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GEF/R2016-0003/1

April 25, 2016

Closing Date: Monday, May 9, 2016 at 6 p.m.

FROM: Acting Vice President and Corporate Secretary

China - Mainstreaming Integrated Water and Environment Management Project

Project Appraisal Document

Attached is the Project Appraisal Document regarding a proposed trust fund grant from the Global Environment Facility (GEF) to China for a Mainstreaming Integrated Water and Environment Management Project (GEF/R2016-0003), which is being processed on an absence-of-objection basis.

Distribution:
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Document of
The World Bank

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Report No: PAD1604

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GRANT

FROM THE GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$9.50 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

MAINSTREAMING INTEGRATED WATER AND ENVIRONMENT MANAGEMENT PROJECT

April 21, 2016

Water Global Practice
East Asia and Pacific Region

CURRENCY EQUIVALENTS
(Exchange Rate Effective January 31, 2016)

Currency Unit	=	RMB
RMB1.00	=	US$0.156
US$1.00	=	RMB6.400

FISCAL YEAR
January 1 - December 31

ABBREVIATIONS AND ACRONYMS

BOD	Biochemical Oxygen Demand
CEPB	Chengde Environment Protection Bureau
CPMO	Central Project Management Office
CD	Chengde of Hebei Province
CIDDC	China Irrigation and Drainage Development Center
CNAO	China National Audit Office
CNY	Chinese Renminbi Yuan
COD	Chemical Oxygen Demand
DDR	Designated Account
DA	Due Diligence Review
EA	Environmental Assessment
EC	Environmental Capacity
EIRR	Economic Internal Rate of Return
ESMF	Environment and Social Management Framework
EPB	Environment Protection Bureau
ET	Evapotranspiration
FECO	Foreign Economic Cooperation Office
FIRR	Financial Internal Rate of Return
FM	Financial Management
FMM	Financial Management Manual
GEF	Global Environmental Facility
GIS	Geographic Information System
GoC	Government of China
GRS	Grievance Redress Service
HPFB	Hebei Provincial Finance Bureau
ICB	International Competitive Bidding
ICR	Implementation Completion Report
3iPET	Integrated, Intelligent, and International Platform for Environmental Technology
IUFR	Interim Unaudited Financial Report
IWEM	Integrated Water Environment Management
IWEMP	Integrated Water Environment Management Plan
MEP	Ministry of Environment Protection
M&E	Monitoring and Evaluation
MOF	Ministry of Finance

MWR	Ministry of Water Resources
NH3-N	Ammonia Nitrogen
NH4-N	Ammonium Nitrogen
NPV	Net Present Value
OCC	Opportunity Cost of Capital
O&M	Operation and Maintenance
P	Phosphorus
PIU	Project Implementing Unit
PMO	Project Management Office
POE	Panel of Experts
QER	Quality Enhancement Review
RAP	Resettlement Action Plan
RBD	River Basin District
RPF	Resettlement Policy Framework
RS	Remote Sensing
SA	Social Assessment
STAP	Scientific and Technical Advisory Panel of GEF
SWRB	Shijiazhuang Water Resources Bureau
TA	Technical Assistance
TN	Total Nitrogen
TOR	Terms of Reference
TP	Total Phosphorus
TVAP	Target Value Allocation Plan
WRB	Water Resources Bureau
WUA	Water User Association
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant

Regional Vice President:	Victoria Kwakwa
Country Director:	Bert Hofman
Acting Senior Global Practice Director:	Jennifer J. Sara
Practice Manager:	Ousmane Dione
Task Team Leader:	Liping Jiang

CHINA
GEF Mainstreaming Integrated Water and Environment Management Project

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PAD DATA SHEET

China

GEF Mainstreaming Integrated Water and Environment Management (P145897)

PROJECT APPRAISAL DOCUMENT

EAST ASIA AND PACIFIC

0000009391

Report No.: PAD1604

Basic Information			
Project ID P145897	EA Category B - Partial Assessment	Team Leader(s) Liping Jiang	
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects [ ]		
Project Implementation Start Date 01-Sep-2016	Project Implementation End Date 31-Aug-2021		
Expected Effectiveness Date 01-Sep-2016	Expected Closing Date 31-Dec-2021		
Joint IFC No			GEF Focal Area International waters
Practice Manager/Manager Ousmane Dione	Acting Senior Global Practice Director Jennifer J. Sara	Country Director Bert Hofman	Regional Vice President Victoria Kwakwa

Borrower: People's Republic of China			
Responsible Agency: Ministry of Water Resources			
Contact:	Nongdi Wu	Title:	Director of International Division
Telephone No.:	861063202708	Email:	ndwu@mwr.gov.cn
Responsible Agency: Ministry of Environment Protection (MEP)			
Contact:	Fang Li	Title:	Director of PMO of MEP
Telephone No.:	861088575203	Email:	Fang.Li@mepfeco.org.cn
Responsible Agency: Ministry of Water Resources (MWR)			
Contact:	Zhenzhong Han	Title:	Director of PMO of MWR
Telephone No.:	861063203235	Email:	Hanzz@mwr.gov.cn

