savings - 1 new technology for measuring ET as a tool for M&E
Date achieved	06/30/2004	06/30/2010	12/10/2007	06/30/2011
Comments (incl. % achievement)	Replicable approaches are:1)Joint Decision Making Conference System;2) Basin-wide KM System;3)New Concept and Approach for Real Water Savings; 4) IWEMPs; 5)CDD-based WUAs;6)Incentives for Waste Water Treatment;7)Non-pollution source contol			

(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 :	IWEMPs prepared and initial implementation has started (IWEMPs for 10 counties and the Tianjin Municipality)			
Value (quantitative or Qualitative)	Baseline: No IWEMP was prepared and implemented	10 IWEMPs 65 WUAs	NA	16 IWEMPs 407 WUAs
Date achieved	06/30/2004	03/31/2007	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: IWEMP 160%, WUA 526% IWEMPS was completed with longer time than original planned given the complexity of development of key and cutting-edge technologies (KM, ET)			
Indicator 2 :	Institutional coordination mechanisms for IWEM established and functional (Improved institutional coordinating mechanisms for IWEM)			
Value (quantitative or Qualitative)	Baseline: at county and city level there was no coordination mechanisms functioning	12 high-level Coordination Leading Groups (CLG) at different levels 13 Joint PMOs 13 expert groups	NA	22 CLG 23 PMOs 23 expert groups
Date achieved	06/30/2004	12/31/2004	12/10/2007	12/31/2005
Comments (incl. % achievement)	Percentage of PAD: 100%			
Indicator 3 :	Strategic studies prepared and findings integrated into IWEMPs (Strategic Studies in Number)			
Value (quantitative or Qualitative)	Baseline: the number of strategic studies: 0	8	NA	8
Date achieved	06/30/2004	12/31/2006	12/10/2007	12/31/2010
Comments (incl. %	Percentage of PAD: 100%			

achievement)				
Indicator 4 :	SAP prepared, distributed and initial implementation has started (SAP for Hai Basin and for ZWN sub- basin in number)			
Value (quantitative or Qualitative)	Baseline: there had been no strategic actions plans prepared by both water and environment departments	2	NA	2
Date achieved	06/30/2004	12/31/2008	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: 100%			
Indicator 5 :	Demonstration projects prepared and findings integrated into IWEMPs (Demonstration Projects):			
Value (quantitative or Qualitative)	Baseline: no demonstration projects has been implemented on the topics selected under the project	4	NA	4
Date achieved	06/30/2004	12/31/2006	12/10/2007	12/31/2008
Comments (incl. % achievement)	Percentage of PAD: 100%			
Indicator 6 :	Policies, mechanisms and instruments are defined and implemented (Policies, mechanisms, and instruments supporting IWEM)			
Value (quantitative or Qualitative)	Baseline: no new policies mechanisms and instruments were available for IWEM.	ET, KM, SSs, applied to SAPs and IWEMPs	NA	- ET, KM, SSs, applied to Saps and IWEMPs - Findings impacted national policies and plans
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2008
Comments (incl. % achievement)	Percentage of PAD: 100% Project results had impact well beyond that anticipated, which provided useful reference in formulation of national level policies and the 12th Five-year Plan Hai Basin Master Plan			
Indicator 7 :	Integrated Water Resource /Water Quality Information Management System created, tested, implemented, and functional (Integrated Water Resource – Water Quality Information Management System in number)			
Value (quantitative or Qualitative)	Baseline: no such a system was available as powerful tools for IWEM	1	NA	1
Date achieved	06/30/2004	12/31/2006	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: 100+% Project resulted in agreements, several systems and approaches which have been adopted into Chinese national policy by the highest level.			
Indicator 8 :	Application System developed, established, and functional			
Value (quantitative or	Baseline: there was no application system	The Application system would be	NA	The system developed has been

Qualitative)	existed	used as tools to support preparation of SS, SAPs and IWEMPs		used to support SS, SAPs and IWEMPs, although completion of the system was later than expected.
Date achieved	06/30/2004	12/31/2007	12/10/2007	12/31/2010
Comments (incl. % achievement)	Percentage of PAD: 100%			
Indicator 9 :	ET Management System established, tested, and functional (Number)			
Value (quantitative or Qualitative)	Baseline: no ET system was introduced to facilitate the management of consumptive use of water	1	NA	1
Date achieved	06/30/2004	12/31/2006	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: 100% Development, verification and acceptance of results were more complicated than anticipated and the full system has been established, tested and functioning with improvements.			
Indicator 10 :	Mechanisms established, tested, and functional (Mechanisms for the continuation of above systems after the Projects finalization (number of ET centres)			
Value (quantitative or Qualitative)	Baseline: no ET centers were established	1	NA	2
Date achieved	06/30/2004	12/31/2008	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: 200% Mechanisms established for sustainability of the project through ET Centers at HBC and in Beijing WRD and information networks established with pilot Counties			
Indicator 11 :	TA provided and canal renovation remediation carried out (TA for the renovation and remediation of the Dagu Canal)			
Value (quantitative or Qualitative)	Baseline: no physical works were built to reduce one of major pollution sources to Bohai Sea	Dagu canal to Jugezhuang pump station rehabilitated	NA	Dagu canal to Jugezhuang pump station rehabilitated
Date achieved	06/30/2004	12/31/2008	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: 100%			
Indicator 12 :	Industrial Pollution Control carried out and integrated into IWEMP (Dagu Catchment Industrial Pollution Control (Number of study reports)			
Value (quantitative or Qualitative)	Baseline: there was no field survey and study carried out for pollution control of Dagu canal	1	NA	1
Date achieved	06/30/2004	12/31/2006	12/10/2007	12/31/2008
Comments	Percentage of PAD: 100%			

(incl. % achievement)				
Indicator 13 :	Wastewater Management Study carried out and integrated into IWEMP (Comprehensive Wastewater Management Study in number of Study Reports for 2 small cities)			
Value (quantitative or Qualitative)	Baseline: no special study was carried out for wastewater management in the coastal small cities and towns in Tianjin	2	NA	2
Date achieved	06/30/2004	12/31/2005	12/10/2007	12/31/2009
Comments (incl. % achievement)	Percentage of PAD: 100%			
Indicator 14 :	Incentive mechanism tested (Small Cities WWT Financial Incentive Mechanisms (Number of pilot projects)			
Value (quantitative or Qualitative)	Baseline: no such a incentive mechanism for small town wastewater treatment was introduced before	1	NA	1
Date achieved	06/30/2004	12/31/2007	12/10/2007	06/30/2011
Comments (incl. % achievement)	Percentage of PAD: 100%			
Indicator 15 :	Expert Groups set up and Functional (Joint Expert Groups in number of expert groups established and operating)			
Value (quantitative or Qualitative)	Baseline: no expert groups were established to support government in IWEM in Hai Basin	20	NA	23
Date achieved	06/30/2004	09/30/2004	12/10/2007	09/30/2006
Comments (incl. % achievement)	Percentage of PAD: 100%			
Indicator 16 :	Training, Workshops and Study Tours carried out (Conduct Training, Workshops and Study Tours)			
Value (quantitative or Qualitative)	Baseline: no such intensive training was provided before through various workshops, study tours.	NA	NA	164 training sessions, 57 study tours
Date achieved	06/30/2004	12/31/2010	12/10/2007	12/31/2010
Comments (incl. % achievement)	The management capacity of government staff associated with the project has been greatly strengthened. Percentage of PAD: 100%			
Indicator 17 :	M&E system in Place (M&E system and MIS)			
Value	Baseline: no M&E system	2	NA	2

(quantitative or Qualitative)	and MIS were established for monitoring the results of project implementation			
Date achieved	06/30/2004	09/30/2004	12/10/2007	09/30/2004
Comments (incl. % achievement)	The M&E system was established to closely monitor and evaluate the outputs and outcomes of the project, which has been extended to improve the management and implementation of the internal projects fully financed by government. Percentage of PAD: 100%			

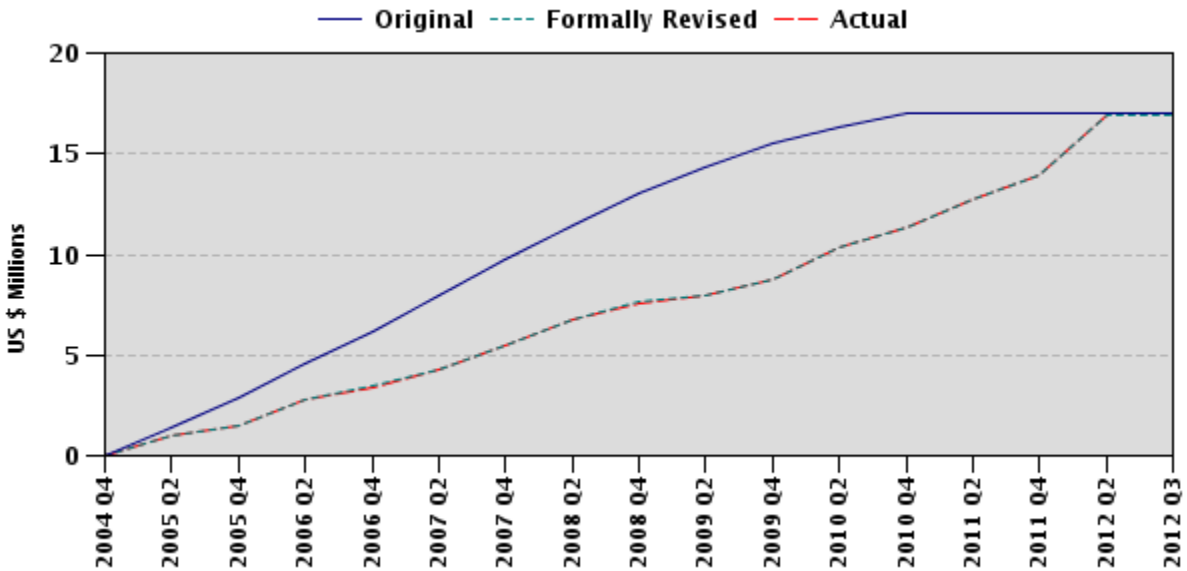
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	06/22/2004	Satisfactory	Satisfactory	0.00
2	12/14/2004	Satisfactory	Satisfactory	0.97
3	05/20/2005	Satisfactory	Satisfactory	1.48
4	02/22/2006	Satisfactory	Satisfactory	2.87
5	08/29/2006	Satisfactory	Satisfactory	3.43
6	08/31/2007	Satisfactory	Satisfactory	5.93
7	03/11/2009	Satisfactory	Satisfactory	8.69
8	01/27/2010	Highly Satisfactory	Satisfactory	10.38
9	06/21/2011	Highly Satisfactory	Satisfactory	13.97

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Global Environment Objectives and Design

1.1 Context at Appraisal

1.1.1. **Country Background:** The very rapid growth of China's cities and industries had created a strong demand for water in the agricultural, urban and industrial sectors in recent years. This resulted in an imbalance between water demand and supply and as a consequence there had been a drying up of waterways and over mining of groundwater. Surface and groundwater were also heavily polluted with 68% of the total river length on the North China Plain considered polluted. As well as degraded rivers in the Hai Basin, the off-shore of Bohai Sea had become polluted to some extent and it suffered 'red tides' in 1989 and 1998. The important fisheries and biodiversity of the Sea were degraded and this had negative implications for the Yellow Sea and East China Sea.

1.1.2. Integrated water and environmental management in China was also problematic because of difficulties in inter-jurisdictional and inter-administrative cooperation. For example there were considerable overlapping jurisdictions between Ministries with responsibilities for water and environmental management.

1.1.3. Chinese Government Programs had begun to address these problems by identifying water pollution in the Bohai Sea and Hai Basin as a priority in the ^{9th} (1995-2000) and successive National Five-Year Plans as well as preparing Action Plans and investment programs to address the pollution problems. The Government had also commenced taking measures to address water scarcity issues including by improving irrigation conservation and efficiency, water pricing and by proposing construction of the South-North Transfer (eastern and middle routes) to bring about 27 billion cubic meters of water per year from the Yangtze River system to North China including the Hai Basin. The government had also formulated related policies to improve the Bohai Sea area including the 'Bohai Declaration', amendment of the Marine Environmental Protection Law, and the introduction of the 'Blue Sea Action program'.

1.1.4. **Global Significance of the Project:** The Bohai Sea is located in the North West of the Yellow Sea and had provided important fisheries for China, Japan and North and South Korea. More than 40 rivers discharged from the North China Plains into the Bohai Sea including from the Hai Basin. The Sea also had a diverse marine life and has in the past been important for fisheries recruitment for the East China Seas and North West Pacific. The deteriorating environment and water scarcity could also lead to adverse impact on water quality of Bohai Sea, which could be of global significance and concern.

1.1.5. The project supported the objectives of the International Convention on Biodiversity and falls under the GEF International Waters Focal Area. It had direct relevance for the Global Program for the Protection of the Marine Environment from Land Based Activities. The project also complemented other GEF initiatives including the 'Yellow Sea Large Marine Ecosystem Project' and the 'Partnerships in Environmental Management for the Seas of East Asia'.

1.1.6. **Rationale for Bank Assistance**: At the time of project identification, the government was implementing policies and plans through sectoral programs that focused more on large infrastructure investment. In general, it lacked an integrated approach which leads to a more balanced economic development and environment protection, and considered institutional cooperation, balanced management and investment, used science based decision making, considered interactions between surface and groundwater; water quantity and water quality; land and water use; and, impacts on the marine resources water.

1.1.7. Bank sector work had highlighted the problems of water scarcity and pollution in the North China Plain (Agenda for Water Sector Strategy for North China) and the high financial and environmental costs of water transfers (China Country Water Resources Assistance Strategy). Sector work in rural development had underlined the need to improve rural incomes (Rural China: Transition and Development).

1.1.8. The Bank had assisted with funding of 20 water resources and irrigation projects since 1995, including institutional elements, plus numerous water supply and sanitation projects in the previous 15 years. Two in particular, the Water Conservation Project (WCP) and the second Tianjin Urban Development Environment Project (TUDEP2) had provided direct and innovative experiences and had links to the project objectives. Some of the projects had also been supporting institutional aspects of water and environment at river basin and at administrative levels.

1.1.9. The government requested Bank assistance for a project to benefit the water and environmental conditions of Hai Basin and Bohai Sea areas. Many agencies including MWR, SEPA (now MEP), Tianjin and Beijing Municipal governments and Hebei Provincial governments participated in project preparation and provided strong support. The catalyzing effect of the project was considered to be very large with all entities recognizing its significance in carrying out integrated water and environmental management (IWEM) in China.

1.1.10. The project was in line with the China Country Partnership Strategy (CPS) and the sector related goal for sustainable development and management of water and other natural resources.

1.1.11. The project did not target the whole Hai Basin or North China Plains area as a number of the project elements were considered innovative and needed testing and adaptation to local conditions. At that time, it was considered a good mechanism for providing significant lessons for an eventual wider application.

1.2 Original Global Environment Objectives (GEO) and Key Indicators

1.2.1 The overall objective is to catalyze an integrated approach to water resource management and pollution control in the Hai Basin in order to improve the Bohai Sea environment. Specifically, the Project will (i) improve integrated water and environment planning and management in the Hai Basin, (ii) support institutional aspects related to effective local, municipal/provincial, and basin-wide water and environment planning and management, (iii) enhance capacity building in water and environment knowledge management and implementation, and (iv) reduce wastewater discharges from small cities along the rim of the Bohai Sea.

1.2.2 There are altogether 29 Key Performance Indicators including 12 outcome/impact indicators and 17 output indicators as presented in Annex 1 of PAD, which are also included in the data sheet and Annex 2 of this ICR. These indicators are summarized below as same as they were presented in the main text of PAD:

(1) Decreased water pollution in pilot counties (tons of reduction);
(2) Reduced Groundwater overdraft in pilot counties (rate of water table lowering reduced);
(3) Reduced pollution loading to the Bohai Sea from pilot counties and coastal counties;
(4) Inter-agencies committees established in Integrated Water and Environmental Management (IWEM) in counties and in demonstration counties;
(5) Formulated Integrated Water and Environmental Management Plans (IWEMPs) for 10 selected counties in the Hai Basin and for Tianjin Municipality;
(6) Produced eight Strategic Studies at central and Hai Basin levels and integrated findings into IWEMPs;
(7) Carried out four Demonstration Projects and integrated findings into IWEMPs;

(8) Formulated Strategic Action Plans (SAP) for the Zhangweinan (ZWN) sub-basin and Hai Basin;
(9) Established Integrated Water Resource- Water Quality Information Management System;
(10) Established a functional Evapotranspiration (ET) Management System for the Hai Basin;
(11) Implementation of improved small city wastewater management in Tianjin coastal counties;
(12) Construction of two small city wastewater treatment plants in Tianjin; and
(13) Disposal of contaminated sediment from Dagu canal

1.3 Revised GEO and Key Indicators, and Reasons/Justification

1.3.1 There were no revisions of the project development objectives or the key indicators.

1.4 Main Beneficiaries

1.4.1 The project beneficiaries remain as described in the PAD. The primary beneficiaries are the people living in the project area who have seriously suffered from water shortage and water pollution – especially those in the rural areas outside Beijing and Tianjin. Control of water use and pollution in the basin will improve people's health, living conditions, reduce odours, and improve aesthetic and recreational conditions.

1.4.2 Benefits will also accrue to fishers and people fringing the Bohai Sea through improved water quality, fishery stocks and biodiversity although this will be longer term. Healthier ecosystems and environmental aesthetics will also benefit the Basin's population.

1.4.3 Farmers in the project area will benefit from self management of irrigation water supply and project investments in water-saving infrastructure, agriculture, and better water management that were expected to increase incomes. The long term sustainability of surface and groundwater supply for irrigation, human and industry users was also considered a significant benefit.

1.4.4 Responsible government agencies at National, Provincial and County levels are an additional beneficiaries as project innovations enables integrated management and introduces mechanisms which can effectively implement and monitor government water use and discharge policies. MWR, MEP, Ministry of Construction (MOC), State Oceanic Administration (SOA), Ministry of Agriculture (MOA), Ministry of Finance (MOF), Beijing Municipality, Tianjin Municipality, Hebei Province, and, HBC (under the MWR) were involved in project implementation.

1.5 Original Project Components (as included in the PAD)

1.5.1 The Project would support the development of top-down and bottom-up mechanisms for integrated water and environment management in the Hai Basin, based to the extent possible on existing institutional mechanisms. The Project would also promote development of new coordination approaches at all levels that would adopt practical and pragmatic methods to overcome current institutional barriers to integrated water and environment management. The Project included four components:

Component 1: Integrated Water and Environment Management - IWEM

This component would finance consultant services, training, goods and small works. The IWEM would be divided into following 3 subcomponents:

(1) *Subcomponent 1A* - Strategic Studies: The eight strategic studies (please refer to indicator 15 in Annex 2) focus on four primary areas of concern at the Hai Basin level: policy,

legal and institutional issues; environmental needs for water including the Bohai-Hai linkages; water quantity management; and pollution management;

(2) *Subcomponent 1B* - Integrated Water and Environment Management Planning – IWEMP: The IWEMP subcomponent is the core of the Project. It would provide an example of the methods and benefits of this approach to China and to the receiving environment of the Bohai Sea. The subcomponent would provide the context within law, policy, institutional arrangements, and operational practices, for the development of practical approaches to IWEM at the basin, sub-basin, and county levels; and

(3) *Subcomponent 1C* - Demonstration Project*:* This subcomponent would finance demonstration projects prepared and implemented under the Beijing, Hebei and ZWN PMOs that would serve as experimental units to carry out the IWEMPs

Component 2: Knowledge Management - KM

This component would finance consultant services, training and goods and would be implemented under the Hai Basin PMO. The KM component would have 2 subcomponents:

(1) *Subcomponent 2A* - Knowledge Management: This subcomponent would provide a service function for all users and clients within the Project and would provide hardware and software tools to help Project participants to address their specific issues; and

(2) *Subcomponent 2B* - Establishment of Remote Sensing Evapotranspiration Management System: This subcomponent would support improvements in the conservation of water resources and the water environment, in order to achieve a rational water balance and its sustainable management, based on a focus on ET management.

Component 3: Tianjin Coastal Wastewater Management

The component would be implemented under the Tianjin PMO and would provide technical assistance for Tianjin to address critical water pollution control issues in the coastal area related to two infrastructure activities (Wastewater Infrastructure, and Renovation of the Dagu Canal System) under the World Bank-financed Second Tianjin Urban Development and Environment Project (TUDEP2). The component would have 2 subcomponents:

(1) *Small City Wastewater Management Studies*. It would cover institutional, financial, and technical studies for wastewater management programs in small coastal cities including funding a small cities financial support program to help the small cities meet their financial obligations;

(2) *Dagu Catchment Industrial Pollution Control Program*. It would support an industrial pollution control and pre-treatment study, and improve monitoring and enforcement of discharges into Dagu canal.

Component 4: Project Management, Monitoring and Evaluation, and Training

This component would finance consultant services, training and goods. Hai Basin Project management would support coordinated and integrated actions by the Ministries/Bureaus of environmental protection and water resources at the various levels. All Project Management Offices (PMOs) would have Joint Expert Groups to assist the PMOs in coordination, review, supervision and in some cases execution of technical activities under the Project. The Central PMOs would be supported by an international expert panel with broad experience in water quality and quantity management, water and environment planning and knowledge management. The PMOs would also arrange international and domestic study tours and international and domestic training on a variety of topics related to IWEM, river basin management, knowledge management, "real" water savings and ET management, pollution control, water rights and well permits, wastewater treatment, wastewater canal clean up, wastewater reuse, ecological restoration, etc.

The Project would also support PMO operations, monitoring and evaluation and other Project management aspects mainly through counterpart funding. The above activities would be supported under this component at the following three administrative levels:

(1) At central level for a joint PMO and joint expert group led by MWR and MEP
(2) At provincial level for a joint PMO and joint expert group led by WRB and EPB
(3) At county level for a joint PMO and joint expert group led by WRB and EPB

1.6 Revised Components

1.6.1 There was no major revision of the project components during project implementation.

1.7 Other significant changes

1.7.1 Two official extensions of the Grant closing date were made for this project. The first extension was from June 30 to December 31, 2010, as result of the Mid-Term Review, based on the conclusion that an additional six months would be necessary to complete the project, because of start-up delays due to three reasons: (a) lack of counterpart funding at the Hai Basin level (the issue was resolved after about 6-months delay); (b) unfamiliarity of the Bank procurement and financial management procedures (the project took more time than expected to help the project staff to learn Bank procurement guidelines and financial and disbursement procedures for reimbursement); and (c) difficulties for project staff to understand the innovative concept and approach of the project (the project took more time than expected to hold workshops and training with technical assistance for the project staff to fully understand the project concept and approach).

1.7.2 The second extension was made from December 31, 2010 to June 30, 2011, due to the two major reasons: (a) delayed completion of the waste water treatment plant financed under TUDEP2, which in turn, translated into another six-month delay in implementing the incentive program for O&M of the plant under the TA for wastewater management in small cities along the coastal lines; and (b) additional time would be needed for the project provinces, counties, MWR and MEP to review and clear the outputs of the project and carry out the necessary follow-up work to ensure project sustainability. The follow-up work also included organizing meetings and workshops to determine what actions should be taken in order to extend the project approach beyond the original project areas of the Hai Basin, which would enhance the project's sustainability.

1.7.3 There were some minor adjustments in content and funding allocations based on the principles of best utilizing resources to achieve the Global Environment Objectives (GEOs) of the project, which have been made at the time of the Mid Term Review (MTR) proposed by MOF and officially approved by the Bank (refer to mid-term report in project file):

(1) The KM system specific to Tianjin and Beijing Municipalities was added;
(2) Three additional County IWEMPs were added in Tianjin;
(3) An additional study into Non Point Source Pollution was added;
(4) Only minor adjustments were made to the investment plan during MTR review: $1,857 k reduction in civil works (the works to be financed under this project had been internally financed by government); $733 k reduction in goods (vehicles and equipment to be purchased under the project have been provided by government); $2,477 k reduction in training and study tours (overseas training and study tours were replaced by inviting international experts to China to provide training); $4,896 k increase in consulting services (above item 1 to 3 plus international consultants to deliver training to project

staff in China); $500 k reduction in financial incentive mechanisms (based on the actual needs); $190 k increase in international workshops; and, $810 k increase in project management (financed with 100% counterpart funds).

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

2.1.1 Based on previous Bank project experience and sector work, the project was correctly focused on new and innovative approaches to address the critical issues of the Hai Basin and Bohai Sea. These included: (a) taking an integrated approach to water resources and environmental planning and management, (b) including institutional cooperation and development at national, river basin, and provincial levels, (c) ensuring a balanced top down (from national and river basin levels) and bottom up (participation from water user levels) management approach, (d) emphasizing the importance of data and knowledge management for water environmental management including the wide sharing and compatibility of data, and, (e) recognizing the critical need to control water consumption rather than water use or withdrawal. The project introduced many linked innovative approaches at the preparation and design stage based on the following world-wide recognized three principles for integrated water resources management, including some at the leading edge internationally.

(1) The ecological principle (the principle for ecological environment protection in the context of a river basin). Under this project, the control of total consumptive use of water and total discharge of pollution loads at the river basin level with linkages of the control down to the water user level) has been incorporated in the project design – water was managed comprehensively (not independent actions taken by water users) in the context of the river basin as the development and management unit with a special attention paid to the environment, that was, development and utilization of water resources concerned water use for multi-sector economic development and eco-environmental protection and therefore was managed in an integrated manner based on the basin as the unit. In this regard, the innovative part of the project was that the integrated water and environment management was carried out at both river basin level and water user level with the quantitative linkages in-between. The linkages included the maximum consumptive use of water (or target ET) and maximum discharge of water pollution loads as targets, which were enforced at both river basin and water user levels.

(2) The institutional principle (the principle for cooperation of all stakeholders). Under this project, a joint conference-based decision making system for integrated water and environment management and all stakeholder participation have been followed in the project design. Water resources management is best done when all stakeholders participate, including the state, private sector and civil society and involving participation by women, and that water management should take place at the lowest levels possible. The innovative part of the project in this regard was that all project activities were carried out with the approach with top-down/bottom-up and vertical and horizontal integration to involve all the PMO staff and other stakeholders (farmers, private sectors, experts and government officials) to participate in the project management and implementation.

(3) The instrument principle (the principle for economic value of water resources) – water is a scarce resource and economic good whose management requires greater use of incentives and economic principles in improving its allocation and enhancing equity. This principle has been followed in the project design – cropping pattern adjustment, ban for use of deep groundwater resources, and volumetric water charges were considered to reach the purpose of increasing farmer incomes while reducing consumptive use of water for sustainability.

2.1.2 These principles and innovations, proposed by the Bank at preparation, were not fully understood or accepted by the government at the beginning of the project as the innovations were significantly different from established and traditional practice in China. Each of the innovations required further study, testing and discussion before it could be adopted by the project. This is one of reasons for this project to take a long time than usual for preparation and implementation.

Assessment of project design

2.1.3 With the background described above, the project objectives were clearly stated and responsive to China's and international priorities. The components were well designed and well matched to project objectives. First, the project was fully consistent with one of objectives in the Bank Group's Country Assistance Strategy (CAS / 2001-2005), which was to "support rational and environmentally sustainable use and development of natural resources". Second, the project has been consistent with the Bank Group's Country Partnership Strategy (CPS / 2006-2010) for China. The proposed project would support Pillar 2 of the CPS to reduce poverty, inequality and social exclusion, through promoting balanced urbanization, sustaining rural livelihoods, and expanding access to basic social and infrastructure services, particularly in the rural areas, and Pillar 3 to manage resource scarcity through conserving water resources. Specifically, the project was designed in line with the World Bank's China Country Water Resources Assistance Strategy (CWRAS), which addresses the important issues and provided a good foundation for future Bank assistance to China in water resources management issues. The important message in the CWRAS addressed by the project design was that integrated water resources management is both a top down and a bottom up set of activities. In China that means that the counties (and the townships, villages, and individual water users) need to be directly involved in planning and implementing integrated water resources management actions, including water rights and well permit administration, and enforcement, discharge control, industrial restructuring, "real" water savings measures, wastewater treatment, treated effluent reuse, etc..

2.1.4 The project involved many counterpart organisations at national, municipal/provincial, river basin and sub-basin, and county levels. In addition, there were many top-level water and environment research institutions involved through competitive bidding process in undertaking the large number of SS, KM system development and planning activities. The project also introduced a large number of significant project innovations which were not directly aligned with contemporary government approaches to water and environmental management. In particular, the time taken to develop and introduce the ET-water budget approach and KM system was longer than expected and required significant effort to persuade many officials and engineers that it was worth adopting. An extension of the project by one year accommodated this situation so that all objectives were fulfilled. For such an innovative project, a thorough assessment of the capacity of implementing agencies during project preparation would be needed to determine if the project would need a longer time during project implementation.

2.1.5 Environmental and social factors were adequately incorporated in project design. Environmental impacts were expected to be largely beneficial. A sound concept for participation at the different levels and for WUAs and the community was developed. The safeguards triggered by the project were the Environmental Assessment (OP 4.01, BP 4.01, and GP4.01), and the Involuntary Resettlement (OP/BP 4.12) safeguard policies. Although the project involved small civil works Environmental Management Plan, Environmental Management Plan and Resettlement Frameworks were prepared to minimize any impacts.

Government commitment and stakeholder involvement

2.1.6 The Chinese government provided assurances that it was committed to the project and that it would take full advantage of successful results including wider replication and this has since been demonstrated. Governments at different levels provided significant institutional support. This involved setting up the Central Project Management Office (CPMO) jointly with MWR and MEP before appraisal, and the PMOs were also set up at Provincial (HBC, Beijing, Tianjin, Hebei and Tianjin Construction Bureau), ZWN sub-basin, and in each of 16 demonstration Counties. Consistent with government policy that development should, wherever possible, be locally financed, local government commitment was demonstrated by Provinces/Municipalities and counties/cities borrowing a share of the Bank Loan, to allocate their own counterpart resources. MWR also arranged counterpart resources to contribute to the operational costs of the CPMO.

2.1.7 Special arrangements were made by the CPMO for technical guidance including establishment of a Central Independent Expert Group, a Central Joint Expert Group and an International Expert Panel. In addition, the Hai Basin Commission set up a KM Expert Group and ET Expert Group. The project design provided adequately for stakeholder involvement at lower levels (refer to 2.1.7).

Risk assessment

2.1.8 Critical risks were assessed at appraisal and, where appropriate, mitigation measures were correctly built in to the project or addressed during implementation so that they did not materialize. One risk that was not identified in the PAD was the risk associated with the advanced technologies that were selected to achieve project outcomes; in particular, the advanced ET technology and KM were not well developed at that time and had to be more fully developed during the project in order to apply it at a basin scale. This risk was overcome with government's strong support by allocating more external funding for development of the RS-based ET measuring technology.