Project Financing Data(in USD Million)

[ ]	Loan	[ ]	IDA Grant	[ ]	Guarantee
[ ]	Credit	[X]	Grant	[ ]	Other

Total Project Cost:	104.50	Total Bank Financing:	9.50
Financing Gap:	0.00		

Financing Source	**Amount**
Borrower	95.00
Global Environment Facility (GEF)	9.50
Total	104.50

Expected Disbursements (in USD Million)

Fiscal Year	2016	2017	2018	2019	2020	2021	2022	0000	0000	0000
Annual	0.00	1.00	2.00	3.00	2.00	1.40	0.10	0.00	0.00	0.00
Cumulative	0.00	1.00	3.00	6.00	8.00	9.40	9.50	0.00	0.00	0.00

Institutional Data

Practice Area (Lead)

Water

Contributing Practice Areas

Cross Cutting Topics

[X] Climate Change
[ ] Fragile, Conflict & Violence
[X] Gender
[ ] Jobs
[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Agriculture, fishing, and forestry	Agricultural extension and research	70	100	
Water, sanitation and flood protection	Water supply	30	100	
Total		100		

☐ I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Themes		
Theme (Maximum 5 and total % must equal 100)		
Major theme	Theme	%
Environment and natural resources management	Water resource management	60
Environment and natural resources management	Other environment and natural resources management	40
Total		100

Proposed Global Environmental Objective(s)

The Project Development Objective (PDO) is to increase water productivity and reduce pollution discharges in the project areas to mainstream and scale up an innovative approach to integrated water and environmental management in the three river basins entering the Bohai Sea.

Components

Component Name	Cost (USD Millions)
Component 1: Mainstreaming of Innovative Approach on Integrated Water and Environment Management	3.45
Component 2: Demonstration in Hai Basin on Integrated Water and Environment Management	90.10
Component 3: Scaling up the Integrated Water and Environment Management Approach in Three River Basins	7.30
Component 4: Institutional Capacity Building and Project Management	3.65

Systematic Operations Risk- Rating Tool (SORT)

Risk Category	Rating
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Low
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Moderate
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other	
OVERALL	Moderate

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ] No [X]
Does the project require any waivers of Bank policies?	Yes [ ] No [X]
Have these been approved by Bank management?	Yes [ ] No [ ]
Is approval for any policy waiver sought from the Board?	Yes [ ] No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X] No [ ]

Safeguard Policies Triggered by the Project	**Yes**	**No**
Environmental Assessment OP/BP 4.01	**X**	
Natural Habitats OP/BP 4.04	**X**	
Forests OP/BP 4.36		**X**
Pest Management OP 4.09		**X**
Physical Cultural Resources OP/BP 4.11		**X**
Indigenous Peoples OP/BP 4.10		**X**
Involuntary Resettlement OP/BP 4.12	**X**	
Safety of Dams OP/BP 4.37		**X**
Projects on International Waterways OP/BP 7.50		**X**
Projects in Disputed Areas OP/BP 7.60		**X**

Legal Covenants in Grant Agreement

Name	**Recurrent**	**Due Date**	**Frequency**
1.Cooperation Framework Agreements		31-Dec-2016	
Description of Covenant: The Recipient, through MEP PMO and MWR PMO, shall, and shall cause the Project Participant to, enter into cooperation framework agreements for the management and implementation of the Project (refer to the 5 Cooperation Framework Agreements indicated in Section I A of Schedule 2 to Grant Agreement)			
2.Implementation Agreements		31-Dec-2016	
Description of Covenant: For the purpose of carrying out of the Project Participant's Respective Part of the Project, the Recipient, through MEP PMO and MWR PMO, shall enter into an agreement ("Implementation Agreement") with the Project Participant on terms and conditions satisfactory to the World Bank, which shall include the provisions set forth in Annex 1 to this Schedule 2 (refer to A in Section I of Schedule 2 to Grant Agreement).			
3.Sub-grant Agreements		31-Dec-2016	
Description of Covenant: For the purpose of assisting the Recipient or the Project Participant with the carrying out of its Respective Part of the Project, the Recipient, through MEP PMO and MWR PMO, shall enter into an agreement ("Sub-grant Agreement") with each sub-grant PIU, under terms and conditions acceptable to the World Bank, which shall include those set forth in Annex 2 to this Schedule (refer to A in Section I of Schedule 2 to Grant Agreement).			

4. Monitoring and Evaluation (M&E) Report at the MEP/MWR level		31-Mar-2017	

Description of Covenant: The Recipient, through MEP PMO and MWR PMO, shall ensure that a consolidated monitoring and evaluation report is prepared for each calendar year during Project implementation on the basis of indicators set forth in the Results Framework and furnished to the World Bank not later than April 30 of the year following the year covered by such report (refer to B in Section I of Schedule 2 to Grant Agreement).