2.1.9 Overall, this was a very timely, well designed, and highly innovative project.

2.2 Implementation

2.2.1 The implementation of the project kept in the right track towards its objectives after it became effective in July 2004. The investment progress was rather slow during the first two years mainly because of lack of counterpart funding at the Basin level. This issue was successfully resolved with the efforts made by the Hai basin Commission, MWR and NDRC. In addition, the project took more time than expected during the first two years to provide project staff with intensive training in Bank's procurement and financial management guidelines and project concept and approaches to ensure the quality of the project implementation.

2.2.2 Mid-term review. Conducted in December 2007, the MTR found implementation largely on track and noted the need to accelerate disbursement of domestic funds by some PMOs. The complexity of the KM and ET aspects of the project leading to project delays were identified. Following the MTR the government requested (a) extension of the Closing Date; (b) reallocation of the amount of the Grant allocated among Categories; (c) adjustment of the disbursement rate of concerned Categories (refer section 1.7); and (d) addition of a new Category "International Workshop", which were agreed by the Bank. There was no project restructuring.

2.2.3 The project was implemented very largely as designed, with only small adjustments following the MTR. The project met or exceeded most output targets. One target, the amount of Zinc to be removed in sediment from the Dagu canal was slightly (91%) less than the target. However the amount of sediment removed was 285% of the target and oil (287%) and Total Nitrogen (286%) substantially and consistently exceeded targets. The shortfall in Zn removal therefore can be reasonable be attributed to sampling errors at project design.

2.2.4 Overall, the timely MTR proved very effective in adjusting the project, accelerating implementation and disbursement. The CPMO's report provided a comprehensive review and analysis of project status. It highlighted seven important project actions requiring attention and recommended adjustments and remedial actions for the balance of the project (the MTR report at the project file).

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

2.3.1 The project monitoring and evaluation system, designed with consultant support, selected a large number of indicators to track outputs and outcomes for all parts of the project and at every level of implementation. The M&E groups at both central and local government levels were established to perform routine inspection against performance indicators. The M&E group at the central level was responsible for preparing consolidated M&E report for the whole project, and for analyzing and checking quality and consistency of the data collected by local M&E groups and then consolidating them for the entire project. The local M&E groups were responsible for collecting data from the data sources including monitoring stations in the field and KM System installed at Hai Basin Commission and project counties and cities according to the M&E design agreed during project preparation. The baseline surveys were conducted by all M&E groups right before the project against which the M&E group at the central level evaluated the project progress, outputs, outcomes / impacts of the project, and prepared a consolidated annual monitoring and evaluation report, and regularly reported this to MWR, MEP and the World Bank.

2.3.2 Procurement and financial management information system (MIS) was developed under the project as part of M&E system to keep cross-checking all the project progress numbers all the time from both procurement and financial reports and timely send an alert if there is an error detected by the system, and indicate where the error is. The system will stop working until PMO finds out the problem and makes corrections. In addition, the system helped the eight PMOs for project management and data consolidation, and also helped the CPMO to monitor and evaluate the progress for the entire project and consolidate the actual investment cost, disbursement and eligible expenses incurred from the eight PMOs of the project.

2.3.3 The activity was found to be more complex than planned and it was delayed due to the need to train domestic staff in performance management systems and the number of units and PMOs involved reporting. Overall, the monitoring and evaluation system was well designed and implemented with reliable information on the key outcome and output indicators generated.

2.3.4 The monitoring system is in place and it is expected that monitoring of ET, the water balance and pollutant discharges will continue after the project completion for its sustainability under a variety of programs and budgets including the government's Bohai Sea Ecological Improvement program.

2.4 Safeguard and Fiduciary Compliance

2.4.1 Financial management was generally of good quality. Capacity was built through the development of standardized written procedures and by intensive training. Issues detected through the supervision process were promptly resolved, and audit reports were timely and of acceptable quality. Procurement performance was good. The Management Information System (MIS) allowed real-time tracking of procurement and the prompt identification of issues. As a result, procurement was rapid and efficient and in line with Bank requirements despite the very large number of contracts and contracting units (23 PMOs).

2.4.2 Safeguard policies were adequately addressed at project design. During project implementation, the brief EMP prepared during project preparation has been well implemented and the impacts of the very small and limited amount of small civil works constructed under the project have been mitigated. Actually, this project is in fact a project to improve environment management in the Hai Basin, the entire PIP for the project was considered to be the overall EMP, which has been implemented as planned and benefited the environment and social aspects in the Hai Basin.

2.5 Post-completion Operation/Next Phase

2.5.1 **Follow-on:** It is assured that activities financed under the project will continue sustainably beyond project completion. Project concepts have been adopted in a number of the river basin level and national level issued policies, which fully supported enforcement of the most strict water resources management proposed in the 'Number 1 Central Document'. This is the first time that Number 1 Central Document' has addressed water resources management. The government has planned to develop a National Water Resources System that took reference of the project's KM system. Other project concepts and approaches that have been adopted and will continue post project include (i) budgeted continuation of joint decision making conference systems (joint leading groups) at HBC and ZWN as well as in the Municipalities and some pilot Counties; (ii) inclusion of the project concepts and results in the 12th 5-year water resources development plans at the various levels; (iii) inclusion of project results, approaches and targets (eg. ET, flow to Bohai Sea, water quality targets in Water and at Provincial borders) in the Hai Basin Master Plan for Water Resources Development as well as Municipal level Master Plans for Water Resources Development; (iv) data sharing agreements between Ministries and in some Municipalities, Provinces, and Counties; (v) the HBC ET Centre that is established with sustainable funding from water fees to continue the ET quota system; (vi) WUAs which improve livelihoods, provide better service and which are self funding; (vii) project concepts and approaches have been extended to other places in China. For example, ET monitoring is used in Gansu Province; consumption management is adopted in the MOF 'Irrigation Intensification Program'; the IWEMP approach was extended to Jilin Province; (viii) Other Bank projects have adopted project approaches.

2.5.2 **Scaling-up.** The project has successfully demonstrated IWEM for Hai Basin and for Bohai Sea ecological improvement. The government is keen to scale this up across the whole Hai Basin as well as across other river basins flowing into the Bohai Sea. Further illustration of scaling up is evident from inclusion of project approaches in national policy and Masterplans. In the Master Plan of Water Resources in Hai Basin (2011 - 2020) recently approved by the State Council, the project approach on ET management with remote sensing technology has been included as a new tool to control consumptive use of water resources in the Hai Basin.

2.5.3 Scaling up the project will require initiatives which include training and IWEM best practice; institutionalization of inter-Ministerial cooperation; further improvement of ET accuracy,

remote sensing (RS) and KM with practical and agreed ET targets, quotas and permits in non project counties; implementation of the 12th Five-year Plans and Master Plans for Water Resources Development; revision of laws and regulations to include modern concepts of water management developed in this project; establishment of long-term mechanisms and financing to ensure technological outcomes remain sustainable; and, data and information sharing between sectors in the project area as well as nationally. It would be advantageous to include the Ministry of Agriculture and the State Oceanic Administration in scaling-up the project.

2.5.4 It is recommended by the government and supported here, that the Bank and GEF support a follow-up phase to consolidate and extend project approaches across all basins flowing into the Bohai Sea consistent with the 12th Five-year Plan.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

3.1.1 The project, as designed and implemented, is entirely consistent with the Bank's CPS (2006-2010) in pillar 2 and 3 (see paragraph 2.1.11) and also in line with CWRAS on integrated water resources management and addresses key development priorities (balanced economic development and ecosystem protection) that remain highly relevant to China today and which are fully consistent with successive Five-year Plans. These have been recently captured in National level policies and river basin Masterplans. The specific targets of "water-saving" and "pollution-reduction" match the "energy-saving" and "environment-friendly" society development goals defined in the 11th Five-year Plan. The specific targets of "Zero over-exploration of groundwater", reduction of excess ET, reduction of pollutant discharge into rivers, and implementation of the strict water resources management scheme known as the three control "Red-lines". The project developed viable and replicable models for China to address these problems. The successful experience under the project is also of global significance, as many water scarce countries are beset by problems similar to those of China.

3.2 Achievement of Global Environmental Objectives

3.2.1 *Project outcomes*: Based on the detailed evaluation of the project performance indicators, the project fully achieved its development objective of catalyzing an integrated approach to water resource management and pollution control and this is demonstrated by the incorporation of project approaches and results into national level policies, Five-year Plans and Master Plans for river basin and administrative areas. The following is a summary of project outputs and outcomes achieved to support accomplishment of each of the four objectives of GEO (Annex 2 gives the details of project outputs, outcomes and impacts and their achievement, which contributed to the GEO):

(1) To improve integrated water and environment planning and management in the Hai Basin: The KM, ET, remote sensing, and the 8 Strategic Studies were completed and informed policy at National, Hai Basin and Municipality/Provincial levels. The 3 demonstration projects of real water saving, water allocation and withdrawal, and pollution permitting and groundwater development, were successfully implemented and results promulgated. IWEM plans were developed for all 16 pilot Counties (PAD target was 10) and implementation commenced. Strategic Action Plans were prepared for Hai Basin and ZWN sub-basins. Targets to reduce groundwater overdraft exceeded targets by more than 500%. The project has had a profound impact on the understanding of

sustainable water resources management and the need to control water consumption rather than supply.

(2) To support institutional aspects related to effective local, municipal/provincial, and basin-wide water and environment planning and management: This included joint PMOs and Experts Groups at different levels, cooperative and information sharing between water and environmental agencies, vertical and horizontal integration, and establishment of the regular joint decision making conference systems at the river basin and administrative levels. WUAs were established well in excess of project targets (407 vs 65) substantially exceeding the target. Technical assistance was provided by domestic and international expert panels.

(3) To support capacity building in water and environment knowledge management and implementation: it was achieved via project implementation and special studies as well as by the domestic and international expert panels, 155 domestic, and 9 international events, and 57 study tours (43 domestic), and 2 large international workshops involving more than 200 international and domestic experts and over 160 papers. As a result, substantial progress has been made in capacity building of a large number of the government staff and experts through the project preparation and implementation with knowledge sharing of project innovations, new concept and approaches.

(4) To reduce wastewater discharges from small cities along the rim of the Bohai Sea: Wastewater discharges from small cities along the rim of the Bohai Sea were much reduced and project targets exceeded, for example, reduction in COD and NH3-N from pilot Counties exceeded the target by around 135% and 146%, respectively and targets for reduction in pollutants entering the Bohai Sea were exceeded by 200-300%.

3.2.2 *Project innovations and sustainability*: The project was successfully implemented with the following innovations which also contributed to accomplishment of four objectives of GEO and proved to be effective and sustainable for integrated water and environment management in Hai Basin of China.

(1) Introduction of new concept of real water savings which targeted a reduction in consumptive use or ET rather than just increases in irrigation efficiency alone which normally leads to increases in consumptive use of water through increased effective irrigation areas. This innovation introduced new concept and approach to improve the traditional approach for integrated water and environment management in the Hai Basin. Experience in China had shown that focusing on improvements to physical infrastructure alone might increase irrigation efficiency but it could also reduce groundwater recharge by increasing the proportion of rainfall or irrigation water consumed by crops through ET. This reduced availability of water for other users and the environment. Only a reduction in actual consumption of water represented a genuine saving of the resource to the hydrological system. The project therefore introduced ET quotas or targets, which were based on the actual ET measured with remote sensing technology, and the models of surface water and groundwater use and systems. As well as setting quotas to balance water supply with water consumption and to reduce over use of groundwater, it also acted to raise understanding of real water savings and sustainable water use. To ensure sustainability, the consumption-based water withdrawal control has been tested in the demonstration subprojects in Hebei and Beijing, where the target ET has been converted into withdrawal which the farmers could use as the new limit to reduce groundwater overdraft and where only can the allocated consumptive use of water or target ET be

traded among water users, rather than the amount of water withdrawal. Based on the testing, subproject design for irrigated agricultural water savings based on this new concept has been extended to other water scarcity areas to ensure that the actual consumptive use of water or ET is less with the subproject than without the subproject. In addition, ET-based design approach for irrigated agricultural water savings developed under this project was recently awarded the second price for agricultural water savings by the Ministry of Water Resources.

(2) The introduction of institutional mechanisms for cooperation among government departments in different sectors rather than the traditional sectoral line management and top down (command and control) direction. This integrated institutional management proposed horizontal (cross-sectoral) cooperation between MWR, MEP, MOA and the MOC, and their national, provincial and county equivalent agencies. The innovation also include vertical cooperation between administrative levels, and refers to direct communication and constant interaction between project activities at the national, HBC, sub-basins, Municipality/Provincial, County and Village WUA (farmer) levels. The integrated management also included establishment of horizontal and vertical project coordinating mechanisms, signing of data sharing agreements, establishment of a joint decision making conference system at the Hai Basin and ZWN Sub-Basin, and inter-agency decision making committees at the county level, and a suite of strategic policy studies and demonstration projects to deal with issues important for IWEM and the project. To ensure sustainability, the joint review and approval of water withdrawal permit and wastewater discharge permit have been tested by the water and environment departments under the project in Hebei and Tianjin, which has strengthened enforcement of pollution control. The joint decision making conference system established under the project will continue to work and a data sharing agreement signed jointly by MWR and MEP will be implemented in the Hai Basin after the project completion.

(3) The introduction of a Basin-wide Knowledge Management (KM) System (including application of remote sensing ET measuring technology) located at the Hai Basin Commission and local governments which included decentralized knowledge hubs at lower project levels, and made it technically possible to share and allocate data at both basin and county levels by local governments and water use sectors within the basin. The key part of this is that a quantitative linkage has been established of the monitoring indicators (e.g. target ET and target pollution discharges) between the basin-level and field-level, which greatly facilitated the integrated river basin management. During the project implementation, MWR and MEP shared information and used common technical tools to facilitate joint and consistent decision-making. This KM system included shared water and environmental data and developed or adapted a variety of models and decision support systems for water use and pollution management. It served as a basis for IWEM decisions by water and environment agencies. To ensure sustainability, the target ET has been included in the Master Plan of Water Resources in Hai Basin, which has been officially approved by MWR, NDRC, and State Council. The indicator of target ET will be monitored and evaluated with satellite remote sensing technology to control water use at both basin level and water user level after the project completion. In addition, the project helped to establish two permanent ET Application Centers at the Hai Basin Commission and Beijing Water Affairs Bureau, which measure, monitor and evaluate ET changes over the irrigated areas in the Hai Basin during and after project implementation.

(4) The development and implementation of sub-basin and county-level Integrated Water and Environmental Plans (IWEMPs) to return surface and groundwater use and pollution discharge to sustainable levels consistent with the project's goals, ET quotas or targets, and water quality targets for water function zones. The IWEMPs also considered the ecological water requirements both in stream and also to achieve flow and quality targets for the Bohai Sea. To ensure sustainability, the IWEMP prepared and completed under the project for Tianjin has been officially approved by the Municipal Government of Tianjin and the IWEMPs completed for 16 pilot counties have been approved by the respective county governments. All these IWEMPs have started to implement during the project implementation and will continue to implement after the project completion.

(5) Public participation: During project implementation, the outcome was achieved by establishing Water Users Associations (WUAs) and by promoting Community Driven Development (CDD) that farmers' income increased greatly while consumptive use of water was reduced. The core value of the CDD/WUA approach was to mobilize farmers' incentives to participate in the whole process of the project design, implementation, operation and management. The communities made decisions on their own choices on the ways to increase their incomes and on how they were going to do water management, particularly on irrigated agricultural water savings and O&M of the on-farm systems. The cropping pattern adjustments have been considered by farmers under the project to ensure that water was used for higher-value crops to increase farmer incomes and water which was really saved was allocated to restoration of ecosystems. Beijing project area of farming region that is overdrawing its aquifers, the project helped 360,000 farm households to save water and to leapfrog technology. Each farmer got a prepaid card for water. Once it was used up, the pump shut down. Farmers used less water, they used it better, and their incomes increased fivefold. This project approach has been scaled up to other areas in North China.

(6) Introduction of incentives for small-town waste water treatment and management was tested in Tianjin and proved to be effective. In China, a quite number of completed small waste water treatment plants are not able to maintain their O&M because charges for treatment collected from water users are too low to cover the cost of O&M. Hence there are little incentives for investors to build, operate and maintain these plants. To resolve this issue, incentives have been given to investors through providing subsidies to maintain O&M of the plants until the charges on treatment increase to cover the cost. The experience and lessons achieved under the project in this regard are to be extended to other small-towns in Hai Basin for waste-water treatment and management.

(7) The demonstration and studies with experiences and lessons summarized by MEP for non-pollution source control in ZWN sub-basin proved to be effective. Currently non-point pollution sources take an increasingly bigger proportion in water pollution with the substantial reduction of point-pollution sources in China. In north China, most of non-point pollutants stay where they are produced rather than enter into rivers because there is much less rainfall than in the south China. They become potential pollution sources and would make much more serious water pollution once they are flushed into rivers during floods. The project summarized the experience and lessons based on the results of demonstration in reducing non-point pollution sources and potential pollution sources in ZWN sub-basin, which are to be extended to other semi-arid or arid areas in China.

3.3 Efficiency

3.3.1 The expected project benefit targets were reached as described elsewhere. A project-specific analysis of GEF incremental costs was prepared for the PAD (Annex 4) as per GEF requirements, and this was revised using the same methodology at completion.

3.3.2 The total cost of the Baseline Scenario was estimated in the PAD at US$206.95 million, including GOC expenditures of US$118.72 million and IBRD financing of US$88.23 million. The ICR analysis undertook the same approach to defining baseline scenario costs, which is too conservative but readily quantifiable and practical. For the GEF alternative, the total cost is composed of baseline scenario costs (US$ 206.95 million at PAD), plus incremental costs US$ 132.59 (US$ 131.57 at PAD). This includes US$34.34 million for GEF project total costs (refer to Annex 1 of this ICR) and US$98.25 million from TUDEP2 for the Dagu Canal Rehabilitation and Suburban Sewerage components of TUDEP2. Its successful implementation was dependent upon GEF Project implementation. Annex 3 presents the Incremental Cost Analysis and shows the incremental cost distribution according to project component.

3.3.3 Benefits accrued to a large number of beneficiaries though the pilot, county level, IWEMPs, CDDs, County level demonstration projects, and WUAs much exceeding PAD targets. To this can be added non-quantifiable social and environmental benefits. As indicated, the project also had a very direct and significant impact on national policy and the 12th Five-year Plan and this will have significant impact on all river basins contributing to the Bohai Sea, throughout all of China, as well as internationally through China's international assistance programs and influence.

3.3.4 Without GEF support, achieving IWRM at the county, provincial, river basin and national levels is unlikely because of the well known difficulties in inter-jurisdictional and inter-administrative cooperation and inadequate programs to implement government policies at grass roots level. Additionally, GEF support was able to shift government focus from measures that are visible and with immediate effect and thus geared towards infrastructure; to management that results in the most cost effective and efficient measures being taken. The GEF project was able to fill gaps and complement other related initiatives in the region as well as in China. In doing so, synergies and spin-offs between initiatives were able to be achieved including internationally. These impacts are not quantified here. In total, this is a highly satisfactory result.

3.4 Justification of Overall Outcome Rating

Rating: Highly Satisfactory

3.4.1 The project was highly relevant to current country and global priorities and to the Bank China Country Partnership Strategy (CPS/2006-2010); it met or exceeded all targets as measured by outcome and impact indicators and so fully attained all development objectives.

3.4.2 The rating is further justified by the highly innovative nature of the project (Section 3.2) and successful implementation, particularly as some of these innovative elements have since been embraced in a new and pioneering National level policy, the 12th Five-year Plan, Master Plans at various levels and extension to other regions in China. The project provides optimism that with wider roll-out it is indeed feasible to improve the ecological conditions of the Bohai Sea as well as to move water utilisation on the North China Plain to sustainable levels.

3.5 Overarching Themes, Other Outcomes and Impacts

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

3.5.1 Many beneficiaries are rural poor and it is likely that many of the beneficiaries were below the official poverty lines. Women were involved in WUAs and training and elected to WUA committee posts although there is no direct information quantifying the extent of the involvement. In some WUAs there is a 30% female membership requirement.

3.5.2 The number of WUAs implemented far exceeded the project target. The ICR found that the WUAs were very positively pro-poor and provided and benefited disadvantaged groups including the poor and women. The model is efficient, effective and easily replicable.

(b) Institutional Change/Strengthening

3.5.3 The project included many significant institutional impacts with longer term ramifications (section 3.2) and this was one of the goals of the project. Two that deserve emphasis are the signing of data sharing agreements between the Water and Environmental Ministries and the joint (MWR-MEP) preparation the "Master Plan for Water Pollution Prevention and Control in the Hai Basin during the 12th Five-year Plan Period". Joint CPMOs were effective at all levels.

(c) Other Unintended Outcomes and Impacts

There were no unintended Outcomes or Impacts noted.

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

3.6.1 Efficient, consumption based, irrigation management leads to saving water, energy, and money. It also leads to higher water productivity and crop yields, reduced agricultural labor, increased farmer and household incomes, environmental benefits and a sustainable water supply. The win-win benefits of management ease, increased water productivity, increased yields and increased household incomes, are the major incentive for farmers' involvement and enthusiasm.

3.6.2 Beneficiary surveys in seven of the involved villages, clearly demonstrated these impacts (Annex 5). Typically for example, water quotas have been reduced by 40% since 1999 in Beidonggu Village of Guantao County and one irrigation cycle has been reduced from 20-30 days to 7 days and labour hours for irrigation were reduced by 35%. In Wuji Village of Cheng'an County, field labor per household was reduced from 3 to 1 person and a male is no longer needed in the field and so more remunerative, off-farm income can be sourced thereby greatly increasing household incomes. In Dashawu Village of Beijing Municipality, wheat yields have increased by more than 60% due to more productive and water efficient varieties. Such experiences are spread rapidly and led to the rapid adoption of the WUA approach much beyond project boundaries.

4. Assessment of Risk to Development Outcome

Rating: Negligible to Low

4.1.1 The risk to the development outcome is considered negligible to low and can be demonstrated as the project's concepts and approaches have been adopted by project partners and captured in recent national policies as well as the recent 12th Five-year Plan and 'Hai River Basin Integrated Water Resources Master Plan'. The 'Number 1' central document of the CPC Central

Committee calls for 'increasing fiscal investment in water resources development' and 'striving to make the annual average investment in water resources development from the whole society twice as much as in 2010 in the coming ten years'. The national policy also states that 'implementation of the strictest water resources management system' will be achieved through control of 'the three red lines' (control of total amount of use, water use efficiency, and pollutant discharge).

4.1.2 Risk to integrated planning and management: Integrated planning and supporting KM systems are well established and accepted at the different levels of government. Consumptive ET control is well understood and is institutionalised into current planning and management using simplified water balance models. There is a risk that Remote Sensing based ET management will not be adopted as further work is required to prove the methodology under all conditions. However, there are few alternatives to monitoring water use and consumption over such a large area, without considerable investment in flow measurement and groundwater monitoring equipment. This is essential to implementing a system of permits and regulation of water use. The government has planned on-going funding of the Hai Basin ET Centre and so development and application of the approach will continue.

4.1.3 Risk to institutional aspects of integrated management: The concepts of vertical and horizontal integration are well understood and adopted. There is a slight risk that cooperation between Ministries may not continue however this is considered slight. Since the project commenced the SEPA was promoted to a Ministry level giving it equal seniority to MWR. The two Ministries have experienced the benefits of working together, established post-project collaborative systems, signed data sharing agreements and harmonized systems such as Water Function Zones. There is a risk to the sustainability of WUA and CDD systems as, at least in some Municipalities, there is a relatively high cost associated with government agency support and the sustainability of this could be questioned. On the other hand there has been a rapid adoption of WUA at the farmer level and so it is reasonable to expect that a lower cost model of WUA would evolve with time provided farmers continue to see the private benefits of the approach.

4.1.4 Risk to capacity building: The project has achieved much capacity building both in agencies directly responsible for the project but also in the institutions and Universities that provide technical services to the project. The government has also established an on-going ET Centre at the HBC which will continue to build capacity. Therefore the risk here is negligible.

4.1.5 Risk to reduced waste water discharge from cities along the Bohai Sea: Infrastructure has been established and targets have been exceeded. There is a risk that with continued population migration to the coastal zone that waste water discharge will rise. However this is thought unlikely because of the priority and investment being made to improve Hai Basin and Bohai Sea conditions by the government. Other projects have demonstrated that there is scope to improve plant efficiencies fairly easily.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

Rating: Satisfactory

5.1.1 Overall, the Bank ensured, through the preparation and appraisal process, that the project design was sound and that the project could achieve its development objectives. The Bank also ensured that fiduciary arrangements were adequate and that provision was made to respect safeguards. The project was of very high strategic relevance, and the Bank played an important role in ensuring that it was responsive to issues of the highest concern to policy makers. Preparation and appraisal of technical aspects was well conducted tapping international expertise where needed. The Bank effectively engaged government in dialogue, studies and fieldwork to develop and build support for the inclusion of the many major project innovations. Bank involvement enabled cooperation between agencies, data sharing, joint reporting, and the pushing of ET based management and IWEMPs, etc..

5.1.2 The novelty and complexity of some of the technical elements of the project (KM and ET) and that related management systems needed to be developed, however, resulted in some minor implementation delays and ultimately a necessary project extension.

(b) Quality of Supervision

Rating: Satisfactory

5.1.3 During supervision, the Bank maintained a focus on development impact, emphasizing the targeted outcomes and the innovations being developed by the project. Supervision was undertaken professionally and, emphasized and continued to build understanding, support, and ownership for the more difficult innovative aspects of the project. The supervision of fiduciary and safeguard aspects were of good quality and specialists in financial management, procurement and social science participated consistently in supervision.

5.1.4 Issues for project implementation were promptly raised, discussed and resolved. Aide memoires and supervision reports were full and clear. Supervision inputs and processes were adequate. The MTR was well prepared and the mission well staffed. Preparation for the ICR process provided training of project staff at all levels in ICR requirements and also focused on transition arrangements

(c) Justification of Rating for Overall Bank Performance

Rating: Satisfactory

5.1.4 The Bank teams played an important role in ensuring quality at entry and in resolving problems and identifying opportunities during supervision. The Bank had a substantial input into the success of the project.

5.1.5 The project introduced many innovations essential to the sustainable improvement of Hai Basin and Bohai Sea conditions which, without the efforts of the Bank team and its cooperative and supportive approach to government, are unlikely to have been introduced or achieved.

5.2 Borrower

(a) Government Performance

Rating: Highly Satisfactory

5.2.1 The government had and maintains a strong commitment to the project's development objectives and this is exemplified by the incorporation of project approaches into national policy.

5.2.2 There was a strong commitment by central and local governments during preparation and then implementation. This resulted in a well coordinated and effectively implemented project and loan and counterpart funding. There was a good working relationship established with the Bank. There was notable involvement of the Ministry of Finance as a full project partner at central and local levels. Joint PMO and agency coordination arrangements were established. Central and local government ensured that the CPMO and PMOs at all levels were financed, fully staffed, trained and effective.

5.2.3 Government, although initially unconvinced by some of the proposed innovations or their necessity, accepted the lengthy process of dialogue and study needed to work out the project concept, design and methodologies. Some of the innovations such as joint PMOs and data sharing are unusual in China. As well, the bottom up participative approach of the project is contrary to traditional top-down approaches. The PMOs also took action to address any issues as they arose and actively implemented recommendations following Bank missions. A project wide M&E system was developed and utilized by the project.

(b) Implementing Agency or Agencies Performance

Rating: Highly Satisfactory

5.2.4 PMOs at Central Municipal/Provincial, HBC, and County levels were committed to achieving development objectives. The project was complex to implement because of the large number of PMOs involved and innovative or new concept and approaches (section 3.2.2), rather than the traditional approaches. The CPMO performed well in this complex environment and in directing and supporting other PMOs. Implementation issues such as project guidelines, staffing, training, financial management, procurement, M&E and preparation for the ICR were undertaken effectively and mostly in a timely way. Relationships between partners were good.

(c) Justification of Rating for Overall Borrower Performance

Rating: Highly Satisfactory

5.2.5 Overall Borrower performance is rated as highly satisfactory. Project approaches are being adopted more widely in the Bohai Sea catchment area and China more generally.

6. Lessons Learned

6.1.1 This project offered many innovative aspects in an overall and well throughout package. The package was effective in changing mindsets to water resources management to an integrated approach that uses water consumption metric. The project stressed cooperative and integrated management, and policies and technologies that can be readily up-scaled.

6.1.2 An innovative but initially contested approach to water resources management was successfully tested and mainstreamed because of a partnership approach between the Bank and GOC, the flexible and learning approach under the project, and the structural linkages between project elements. Lessons from the project include:

(1) *Targeting reduction in consumptive water use and based on ET can be a powerful instrument for water resources management in conditions of competing water demand for multiple uses, particularly in physical water scarcity areas arid and semi-arid regions in the World.* Targeting reduction in consumptive water use and adopting measurement and management based on ET was highly contentious. Eventually ET based consumption control was accepted as the basis for allocation of water rights and quotas at all levels from sub-basins down to individual farmers. Using ET and remote sensing technology for measurement and management are powerful instruments for changing understanding and paradigms about real water savings and water conservation where water is scarce.

(2) *Time is required to change mindsets and demonstrate the necessity of new and advanced concepts and approach, although there have been initial and good outcomes during a very short period of implementation.* This project introduced many innovative aspects, some of which contradicted traditional approaches and which were not immediately accepted such as consumption rather than withdrawal control; cross-sectoral (horizontal) and top down-bottom up (vertical) integration rather than single Ministry top-down control; and the content and design of river basin KM systems. Where approaches are not accepted, or where concepts are advanced, there is likely to be scepticism, dispute and sometimes opposition. Changing mindsets takes time and can interfere with project implementation. However, once officials, technical staff, and farmers outside the project areas can have a chance to see the benefits change or good effects achieved under this project can then happen quickly.

(3) *A new project focusing on implementation of the existing new approach, policy interventions and technologies developed under this project is needed as a follow-up to resolve the potential issues or problems which may be emerged during the project implementation.* This project spent 2/3 of time for development of the new approach and policy interventions but the time left for implementation is relatively short to further test and improve the developed approach and proposed interventions. It is important that complex technologies and support systems are developed and tested for a longer period so that stakeholders/end users can fully understand the approach. However, with limited time available, this project successfully did this in pilot counties so that the technologies and approaches could now be more readily rolled out across the whole Hai Basin or wider Bohai Sea catchment as well as more widely in China and internationally.

(4) *Coordination of a large network of decentralised management units requires well resourced and highly experienced central coordination*. This project used a decentralized management system in which implementation and financial management were delegated downwards to many lower level PMOs in a variety of ministries, institutions, and at various levels of government. This created accountability at all levels however it greatly increased the complexity of bringing uniformity and compliance to all aspects of management. Starting projects modestly to build the capacity and experience of PMOs is recommended before taking on large and complex projects. Thus the experience of the current CPMO, decentralized PMOs and established joint decision making conference system would make increasing the scale of this project highly feasible.

(5) *Incentives are required to make the water consumption approach work at farm level*. Government investment for not only engineering works but also for supporting agronomic and cropping pattern improvements and improving irrigation management thereby raising farmer incomes and reducing water consumption are important. In the case of the Hai Basin, proximity to large urban markets, it would be important to

facilitate cropping change to large extent to produce higher value products per unit of water. WUAs proved to be an important mechanism that resulted in farmer benefits and water saving.

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

7.1 Borrower/implementing agencies

7.1.1 The draft ICR was delivered to MWR and MEP for review and comments. The comments received are given in Annex 6, which focuses on the recognition of the values added by this project: (a) a new approach has been developed and used for overall control of total consumptive use of water and of maximum pollution load discharge at the basin level, which closely links to control of water use and pollution discharge at the water user level. This approach is available in time to support the government strategy on performing the most stringent water resources management system as outlined in the central document No. 1 in 2011; and (b) a joint decision-making conference system has been established and tested on integrated water resources and environment management between the water conservancy and environmental protection departments and all other stakeholders in the Hai Basin, and a cooperation mechanism has been built up in all levels of water resources and environmental protection departments, which has been jointly participating in the integrated water and environment management in the Hai Basin.

7.1.2 The above values added by the project, among others, recognized by the government are fully consistent with all four objectives of the GEO for this project, particularly with the first objective - to improve integrated water and environment planning and management in the Hai Basin, and also with the second objective - to support institutional aspects related to effective local, municipal/provincial, and basin-wide water and environment planning and management. It's believed that this project would play an important role in the future as an example to improve the integrated water and environment management in the water scarcity areas in China.

7.2 Co-financiers

None

7.3 Other partners and stakeholders (NA)

7.3.1 Based on the survey and field visits to the project areas, the response from farmers has been very positive and supportive about the project implementation because their incomes have been increased greatly project-wide, while a big amount of water has been saved.

Annex 1. Project Costs and Financing

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

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
1. INTEGRATED WATER AND ENVIRONMENT MANAGEMENT	13.9168	14.814	106%
2. KNOWLEDGE MANAGEMENT	5.8540	6.281	107%
3. TIANJIN COASTAL WASTEWATER MANAGEMENT	4.1255	4.462	108%
4. PROJECT MANAGEMENT, MONITORING AND EVALUATION, AND TRAINING	8.6290	8.976	104%
Total Baseline Cost	**32.5253**		
Physical Contingencies	0.2956		
Price Contingencies	0.4967		
Total Project Costs	**33.3176**	**34.533**	**104%**
Project Preparation Facility (PPF)	0.00	0.00	
Front-end fee IBRD	0.00	0.00	
Total Financing Required	**33.3176**	**34.533**	**104%**

(b) Financing

Source of Funds	Type of Co financing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower		16.3176	17.575	107.7%
Global Environment Facility (GEF)		17.00	16.958	99.8%

Annex 2. Detailed Outputs and Outcomes Achieved by the Project

Key Performance Indicator (KPI)	Baseline Value	Original Target Value (PAD)	Formally Revised Target Value (MTR)	Actual Values Achieved (ICR) (2010)	Percentage of PAD
I. GEF Operational Program Outcome/Impact Indicators					
1. Reduced pollution loading to the Bohai Sea from pilot counties by 10%	Total discharge from Counties COD 164,000 t/y NH3-N 19,000 t/y	County discharge reduction to achieve 10% reduction in amount reaching the Bohai Sea COD 16,400 t/y; NH3-N 1,900 t/y		Total reduction of Discharge COD 38,615 NH3-N 4,665	COD 135% NH3-N 146%
2. Disposal of 2.2 million cubic meters of contaminated sediment in Dagu Canal in an environmentally safe manner	Baseline: No disposals	2.2 million m3	NA	6.26 m3	285%
3. Reduced pollution loading to Bohai Sea from at least one Tianjin small city by 10,000 tons of COD and 500 tons of NH4 annually	Baseline: No reduced pollution loading	COD 10000 t/y NH3-N 500 t/y	NA	COD 9,855 NH3-N 620.5	98.5% 124%
4. Development of replicable practical approaches to reducing pollution to the Bohai Sea that can be used throughout the Hai Basin and in other Chinese basins	***Qualitative Indicator:*** Baseline: As far as water use control and pollution control were concerned in the Hai Basin, there were no linkages between the Hai basin level or county level and water user or pollution maker levels. There had been no national level 'Number 1 Document' dealing with integrated water and environment management. Achievement: The approach for integrated water and environment management was developed and carried out at both river basin level and water user level with quantitative linkages in-between. The linkages include the maximum consumptive use of water (or target ET) and maximum discharge of water pollution loads as targets to be enforced at both river basin level and water user levels. Both target ET and pollution loads were allocated from the Basin level or county level to water users and pollution makers. This approach can be extended to the other counties in the Hai Basin and the counties in other basins that flow into the Bohai Sea as well as nationally. The exceptional practices of this project are: (a) target ET has been incorporated into the Water Resources Master Plan of the Hai River Basin as a total				

	control indicator, which has been approved by MWR and NDRC, and used as indicators to control water use from the Hai Basin level down to the county and water user levels; (b) target discharges of pollution loads from provinces, cities and counties to rivers and to Bohai Sea have been set up and used as total control indicators and by the national pollution control standards; and (c) IWEMPs at city and county levels have been prepared using the Target ET from the Hai Basin level and target pollution load discharge (national requirement) from the Hai basin level or/and local government levels. Project concepts and themes have been adopted in national level policies at the highest State level. Project concepts and results have been adopted in the 12th 5YP including in projects elsewhere in China.					
Global Objective Outcome/ Impact Indicators						
5. A functioning inter-agency committees established at the county level, with improved cooperation and integration of WRM and pollution control activities with support from upper levels (prefectures, provinces, HBC, Zhangweinan, MWR and SEPA)	No county inter-agency has been established	10	16	16	160%	
	Qualitative Indicator: Baseline: Prior to the project there were no interagency committees established at County level involved in cooperation and integration of WRM and pollution control activities and which were supported from upper levels. Achievement: 16 pilot Counties have functioning interagency committees and PMOs integrating IWEM activities compared to the targeted 10. The committees were supported from upper levels in line with the project design.					
6. Institutions implementing IWEM have adopted improved WRM and pollution control approaches at the county level (including ET and KM management, water rights and well permit administration, and discharge control) with support from upper levels (prefectures, provinces, HBC, Zhangweinan, MWR and SEPA)	No counties with IWEMPs	10	16	16	160%	
	Qualitative Indicator: Baseline: Prior to the project IWEM was not adopted and water was not controlled according to consumption limits, rights/permits and there was limited pollution control. There was no knowledge of ET consumption control and no KM systems to support WRM or pollution control. Participation in water and environmental management was limited. Support from upper levels was limited (the exception being Counties previously involved in the Bank's WCP project). There were no interagency committees established at County level involved in cooperation and integration of WRM and pollution control activities and supported from upper levels. Achievement: KM, ET/consumption control and pollution discharge measures have been applied successfully through IWEMPs with initial implementation of measures. There is widespread participation in WUAs with broadening community involvement based on CDDs.					
7. Improved small city wastewater management approaches have been implemented in Tianjin coastal counties, including collection, industrial pre-	***Qualitative Indicator:*** Baseline: The TUEDP2 project had commenced small city waste water management (prior to this project). Achievement: This project worked in close cooperation with the TUDEP2 and provided TA assistance for industrial pollution control, remediation of contaminated canals flowing into the Bohai Sea, and small city WWM institutional and financial issues.					

	treatment, wastewater treatment, and wastewater reuse				
8.	Discharge pollution load reduced by 10% in pilot counties and coastal counties	COD 164,000 t/y; NH3-N 19,000 t/y	Refer to KPI 1. Above		
9.	Groundwater overdraft for irrigation purposes reduced by 10% in pilot counties	420 million m3/y	42 million m3/y		266 million m3/y	533%
10.	Reduction of pollution loading to Bohai Sea from at least one Tianjin small city by 10,000 tons of COD and 500 tons of NH4 annually	Baseline: no reduction	COD 10000 t/y NH3-N 500 t/y	NA	COD 9,855 NH3-N 620.5	98.5% 124%
11.	Disposal of 2.2 million cubic meters of contaminated sediment from the Dagu canal, and achieve a onetime reduction of 10,000 tons of oil, 2,000 t Zn, and 5,000 t TN	Baseline: No reduction	Sediment: 2.2 m m3 Oil: 10,000 t Zinc: 2,000 t Total Nitrogen: 5,000 t		Sed: 6.26 m m3 Oil: 28,670 t Zinc: 1,822 t TN: 13,379 t	Sed.: 285% Oil: 287% Zn: 91.1% TN: 268%
12.	Development of replicable practical approaches to improving water and environment management resulting in sustainable water resources use and management that can be used throughout the Hai Basin and in other Chinese basins	1. The established *Joint Decision Making Conference System* was tested and proved to be workable administratively for Integrated Water Resources Management (IWRM) in ZWN sub-basin and Hai Basin; 2. The established *Basin-wide Knowledge Management (KM) System (including application of remote sensing ET measuring technology),* which made it technically possible to share and allocate data (including allocation and sharing of target ET and target pollution discharges) at both basin and county levels by local governments and water use sectors within the basin; 3. The introduced *New Concept and Approach for Real Water Savings* (reduction of ET or consumptive use of water) worked well and proved to be very effective and workable in physical water scarcity areas like Hai Basin for sustainable use of its water resources; 4. The introduced *Integrated Water and Environmental Plans (IWEMPs)* at the local government level were prepared and implemented to return surface and groundwater use and pollution discharge to sustainable levels consistent with the project's goals, ET quotas or targets, and water quality targets for water function zones; 5. The established *CDD-based Water User Associations (WUAs)* at the bottom level worked well and played an important role in participatory irrigated agricultural water savings while; 6. The introduced *Incentives for Small-town Waste Water Treatment and Management* were tested in Tianjin and proved to be effective and the experience and lessons can be extended to other small-towns in Hai Basin for waste-water treatment and management; and 7. The *experiences and lessons summarized by MEP for non-pollution source control in ZWN Sub-basin* proved to be			

	effective and can be extended to other areas where non-pollution is the major sources for pollution. The above mentioned innovations have been working in the Hai Basin and can be replicable in other river basins in China. However, they would need to be further refined and improved in the Hai Basin and during their applications and replications in other river basins.
II. GEF Operational Program Output Indicators	
Component 1 - Integrated Water and Environment Management	
13. IWEMPs for 10 counties and the Tianjin Municipality	***Qualitative Indicator:*** Target: 10 IWEMPs prepared and initial implementation started by 03/31/2007. 65 WUA formed and active Achievement: 16 IWEMPs, 160% of target, were completed and acceptance review passed by CMPO in 2010/11. Implementation of core parts of the IWEMPs (consumption control) had commenced by due dates. A total of 407 WUAs, 526% of target, were established greatly exceeding the target. Comment: Completion of IWEMPs were caused by delays in KM and ET projects as well as the time required for project staff to fully understand the project's new concepts and approaches. Consumption control using water balance approaches were used in earlier versions when the delays in ET and KM projects became apparent. This information was used to educate officials effectively so that later implementation proceeded rapidly and smoothly.
14. Improved institutional coordinating mechanisms for IWEM established and functional	***Qualitative Indicator:*** Target: Institutional coordination mechanisms for IWEM established and functional by 12/31/2004 and updated later on in each year, including 12 high-level Coordination Leading Groups (CLG) and 13 joint PMOs, and 13 expert groups. Achievement: Completed. Overall project coordination arrangements in place by due date. 16 at Pilot Counties (IWEMPs) by 2006. Coordination arrangements (CLG) included: 1 national level, 5 at Municipal/provincial (incl. HBC and ZWN) level, and 16 at county level; 5 expert groups (domestic and international), and 23 joint PMOs. Comment: The project's institutional coordinating mechanisms were instrumental in joint project management between the water end environment Ministries at different levels, data sharing agreements, a joint Masterplan for the Hai Basin, and use of Joint Expert Groups and project supervision. Joint management arrangements have been agreed by the Ministries to continue after project completion. Finalising arrangements in pilot Counties delayed as guidelines developed and explained to County leaders.
15. Strategic Studies: SS1: Policy and Legal Framework and Institutional Arrangements SS2: Bohai Sea Linkage SS3: Countermeasures for the Protection and Measurement of the Water Ecological System SS4: Water Savings and High	***Qualitative Indicator:*** Target: Strategic studies prepared and preliminary findings integrated into IWEMPs by 12/31/2006 Achievement: All Strategic Studies were completed and acceptance. Appraisal passed by CMPO in early 2011 indicating the results were highly satisfactory. Results of SSs had been promoted to IWEMPs throughout the project. Comment: The results and achievements of the SSs are evidenced by their inclusion and impacts in IWEMPs, national policy, national laws, the State Council's 'Number One Document' for 2011, the '3 red lines' policy and, in the Masterplan and 12th 5YPs at the Hai Basin, Provincial and County levels.

Efficiency Water Utilization SS5: Administration of Water Rights and Well Permits, and Sustainable Groundwater Exploitation SS6: Wastewater Reuse SS7: Water Pollution Planning and Management SS8: Rationalization of Beijing Water Resources	Specific significant impacts from the studies and which have been applied in policies, laws, IWEMPs, SAPs include: reforms which institutionalise cooperative management of the Hai Basin; ecological flow and quality targets for Bohai Sea and within key river systems; ET concepts and targets; modelling approaches that support ET management in the SAPs and IWEMPs; assessment of the extent of groundwater resources and (reduced) exploitation targets; reuse standards and re-use of waste water; industrial restructuring and closure of highly polluting factories to reduce pollution; optimised allocation of water in Beijing from the South to North Transfer which also included utilisation of results from other SS. The studies also have identified future policy and planning changes that are needed.
16. SAP for Hai Basin and for Zhangweinan sub-basin	***Qualitative Indicator:*** Target: (i) Hai Basin SAP prepared by 12/31/2008; (ii) Zhangweinan SAP prepared and initial implementation has started by 12/31/2006 Achievement: Completed in May 2011. Comment: These were very challenging projects technically and due to their scope and complexity. Management and technical staff and advisors required more time to understand and apply the advanced technologies and concepts (KM and ET) and this led to delays in project results. The Hai Basin SAP, in particular is a very well developed and comprehensive plan and this has fed through into the 12 5YP Masterplan for the Hai Basin.
17. Demonstration Projects: (i) Real Water Savings (ii) Management of Water Rights and Well Permits (iii) Control of Wastewater Discharge (iv) Pollution Control and Water Environmental Improvements	***Qualitative Indicator:*** Target: Demonstration projects prepared, implementation begun, and findings integrated into IWEMPs by 12/31/2006 Achievement: Completed by 2009. Project findings were extended to and included in IWEMPs throughout implementation using mechanisms such as field visits, workshops and conferences although time limited the extent that this was possible Comment: Greater time than originally anticipated was required for leaders, managers and technical staff to understand and absorb the project concepts and approaches. The projects were found to have successfully demonstrated approaches for real water saving and pollution control that were adopted by IWEMPs and SAPs. There is substantial opportunity to extend these results much more widely in the Hai Basin, China and internationally.
18. Policies, mechanisms, and instruments supporting IWEM	Target: Policies, mechanisms and instruments are defined and implemented Achievement: Completed 2009. ET, KM and SSs results were applied to IWEMPs and SAPs and technical assistance provided Comment: Policy impacts went well beyond the original project targets through incorporation into national level policies and plans as described above.
Component 2 - Knowledge Management	
19. Integrated Water Resource – Water Quality Information	***Qualitative Indicator:*** Target: Integrated Water Resource – Water Quality Information Management System created, tested, implemented, and

Management System	functional by 12/31/2006 Achievement: Completed in 2010 and included in Hai Basin, Zhangweinan, Beijing, Tianjin and pilot Counties KM systems. A Data Sharing Agreement that included 32 hydrological stations, 75 water quality stations, and achieved the integration of Water Function Zones and Water Environment Function Zones, was signed between MWR and MEP enabling building of an integrated system. The approach was adopted and incorporated into the National Water Resources Management System and also applied elsewhere in China. Comment: Greater time than originally anticipated was required for leaders, managers and technical staff to understand and absorb the project concepts and approaches. The modelling platform developed as part of the system was used to support IWEMPs and SAPs as well as the 12th 5YP Hai Basin Masterplan. Impacts are very significant for integrated management.
20. Application Systems for the former	***Qualitative Indicator:*** Target: Application System developed, established, and functional by 12/31/2007 Achievement: Completed 2010. The system and modelling platform was used to support IWEMPs and SAPs as well as the 12th 5YP Hai Basin Masterplan. Comment: Greater time than originally anticipated was required for leaders, managers and technical staff to understand and absorb the project concepts and approaches.
21. ET Management System	***Qualitative Indicator:*** Target: ET Management System established, tested, and functional by 12/31/2006 Achievement: Completed 2009. The management and visualisation system as included in the KM is well developed, however the ET measurement technology and link to a permitting system is still under development and verification. Comment: This project was very ambitious as it aimed to apply innovative technology which was still under development. The extent of further development, testing and verification required was more than anticipated. The project has received considerable attention and interest within China and from academic institutions. It has been instrumental in changing the water control paradigm from one of water supply, and then volume demand management to one of consumption control and management. The technology has been used in other parts of China and the underlying R&D has also received national level financial support. The concept should be applied across all Counties within the Hai Basin to set water consumption quotas and where verified supported by the RS-ET technological system.
22. Mechanisms for the continuation of above systems after the Projects finalization	***Qualitative Indicator:*** Target: Mechanisms for making permanent KM and ET systems established, tested, and functional by 12/31/2008. 1 ET centre established. Achievement: Completed in 2010; development of technology delayed (PI 20); 2 ET centres established. The ET concept has been well extended to project institutions at all levels as well as more widely throughout China. Comment: The mechanism for continuation is in place including through government policy and a sustainable funding basis at the Hai Basin Commission level for the KM centre. The Beijing Municipality has also implemented a Municipal level ET Centre and system.

Component 3 - Tianjin Coastal Wastewater Management	
23. TA for the renovation and remediation of the Dagu Canal	***Qualitative Indicator:*** Target: Technical assistance provided, and the first stretch of Dagu Canal up to Jugezhuang Pump Station is successfully rehabilitated by 12/31/2008 Achievement: Completed 2010 according to report of TUEDP2 PMO report. Comment: Sediments and pollutants removed far exceeded targets (refer to Impact Indicators 2 and 12 above).
24. Dagu Catchment Industrial Pollution Control	***Qualitative Indicator:*** Target: Industrial Pollution Control study for Dagu canal catchment completed, implementation of action plan underway, and preliminary study results integrated into Tianjin Municipal IWEMP by 12/31/2006 Achievement: Study on industrial source control was completed in 2008 and results included in the Municipal IWEMP including the use of advanced technologies for the disposal of polluted sludge. The project findings were extended to other locations. Comment: Completion data adjusted in line with TUEDP2 project and as reported in 2008 and 2009
25. Comprehensive Wastewater Management Study	***Qualitative Indicator:*** Target: Comprehensive wastewater management studies for two small cities completed, prepared, and implementation of recommendations started by 12/31/2005 Achievement: Small town integrated sewage wastewater management report completed and acceptance review completed in 2009 The project findings were extended to other locations Comment: Completion data adjusted in line with TUEDP2 project
26. Small Cities WWT Financial Incentive Mechanisms	***Qualitative Indicator:*** Target: Small city financial incentives mechanisms tested and functioning for at least one small city by 12/31/2007 Achievement: Completed June 30 2011. The financial incentives mechanisms were successfully tested before the closing date, although substantially delayed. Government intends to extend the approach to other small wastewater treatment plants. Comment: Implementation delayed.
Component 4 - Project Management and Training	
27. Joint Expert Groups	***Qualitative Indicator:*** Target: Expert Groups including International Expert Panel functional by 9/30/2004 Achievement: Completed and functioning effectively from 2004. Achievement of Target: Highly Satisfactory Comment: The joint expert groups and international panel were implemented from the start of the project and they have contributed significantly to the success of the project.
28. Conduct Training, Workshops and Study Tours	***Qualitative Indicator:*** Target: Training, Workshops, and Study Tours included in annual training plans and carried out accordingly. Achievement: Completed at all levels. A total of 164 training sessions, 9 internationally led sessions, 155 domestic

	sessions, 57 study tours (43 domestic and 14 international) were conducted. Comment: Exchange between project components and locations implemented effectively using guideline and standards development, training courses, field trips, workshops, domestic and international conferences etc
29. Monitoring and Evaluation, specifically of IWEMPs and Demonstration Projects	***Qualitative Indicator:*** Target: Project-wide Monitoring and Evaluation (M&E) system in place by 12/31/2004 Achievement: Completed. A comprehensive M&E system was developed and maintained under complex circumstances due to the number of PMOs and number of projects many with significantly different characteristics. The system was used to monitor progress, reporting to Bank supervision missions, and, for annual, MTR and ICR reporting. Comment: Development of and M&E system for such a complex and for such a decentralised project would have been very challenging and took some time for the project staff to understand the advanced concepts and approaches. The M&E system that was developed was comprehensive and effective in dealing with all aspects and components of the project. It was significant in supporting the ICR.
	Qualitative Indicator: Target: Management Information System (MIS) operational by 9/30/2004 Achievement: MIS operational and decentralised to all PMOs and used to conduct project finance and procurement planning, monitoring, and reporting. The system continued to be strengthened and updated during the project. Comment: The system was well developed with the assistance of the Bank

Annex 3. Incremental Cost Analysis

Introduction

1. The project has successfully achievement its PDOs the expected outcomes as contained in PAD and described in this ICR. This forms the basis for the updated incremental cost analysis which, by and large follows the rationale and methodology adopted in the PAD and updates the incremental costs with actual disbursements. It should be noted that the calculation of the project costs for the baseline scenario is very conservative (see Section on Baseline scenario below).

Background and Broad Development Goals

2. **Background:** The Hai Basin is home to over 120 million people. It is spread over four provinces and the municipalities of Beijing and Tianjin and accounts for some 15 percent of China's GDP. The Project area is one of China's most important river basins, industrial and agricultural regions. Water has played a pivotal role in the development of the Basin, and sustainable development is heavily dependent on water resource management. Like many other areas in China, the Hai Basin is facing serious water-related problems, including water pollution, water scarcity, diminishing water supplies and flooding. Over-exploitation of groundwater, estimated by some to be 9 billion cubic meters annually, overuse of surface water resulting in inadequate environmental flows, along with increasing groundwater and surface water pollution, are contributing to the decline and deterioration of water resources and damaging the freshwater and coastal environments of the Hai Basin. Present water use patterns in the Hai Basin are not sustainable and continued rapid economic growth is jeopardized. The Basin discharges into the Bohai Sea and is a major contributor to pollutant loadings. The sea, international water, is an important eco-system and fishery resource, reflecting its role as a seasonal spawning and nursery ground for the larger and more productive Yellow Sea. However, heavy land-based pollution from urban, industrial, agricultural, and other sources in the Hai Basin, combined with over-fishing, reduction of freshwater inflows, and habitat loss, threatens the fishery and steadily diminishes many of the Bohai Sea's eco-system functions.

3. **Strategic Goals:** The Chinese government's long term social and economic plans (embodied by its five year plans) for the Hai Basin aim to improve water resource management and to restore the environment and Bohai Sea– notably through pollution control measures. Specific measures include greater efficiency in water use, water diversions from the Yellow River to the Hai Basin, and improved flood control measures. While these initiatives are vital, they address problems of immediate concern and insufficiently address longer-term challenges. The south north transfer of water from the Yangtze River to northern China including the Hai Basin is a more long-term solution, but will still be inadequate to meet demands without performing the most strict water resources management systems.

Baseline Scenario

4. By definition, this scenario comprises previously agreed plans and initiatives of the Chinese Government to address water related problems at national and local levels. It reflects the likely situation concerning the Hai Basin and Bohai Sea in the absence of GEF support. It includes the various national programs and more detailed investment programs, generally formulated by sector management agencies and local governments, to implement the national plans.

5. The PAD Incremental cost analysis (Annex 4 of PAD) provided a long list of national plans and regional programs/project, among others, including the following programs and projects:

National Plans

- 10th National Five Year Plan (2000-2005): Emphasized the need for sustainable management and use of water resources, especially intensifying agricultural water-saving and wastewater reuse efforts. (Planned Investment: US$ 30.5 billion)
- China Trans-Century Green Program: Emphasized construction of urban environmental infrastructure. The Program has three phases, spanning 15 years. Formulated through joint efforts of SEPA, The State Development Reform Commission (SDRC), and the State Economic and Trade Commission, it is an umbrella program for all pollution control initiatives in China, including water pollution control of the Hai Basin. (Planned Investment: component of National Five Year Plan)
- The South-North Water Transfer Project (SNWT Project): This, at the time, proposed Project was to address the serious water scarcity problems in North China, including the Hai Basin. The intention was to transfer 20 bcm water from the Yangtze River system to North China. (Planned Investment: US$10-15 billion)
- Bohai Blue Sea Action Plan: The plan sought to influence urban development, the economic structure, and the adoption of clean production technologies. High priority is given to the control and prevention of land-based pollution. The intention is to invest in new and improve existing sewage treatment plants, recycling and reuse of waste, and the adoption of various "clean" technologies. (Planned Investment:US$7.2 billion)
- Water Pollution Prevention Program of Hai Basin: The Program endeavored to ensure that all industries abide by national discharge standards and improve water quality. (Planned Investment: US$5.3 billion for water pollution control)
- Hai Basin Comprehensive Management Plan: The Plan incorporated flood control, water resource management, and soil and water conservation. (Planned Investment: US$1.5 billion)
- National Irrigated Agriculture Water-Saving Program: The Program endeavored to rehabilitate irrigation systems and improve irrigation technologies in 300 counties, identified as demonstration sites. (Planned Investment: US$5.2 billion)

Beijing Municipality

- *Plan for Sustainable Use of Water Resources in the Capital in the 21st Century (2001-2005):* It focused on the development and protection of water resources. By 2005, Beijing Municipality planned to achieve water savings of 790 million cbm, reuse 645 million cbm of treated wastewater, supply 150 cbm of water from rain and flood sources, achieve a groundwater balance in the city, and ensure that the water quality of the city suburbs reaches national standards. (Planned Investment: US$3 billion)

Tianjin Municipality

- *Hai Basin Tianjin Municipality Wastewater Treatment Project:* The Project would complete the Municipality's 1958 Sewerage and Drainage Master Plan, which designates six drainage zones, a WWTP in each zone, and separate sanitary and storm sewers. (Planned Investment: US$274 million)

Hebei Province

- The Hebei Provincial Government outlined an ambitious environment protection plan for the province up to the year 2010 to be implemented in three phases. The plan was consistent with national environmental plans including the Trans-century Green Engineering Plan and the Hai River Pollution Control and Prevention Plan, which are mentioned above. (Planned Investment: TBD)

Related Projects financed by the World Bank and the Asian Development Bank

- Water Conservation Project
- 2nd Tianjin Urban Environment Project
- 2nd Beijing Urban Environment Project
- FY01 Hebei Urban Environment Project
- Agenda for Water Sector Strategy for North China
- Tianjin Wastewater Treatment and Water Resources Protection Project
- Coastal Resource Conservation and Environment Management Project for the Bohai Sea

6. It has to be taken into account, however, that these national plans are highly ambitious and are sometimes not fully realized. Related activities are often carried through to the next planning period and tend to be large scale investments, leaving out the medium to small scale investment level. Another important issue is the institutional fragmentation of water resource management as it involved amongst others, the following agencies: the Ministry of Water Resources (MWR), the State Environment Protection Administration (SEPA), the Ministry of Construction (MOC) and the Ministry of Agriculture (MOA). Each agency has its own planning process, frequently leading to overlapping and/or inconsistent plans and programs.

7. All these investments were large and may not all directly contribute to the Project objectives of moving towards integrated water resources management in the Hai Basin and small city and suburban wastewater treatment. Even for those water treatment projects undertaken in the counties and peri-urban areas (in the same GEF project areas) by the local governments, which are directly linked to the small cities water treatment support component, the estimated investment reached some US$ 7 billion. For the purpose of the incremental cost analysis of the PAD, it was decided to only include in the Baseline Scenario those investments related to the closely-linked TUDEP2 and Water Conservation Project (WCP) that would contribute to the Project objective of integrated water and environment management. In this regard, using data from TUDEP2 and WCP, the total cost of the Baseline Scenario was estimated in the PAD at US$206.95 million, including Government of China expenditures of US$118.72 million and IBRD financing of US$88.23 million[1]. The analysis for ICR takes the same approach to defining baseline scenario costs although these are obviously too conservative but readily quantifiable and practical.

[1] The Baseline Scenario included all the costs of WCP and only the costs of Water Reuse and Institutional Development components of TUDEP2.

Global Environmental Objectives

8. Success in managing the Hai Basin and restoring and protecting the environment of the Bohai Sea is of global importance, because the trans-boundary effects of water pollution are severe. The Bohai Sea, the Yellow Sea, and the East China Sea are connected, forming a continuous circulation system. The Bohai Sea and the Yellow Sea are a single large marine ecosystem and interdependent fishery. Approximately 600 million people live in the basins that drain into the Yellow Sea and many depend on it as a source of livelihood. Damage to the Bohai Sea's function as a nursery area for fish and shellfish stocks damages the resource wealth of the Yellow Sea. The implications are even more widespread, for pollution of the Bohai Sea ultimately affects the East China Sea.

9. The deterioration of the water resources in the Hai Basin is severely impacting the quality of life of millions of people in a river basin with major population, industrial production and agriculture production. Water pollution and water scarcity impact on agricultural production and human and environmental health. Deterioration of the environment is also hampering poverty reduction, the most seriously impacted are often the most vulnerable.

10. The GEF Alternative Project will assist China to significantly improve its water resource management practices. From a global perspective, this improvement would result in the following benefits:

- It would help improve the Bohai Sea environment, contributing thereby to maintaining fishery stocks and biodiversity of the Yellow Sea and the East China Sea more generally;
- Poverty reduction enhances social stability which, if not addressed, has national and potential international implications;
- An integrated approach to water resources management in the Hai Basin would provide a model for wider application in China;
- Success in China would encourage other developing countries to draw upon the lessons learned.

GEF Alternative

11. The GEF Program for the Hai Basin and Bohai Sea encouraged a more comprehensive integrated water resource management approach. As mentioned in the Base Scenario, water resource management involves amongst others, the following agencies: MWR, MEP, MOC and the MOA. Each agency has its own planning process, frequently leading to overlapping and/or inconsistent plans and programs.

12. The GEF program helped to give direction to and ensure that various plans of the agencies involved in the Hai Basin were coordinated and properly integrated. The central focus of the GEF alternative was to support the formulation of Integrated Water Resource and Environmental Management Plans (IWEMPs) in pilot counties and at the sub-basin and basin levels. Attempts to improve water resources management in China have been very top down, with strong laws, policies, regulations and large investments, but with insufficient bottom up implementation at the grass roots level. The purpose of the IWEMPs was to address integrated planning and to implement practical bottom up actions that translate top down initiatives into bottom up results. The IWEMPs developed under the GEF program included water user participation and local government ownership in the development of plans that address:

i. Water quality management aspects, concentrating on point and non-point sources of pollution through the implementation of discharge controls, industrial restructuring to clean industries, wastewater treatment in small cities, industrial wastewater treatment, and agricultural and livestock production related pollution controls,
ii. Reuse of treated wastewater,
iii. Improvements in water use efficiencies that result in "real" water savings by reducing non-recoverable losses particularly ET,
iv. Implementation of effective water rights and well permit systems,
v. Increasing water pricing combined with volumetric measurement,
vi. Conjunctive use of surface run-off and groundwater, and
vii. Ecological restoration.

13. In addition, Demonstration Projects were implemented in selected counties to deepen experience in key complicated areas including: (i) "real" water savings, (ii) administration of water rights and well permits, (iii) pollution control, and (iv) ecological restoration. Strategic Studies at the basin level were to address important basin policies, programs and approaches in order to ensure adequate government support to the lower levels for planning and implementation of the IWEMPs and demonstration projects. Lessons learned from the pilot counties and demonstration areas were to be shared with other counties throughout the Hai Basin and elsewhere in China. An integrated approach was also to lead to a better understanding of important surface/subsurface and water quality interactions, and facilitate new management techniques.

14. Without GEF support, integrated water resource management at the county level would have been unlikely to be achieved because of the already mentioned difficulties in inter-jurisdictional and inter-administrative cooperation, and inadequate programs to implement government policies at the grass roots level. Each agency has its own programs with generally ineffective bottom up implementation, inadequate coordination, and little vertical and horizontal integration of activities. Water resource management involves many agencies. While the MWR has the primary responsibility for overall management of the nation's water resources and SEPA has overall responsibility for pollution control; there are considerable overlapping jurisdictional problems between these agencies and with other ministries and agencies concerning: urban water supply, water pollution control, groundwater management, and irrigated agriculture. MWR's and SEPA's management role is further limited by the increasing powers of provinces following the decentralization process. The GEF Program has provided a powerful demonstration effect and an incentive to break through institutional barriers.

15. The Project also included an integrated program to improve basin-wide measurement, monitoring, modeling, and data sharing that greatly enhanced water resources management. River reach files with a common coding system have been developed and implemented and this allows the sharing of information that will satisfy both SEPA and MWR needs, as well as the lower-level needs at the county level. Applications have also been developed that support the needs of integrated water resources management for the different entities. These activities under the Project are referred to as Knowledge Management (KM). KM improvements are needed because an adequate system of data collection and analysis is critical to integrated water resources management.

16. Monitoring is another serious problem in the Hai Basin. Without effective monitoring and enforcement, it is impossible to have an adequate system of water rights administration or volumetric pricing.

17. This is the first GEF initiative of this kind. A further global benefit, therefore, is the important demonstration effect of solving problems related to water resources through adopting a comprehensive integrated management approach for a globally important river basin. The Project helped to provide the management framework for integrated water resources management, which is indispensable for a long-term sustainable approach to water use in the Hai Basin and to reducing pollution into the Bohai Sea.

18. Although government policy calls for an integrated framework, experience has shown that inter jurisdictional, and inter-administrative cooperation often proves difficult. The GEF grant has provided an incentive to break through institutional barriers and it should provide a powerful demonstration effect.

19. The rationale for GEF involvement was that, without support, the Government tended to focus on measures that are visible and with immediate effect, and thus geared towards investment in infrastructure rather than management activities and research (see baseline scenario). The Government and research institutes would need to improve practical experience in designing integrated water resources management instruments resulting in sustainable use of water resources and environmental protection/restoration. The international expertise that accompanies GEF Projects would provide Chinese authorities with a broad range of management experiences and instruments to draw on.

20. In addition to the global benefits described above, the Project also generated significant supplementary benefits for China. The IWEMPs formulated under the Program enabled government agencies at various levels to better manage and use water resources in the Hai Basin. The improved knowledge management system, including ET management for the Hai Basin, helped government agencies formulate efficient and sustainable water resources policies and ensured effective enforcement of water pollution regulations and laws. These benefits are not in the baseline scenario because of inadequacy of financing and institutional capacity limitations. ET management using remote sensing is a principal innovative and international cutting edge approach being introduced under the Hai Basin Project. The key to sustainable water quantity management in the Hai Basin is to reduce present amounts of ET to sustainable levels, and the Project provided a practical and feasible approach for achieving this objective. Eventually reducing ET to sustainable levels will result in stabilization of groundwater systems and the long-term provision of water for environmental purposes including delivery of fresh water to the Bohai Sea.

21. The wastewater management for small cities and industries along the coastal area (component 3) directly addressed GEF's Operational Program #10 by demonstrating ways to reduce land based-sources of marine pollution, in this case to the Bohai Sea. China presently pays very little attention to small cities and suburban industrial pollution, concentrating almost exclusively on pollution control in large urban areas.

22. The Project leveraged GEF funds by supporting infrastructure investments in small cities and suburban areas financed under the World Bank-financed Tianjin Urban Environment and Development Project (TUDEP2). In addition this component supported cleanup of the Dagu Canal system which has served as the main wastewater canal for Tianjin City for four decades and which discharges directly into the Bohai Sea. China has many of these large sewerage discharge canals that need to be renovated and the Project will provide a demonstration on technically and environmentally sound approaches for this.

23. Success of this component provided powerful demonstrations of how to begin to address these huge and presently largely un-addressed pollution problems.

24. Although the scope of the proposed GEF Program is small compared to the enormity of reducing pollution of the Bohai Sea, it provided important demonstration effects. It supported technical assistance to control pollution from secondary cities, and suburban and rural areas, which account for more than half the pollution loadings entering the Bohai Sea. The global benefit, therefore, will be laying the groundwork for substantial reduction of pollution of the Bohai Sea and an improved marine environment. This, in turn, will contribute to sustainable management of the Bohai Sea and maintaining fish stocks and the biodiversity of the Yellow Sea and East China Sea.

Related GEF Projects

25. The GEF Project builds upon, fills in gaps, and complements other related initiatives in the region that are supported by GEF. By contributing to improvement of the Bohai Sea environment, the Program addresses an important missing link in the China/GEF relationship. China is a participating state in two GEF/UNDP Projects for improvement of the Bohai Sea environment: "Partnerships in Environmental Management for the Seas of East Asia" (PEMSEA); and "Reducing Environmental Stress in the Yellow Sea Large Marine Ecosystem" (YSLME). The proposed GEF alternative also complements initiatives supported by other international agencies.

26. The PEMSEA Project is designed to assist the East Asia Sea Region to collectively protect and manage the coastal and marine environment through intergovernmental and inter-sectoral partnerships. It involves ten countries in Asia, including China. A key element is to facilitate development of institutional capacity, management strategies and action plans to deal with land-based pollution. The Bohai Sea is identified as a sub-regional sea under stress and a pollution "hot spot". A demonstration site has been established to reduce waste discharges and to address environmental problems common to adjacent provinces and municipalities. The GEF Program for the Hai Basin and Bohai Sea complements the PEMSEA Project in two important ways:

- It will contribute to PEMSEA's objective to control land-based sources of pollution of the Bohai Sea;

- It will complement PEMSEA's efforts to establish inter-jurisdictional coordinating mechanisms to address environmental issues in the Bohai Sea by promoting integrated water resource management in the Hai Basin.

27. The YSLME Project is a regional effort involving China and the Republic of Korea to formulate and implement a regional Strategic Action Program (SAP). The Democratic People's Republic of Korea has also been invited to participate in the Project, although it has so far declined formal involvement. The long-term objective of the Project is ecosystem-based, by supporting environmentally-sustainable management and use of the Yellow Sea. As mentioned earlier, the Bohai Sea is critical to maintaining the fish stocks and biodiversity of the Yellow Sea. The Hai, Liao, and Yellow Rivers have important effects on salinity in the western Yellow Sea. Therefore, the SAP must involve the Bohai Sea and the Hai Basin. The proposed GEF alternative will contribute to YSLME Project's long-term objective and support the formulation and implementation of the SAP.

Incremental Costs Matrix

28. As discussed in the Baseline Scenario section above, the Government of China has plans or is in the process of implementing huge investments that will result in improvements in water quantity and water quality conditions in the Hai Basin with consequent improvements to the Bohai Sea.

29. All these investments were enormous and may not all directly contribute to the Project objectives of moving towards integrated water resources management in the Hai Basin and small city and suburban wastewater treatment. Even for those water treatment projects undertaken in the counties and peri-urban areas (in the same GEF project areas) by the local governments, which are directly linked to the small cities water treatment support component, the estimated investment reached some US$ 7 billion. For the purpose of the incremental cost analysis, at PAD it was decided to only include in the Baseline Scenario those investments related to the closely-linked TUDEP2 and Water Conservation Project (WCP), that would contribute to the Project objective of integrated water and environment management. In this regard, using data from TUDEP2 and WCP, the total cost of the Baseline Scenario was estimated in PAD at US$206.95 million, including Government of China expenditures of US$118.72 million and IBRD financing of US$88.23 million[1]. At ICR, the analysis takes a same approach to defining baseline scenario costs, which is obviously too conservative but readily quantifiable and practical.

30. For the GEF Alternative, the total cost is composed of baseline scenario costs (US$ 206.95 million), plus incremental costs US$ 132.59 (including US$34.34 million for this GEF project total costs[2] and US$98.25 million from TUDEP2 for The Dagu Canal Rehabilitation and Suburban Sewerage components of TUDEP2, as its successful implementation was dependent upon the GEF Project implementation). The table below shows the incremental cost distribution according to Project component.

[1] The Baseline Scenario included all the costs of WCP and only the costs of Water Reuse and Institutional Development components of TUDEPII.
[2] See Annex 1 of this ICR.

Table: Incremental Cost Matrix (in US$ Million)

Component	Category	US$ Million	Domestic Benefits	Global Benefits
1. Integrated Water and Environment Management (IWEM)	Baseline	187.85	(i) Water conservation in irrigation agriculture and reduction in surface and groundwater overuse	Some improvement of Bohai Sea marine and coastal environment and protection of fish stocks and biodiversity.
	Alternative	202.68	(i) Demonstration effect of adopting integrated water management measures to control water pollution and deal with water shortage and other related problems; (ii) Reduction of marine pollution caused by land-based sources, especially pollution from secondary towns and their associated industries; (iii)Improvement of public health because of better water quality and pollution reduction; (iv) Improvement of the environment of the Hai Basin; (v) Protection of fish stocks and biodiversity; (vi) Enhanced habitat & species protection	Demonstration effect of adopting integrated water and environment management measures to control water pollution and deal with water shortages. Further improvement of Bohai Sea marine and coastal environment and greater protection of fish stocks and biodiversity
	Increment	**14.83**		
2. Knowledge Management	Baseline	3.82	Improved Knowledge Management in Water Conservation and Pollution Control.	
	Alternative	10.1	Improved Integrated Knowledge Management System for the Hai Basin and improvements in the conservation of water resources and the water environment.	Demonstration of adopting integrated water management measures to control water pollution and deal with water shortage and other related problems.
	Increment	**6.28**		
3. Small Cities Waste Water Treatment	Baseline	0	No known direct benefits	
	Alternative	102.53	Improvement of the water quality of the Hai Basin and improvement of public health because of better water quality and pollution reduction.	Reduction of marine and coastal pollution caused by land-based sources, especially pollution from secondary towns and their associated industries.
	Increment	**102.53**[1]		
4. Project Management and Training	Baseline	15.28	Improved Public Sector capacity for water conservation and pollution control.	
	Alternative	24.23	Increased public sector capacity for Integrated Water and Environmental Management and improved institutional arrangement for integrated water	

[1] Including US$98.25 million from TUDEP2 for The Dagu Canal Rehabilitation and Suburban Sewerage components of TUDEP2, as its successful implementation was dependent upon the GEF Project implementation.

			resource planning and management	
	Increment	**8.95**		
Total	Baseline	206.95		
	Alternative	339.54		
	Increment	**132.59**		

Annex 4. Bank Project Implementation Support/Supervision Processes

(a) Task Team

Names	Title	Unit	Responsibility/ Specialty
Project preparation			
Olson, Douglas	Task Team Leader, Principal Water Resources Engineer		
Jiang, Liping	Co-Task Team Leader, Sr. Irrigation Engineer		
Braedt, Oliver	Natural Resource Management Specialist		
Broadfield, Robin	Sr. Regional Coordinator		
Browder, Greg	Sr. Water Resources Specialist		
Dong, Yi	Financial Management Specialist		
Lin, Zong-Cheng	Social Development Specialist		
Nguyen, Hoi-Chan	Sr. Counsel		
Nygard, Jostein	Sr. Environmental Specialist		
O'Leary, Robert	Sr. Finance Officer		
Png, Margaret	Sr. Counsel		
Reyes, Arlene	Program Assistant		
Sun, Chongwu	Sr. Environmental Specialist		
Yang, Dawei	Procurement Specialist		
Zhou, Weiguo	Operations Officer		
Supervision/ICR			
Jiang, Liping	Task Team Leader, Sr. Irrigation Engineer		
Lyle, Clive	Consultant, Water Resources		
Zhang, Kaiping	Consultant, Project Management		
Liu, Xueming	Economist, FAO		
Su, Yibing	Consultant, Environment		
Li, Ou	Consultant, Social Assessment		
Olson, Douglas	Principal Water Resources Engineer		
Browder, Greg	Lead Water and Sanitation Spec		
Dong, Yi	Sr Financial Management Specialist		
Guo, Xiaowei	Senior Procurement Specialist		
Lin, Zong-Cheng	Senior Social Development Spec		
Wang, Yuan	Procurement Specialist		
Zhou, Weiguo	Operations Officer		
Chen, Xin	Sr. Program Assistant		
Chen, Jianxin	Interpreter		

(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		
FY02	20	33.33
FY03	35	102.05
FY04	40	189.88
FY05	10	1.78
Total:	105	327.04
Supervision/ICR		
FY04	2	0.13
FY05	35	100.50
FY06	20	64.67
FY07	20	64.84
FY08	22	78.88
FY09	15	35.00
FY10	15	30.00
FY11	20	42.00
Total:	149	416.02

Annex 5. Beneficiary Survey Results

Seven project villages from Beijing and Tianin Municipalities and Hebei Province were examined using Participatory Impact Assessment methodology at project completion. The surveyed villages were selected from different project counties and involved, as far as possible, different conditions such as irrigation infrastructure, irrigation management or project features (such as community driven development or CDD/WUA pilot, Demonstration WUA, Extension/ordinary WUA, etc.). The results of the sessions from the surveyed villages are summarized in Table 1. The results are:

The participatory establishment and development of WUAs. No concrete guidance such as an operational manual on participatory development of WUAs was provided by the project however, Beijing and Tianjin PMOs developed some high quality approaches. In Hebei Province, CDD pilots were mostly promoted through the establishment and operation of WUAs. Relevant concrete objectives, methodologies and framework were designed and WUA development was participative. These pilots provided a demonstration of the process and functions for the project areas of Beijing and Tianjin Municipalities. Participative, WUAs were strongly supported by local government.

Activities conducted by the project or the duties and responsibilities of WUAs. Project beneficiaries through WUAs conducted many activities which benefited their livelihoods and water management. Activities and benefits varied between WUA and there was sharing of experiences between them. Beneficial activities conducted included:

- Establishment of the WUA organization, and selection of water managers/heads. Women were active members of all WUAs surveyed;
- Establishment and use of water use regulations and procedures in the WUA, including water allocations, fund raising and collection of water charges and electricity fees, record keeping of agricultural and household water use, and, systems of reward for efficient water use and penalties for overuse;
- Provision of household, metered supply of good quality water;
- Transformation or improvement of the irrigation infrastructure;
- Formulation and changes of the water saving and cropping patterns including agronomic practices, unifying households land holdings to improve productivity and efficiency. In Guantao County, wheat was reduced from 2,000 mu in 2001 when the WUA was established to 1,100 mu in 2005; while cotton increased from 300 mu up to 1,200 mu during the same period. Drought resistant and high-yield wheat varieties were adopted requiring 1 – 2 irrigations compared to the 4 irrigation required previously;
- Maintenance of the relevant water control equipment;
- Raising villager awareness of water saving and water environment protection.

Table 1: Data on demography, land, infrastructures, etc. related to water use and WUA establishment process and composition

Hebei			
County	**Guantao**	**Cheng'an**	
Village	**Beidonggu***	**Huying***	***Wuji***
Project feature	CDD/WUA pilot	Extension WUA	*CDD/WUA pilot*
Participants of survey	WUA/CDD's head + vice head, 3 well's heads, 3 F + 5 M villagers, 1 doctor, 1 veterinary surgeon	1 township leader, 2 WUA executives (1 being village leader), other 2 village leaders 9 F + 3 M villagers	*WUA (head, vice head, financial manager, electrician, WURs, F + M villagers*
Water related demographic, land & infrastructure data	400 HHs, 1,600 people, 2,330 mu arable land (irrigable), 39 machinery wells (22 since project)	270 HHs, 1,300 people, 2,000 mu arable land	*360+ HHs (22 villagers' representatives), 1600+ people, 2,800 mu arable land, 42 wells*
WUA(/CDD) organizational process/ composition	Organized		*1 WUG/well*

Tianjin		
County	**Baodi**	**Ninghe**
Village	**Zhanglan***	**Duli**
Project feature	Project WUA	*Project WUA*
Participants of survey	PBS, VCD, WUA head, 3 WURs (M), 2 F + 5 M villagers	*WUA head (PBS/VCD), male + female villagers*
Water related demographic, land & infrastructure data	156 farm HHs, 580 people (506 agric.), 800 mu arable land (irrigable, 760 wheat- maize, 40 veg.), 14 wells (4 since 2004)	*230 HHs, 1,000 people, 2,015 mu arable land (60% paddy; greenhouse veg, cotton)*
WUA(/CDD) organizational process/ composition	Established in 2004 (1 head + 2 executives), reorganized in 2010 (head + 11 WURs,1/15 HHs, all men)	*300 mu wasteland was reclaimed + a reservoir built in 2002 to store rainfall and drainage, association to store water set up; reorganized as WUA in 2004.*

Beijing		
County	**Tongzhou**	**Pinggu**
Village	**Dashawu***	**Yuzishan**
Project feature	Project WUA	*Project WUA*
Participants of survey	WUA head (PBS), vice head (VCD/WMA/ electrician), 1 F+1 M WMAs, 2 pump's heads, 1F+4M villager	*Township WR station officer, WUA's head, WMAs, male + female WURs*
Water related demographic, land & infrastructure data	500 HHs (330 farm HHs), 1,200 people (960 agric.), 1,200 mu arable land (600 mu contracted to HHs, 600 mu leased to outsider), 15 wells	*500 mu arable land (250 mu greenhouse),* *17 wells (15 for irrigation)*
WUA(/CDD) organizational process/ composition	WUA was established in March 2008 through Villagers' Congress. It consists of the head, vice head, other 2 WMAs, 15 pump's head, one/a well	*Elected by VR congress, consists of 4 executives (head, vice head, etc.), 8 WMAs*

Outcomes, impacts and changes brought about by the project. Impacts of the project on WUAs and farmer water users in Beijing and Tianjin include:

- Water use quota's have been much reduced for example in Beiguo village it was 570,000 m^3in 1999 and in 2010 1it was adjusted to 350,000 m^3. However cropping adjustments and water savings have more than compensated for this.

- Farmer's demand for irrigation water has been met, their time and labor inputs reduced, costs of water and electricity use reduced, cropping patterns adjusted, size of animal raising enlarged, the benefit or income from water use increased, etc. Their demand for safe drinking water had been met at the same time.
- The time, labor, electricity and water for irrigation have been greatly saved.
- As a result of improved infrastructure and management, the area of irrigated crops and proportion of cash crops, use of water saving crops and varieties, yields, water productivity and incomes have all increased. For example income has increased from 100 – 110 yuan/day plus the meals to more than 80,000 yuan/yr. Labor hours for irrigation have also been reduced by around 35%.
- The waste of irrigation and water-for-life has been reduced. For example, Duli Village reduced the use of well-pumped groundwater with the construction of a reservoir that enabled substitution of the deep drainage from surplus rainfall with storage of the water. This reduced the proportion of irrigation water use from 40% to less than 10%. Water usage in Zhanglan village was reduced by 20-30% per annum after water supply was piped and power costs reduced by 25% by replacing warn out pumps. The replacement of earthen channels with pipes has reduced the time for 1 irrigation cycle from 20-30 days to 7 days.
- The problem and difficulty of collecting water charges has been resolved through metering in particular, so that now this new system of irrigation management is financially sustainable.
- Accessing funds for large scale infrastructure repairs or replacement became feasible through negotiation and making financing arrangements with village collectives.
- Women contribute greatly to family's livelihoods and community development. Prior to the water management changes, three people were needed for irrigation, including at elat one man. Now one woman can manage irrigation so that men can work in non-farm activities to earn money. WUA also require that women occupy more than 1/3 of places,
- Elimination of the conflicts and disputes between users and between village leaders and villagers. As a result, the relationships have improved and, in particular, the rights and demand of the marginalized groups for water use has been satisfied.
- Falling levels of groundwater of the last 30 years have been mostly reversed, ceased or in a few cases much reduced.
- The skills development of the people involved in WUAs is having wider and beneficial society impacts. It is also resulting in decision makers with water management backgrounds who appreciate the importance of water and of its good management. Recent village level elections have resulted in many (about 600 of 10,000) water management agents being elected to Village Committees.

Remaining problems and the needs or countermeasures proposed by the participants. The survey results indicated good progress but that WUAs still faced some difficulties from WUA to WUA. These include a need to:

- Continue to strengthen the WUA approach to water allocation, water planning, metering, water fee collection, cropping pattern adjustment, and water saving measures.
- Allow local flexibility and decision making in deciding cropping patterns within the overall water allocation so that higher water efficiency varieties of wheat and maize, which have low labor requirements, can be used as this would also assist opportunities for higher income, off-farm work.

- Involve water bureaus and township governments in ratifying the selection of water agents to reduce the negative impacts and loss of continuity that can result when village committees are changed.
- Strengthen the management of water pollution by industry so that agricultural water is not polluted.

Recommendations on WUA/CDD Development in the Project Areas

Based on the findings from the beneficiary survey, the following suggestions are proposed:

a) With the design of Phase II GEF project or other relevant project, WUA development should have its own objectives, expected outputs, activities and verifiable indicators, to implement the IWEM concepts, technologies and plans at the grassroots community level.

b) Strengthen the participatory approach to WUA establishment, operation and development, and adopt the more participative CDD approach in key areas, so that farmer water users exert their rights of participation and of being informed, having expression, and involvement in supervision, etc.

c) CDD/WUA pilots and demonstration project results need to be conducted or further improved, and then disseminated. The organizational framework and operation rules/norms need to be adapted to the newly revised 'Villagers' Committee Organization Law'. This would accelerate mainstreaming of the WUA and CDD approach.

d) A follow-up project should further clarify the mechanism and verifiable indicators to guarantee the participation and ensuring marginalized groups such as low-income households, women, etc. It should also establish a Complaints Handling Mechanism (CHM), advocated by the Bank in recent years, and also an important part of social management reform and innovation requested by the Central Authority in China.

Annex 6
Borrower's Comments[1] on the Bank's Draft ICR
GEF Hai Basin Integrated Water and Environment Management Project
(December 23, 2011)

Dear Mr. Paul Kriss,

On November 15, 2011, we were honored to receive the draft ICR prepared by the World Bank for GEF Hai Basin Integrated Water and Environment Management Project. We are quite pleased about the positive comments by the Bank on the achievements (project objectives, outputs and outcomes) made during the project implementation.

During the past about seven years, the project has always committed to improvement of the Hai Basin integrated water resources and environment planning and management as the goal, and capacity building of water resources and environment knowledge management and project implementation, and played a proactive role to ensure sustainable social and economic development in the Hai Basin. We would like to express our heartfelt thanks to the related implementing agencies for their excellent cooperation and our sincere appreciation for the arduous efforts made by the project staff to make this project a success. We also would like to express our warmest congratulations on the fruitful outcomes achieved by this project.

Among many important aspects of the project in promoting integrated water and environment management including inter-departmental cooperation mechanism, advanced concept in integrated river basin management, knowledge management system, strategic studies, action plan and demonstration projects, we think that the project has achieved most fruitful outcomes as follows:

Based on the actual conditions of the Hai Basin, the project has provided an approach for overall control of total consumptive use of water and of maximum pollution load discharge at the basin level, which closely links to control of water use and pollution discharge at the water user level. First, through introduction of remote sensing technology on measuring ET value in Hai Basin and of the concept of controlling consumptive use of water, the project has developed ET-based water management tool which actually provided an effective measure to control the water use for irrigated agriculture. Second, it has provided policy recommendations for industrial and agricultural pollution control in Hai Basin based on the demonstration and research results on point and non-point source pollution prevention. To make the approach work, the project has also developed a knowledge management (KM) system platform. The platform helps the government departments on water resources development and utilization and environment protection to achieve the data sharing not only for water quality but also quantity, and effectively carry out the integrated water resources and water environment management in the Hai Basin.

[1] A PDF file of the letter is available in project file.

The project has established a joint decision-making conference system on integrated water resources and environment management between the water conservancy and environmental protection departments, signed and implemented a data sharing agreement in Hai River Basin, and built a cooperation mechanism in all levels of water resources and environmental protection departments, which are jointly participated in the integrated water resources and water environment management. With the integrated approach for water resources management of "bottom-up, top-down" and "horizontal-vertical integration", the water resources management departments, water pollution control departments and stakeholders jointly participated in the integrated water resources and environment management as promoted by this project. In addition, it has developed Water Users Association (WUA) and community-lead Drive Development (CDD) code to promote the establishing of grassroots water management system.

The successful experiences in implementation of the project has provided new ideas on improving integrated water resources and environment management and innovating water resources management mode. It can be an effective reference for many water shortage countries. Therefore, this project has a great popularizing significance.

We wish to thank the World Bank ICR mission and GEF Hai Basin executive organization closely cooperation and World Bank staff, related experts, especially task team leader Mr. Douglas Olson and Mr. Jiang Liping for the great assistance as partners during the 7 years of project implementation.

We look forward to developing further close cooperation with the World Bank on the following projects.

Xu Wenhai	Li Lei
Deputy Director General	Deputy Director General
Department of water Resources	Department of Pollution Prevention
Ministry of Water Resources	Ministry of Environment Protection

Annex 7. Comments of Co-financiers and Other Partners/Stakeholders

N/A

Annex 8. List of Supporting Documents

1. Aide Memoire of the ICR mission in June 2011
2. PCR and its Annexes prepared by Central PMO, Ministry of Environmental Protection and Ministry of Water Resources
3. PCR and its Annexes prepared by the PMO of Beijing Municipality
4. PCR and its Annexes prepared by the PMO of Tianjin Municipality
5. PCR and its Annexes prepared by the PMO of Hebei Province
6. PCR and its Annexes prepared by the PMO of Hai Basin Commission PMO
7. Monitoring and Evaluation Tables by CPMO, Ministry of Environmental Protection
8. Mid-Term Review Report (Revised) GEF Hai Basin IWEM Project PMO of MWR, SEPA, January, 2007
9. World Bank Hai Basin Integrated Water and Environment Management Project, Project Appraisal Document. March 2004

IBRD 32710

CHINA

GEF-HAI BASIN INTEGRATED WATER AND ENVIRONMENT MANAGEMENT PROJECT

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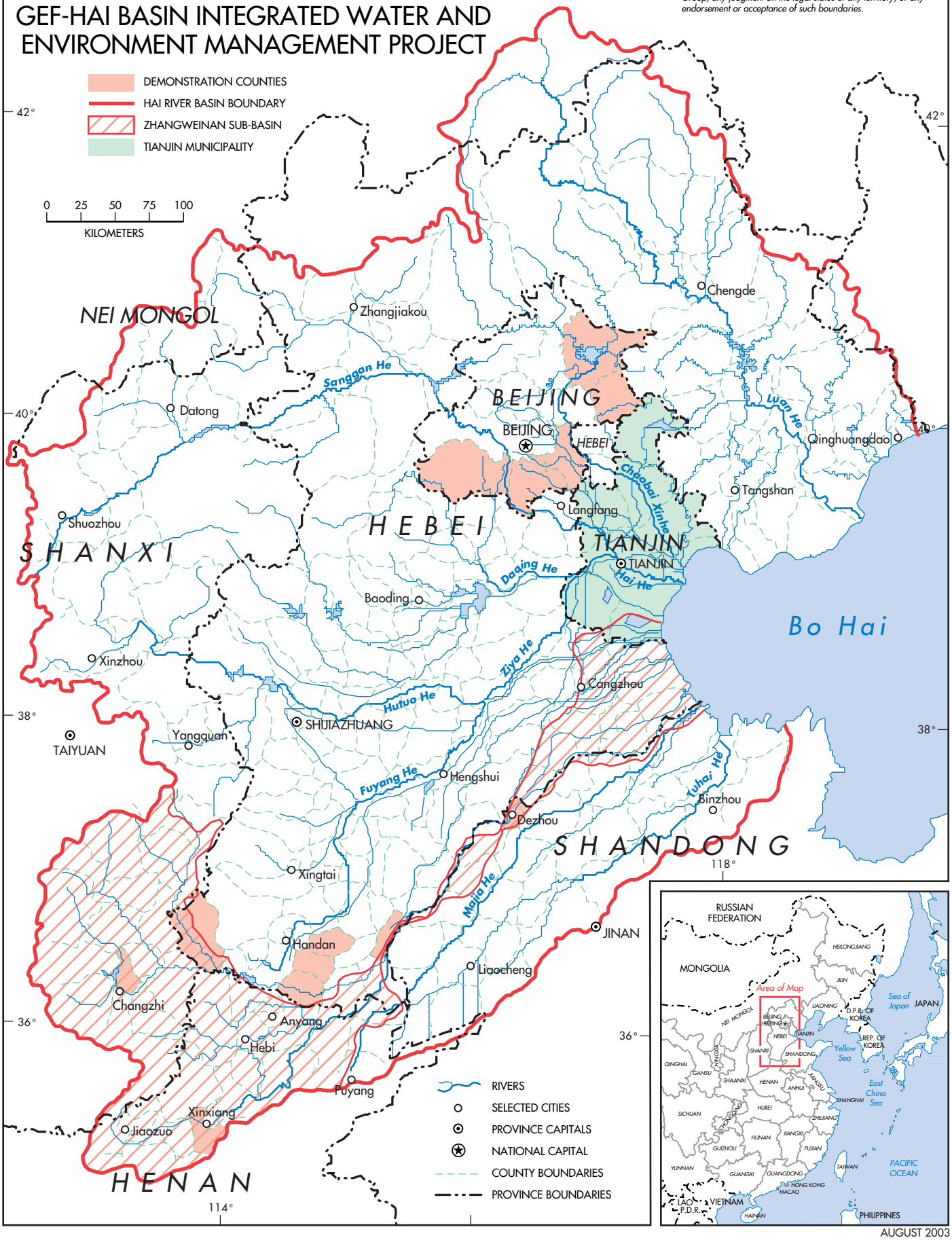

AUGUST 2003