Conditions

Source Of Fund	Name	Type

Description of Condition

Team Composition

Bank Staff

Name	Role	Title	Specialization	Unit
Liping Jiang	Team Leader (ADM Responsible)	Sr. Irrigation Engineer		GWA02
Zheng Liu	Procurement Specialist	Procurement Specialist		GGO08
Fang Zhang	Financial Management Specialist	Financial Management Specialist		GGO20
Dan Xie	Team Member	Program Assistant		EACCF
Feng Ji	Safeguards Specialist	Senior Environmental Specialist		GEN02
Qun Li	Team Member	Senior Agriculture Economist		GFA05
Rong Chen	Team Member	Operations Officer		CASEE
Songling Yao	Safeguards Specialist	Senior Social Development Specialist		GSU02
Zhuo Yu	Team Member	Finance Officer		WFALN
Zongcheng Lin	Safeguards Specialist	Consultant		GENDR

Extended Team

Name	Title	Office Phone	Location

Bingfang Wu	Remote Sensing Specialist		Beijing
Yu Liu	Irrigation Management Specialist		Beijing
Charlotte Hicks	Biodiversity specialist		Sydney
Zijian Wang	Environment Specialist		Beijing
Christopher Perry	Consultant - Agriculture Water Specialist		DEVON
Yiming Chen	Water and Environment Specialist		Washington D.C.
Erkun Gao	Sr. Water Resources Specialist, Consultant		Beijing
Jorge Escurra	Water Ecosystem Specialist		Washington D.C.
Random Dubois	Senior Environmental Specialist		
Yibin Su	Sr. Environment Specialist, Consultant		Beijing
Zhanyi Gao	Sr. Water Resources Management Specialist		Beijing

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
China	Hebei	Chengde		**X**	
China	Hebei	Hebei		**X**	
China	Beijing	Beijing		**X**	

Consultants (Will be disclosed in the Monthly Operational Summary)

Consultants Required? Consultants will be required

I. STRATEGIC CONTEXT

A. Country Context

1. The rapid growth of China's cities and industries in recent years has created a strong demand for water in the agriculture, domestic, and industrial sectors. In addition, climate change impacts have created new challenges to achieving and maintaining the sustainable management of water resources in the country. With regard to water scarcity, this is particularly relevant in China's drier northeast region, which is increasingly being affected by drought. Precipitation has declined by 10 percent since 1980. Reduced precipitation has resulted in a growing imbalance between water supply and demand, and as a consequence, there has been a gradual drying up of waterways and increased incidence of overexploitation of groundwater resources. To make matters worse, China has been facing a severe drought in recent years, which has further reduced surface water availability exacerbating the problem of groundwater overexploitation. Surface and groundwater are also heavily polluted. According to China's Water Resources Bulletin in 2014, some 28 percent of the country's total rivers' courses are considered polluted. This is defined as equal to or worse than, Class IV on a scale of V.

2. Water Scarcity and Pollution, contributing to large-scale changes in water quantity and quality, are also affecting downstream users and ecosystems that depend on the resource. China's Bohai Sea is a large, shallow embayment of the Yellow Sea that in turn connects to the Pacific Ocean. The interconnectivity among these water bodies is important because of their shared physical and biological characteristics. Of particular importance are the fish and shellfish stocks found in the Yellow Sea that are dependent on the Bohai Sea as a reproduction and nursery area. These fishery resources are important both to China and the neighboring countries that border the Yellow Sea, such as Japan and Democratic People's Republic of Korea and Republic of Korea.

3. The Bohai Sea is also one of the world's most ecologically stressed water bodies. The major causes of degradation of the Bohai Sea are twofold: (a) decreasing fresh water inflows; and (b) increasing pollution loads from its surrounding river basins (Liao River Basin, Hai River Basin, and Yellow River Basin).

4. Average annual fresh water inflows to the sea have been reduced by over 50 percent, which has adversely affected its ecological balance. With respect to pollution, more than 40 rivers discharge into the Bohai Sea, of which the Liao, Hai, and Yellow Rivers are the most significant. Moreover, there are some 105 discrete sources of pollution located along its coast that discharge directly into the sea. Estimates indicate that the area of contaminated water has increased from 3,600 km^2 to 13,800 km^2 over the period 2002–2008; the latter figure accounting for 18 percent of the total area of the water body in the same period. Contaminants (mainly, TP, TN, COD, and NH4-N[1]) transported by these rivers not only affect the local ecology, associated fisheries, and biodiversity of the region, but also are thought to pose a growing risk to both the health of the local population and the country's economy. In time, the effects associated with the continued degradation of the Bohai Sea are expected to reach the coastal waters of China's neighboring countries.

[1] Total Phosphorus (TP); Total Nitrogen (TN); Oxygen Demand (COD); Ammonium Nitrogen (NH4-N).

B. Sectoral and Institutional Context

5. Addressing the issue of the ecological degradation of the Bohai Sea will require maintaining, and wherever required, restoring the necessary ecological flow rates in the main rivers entering the sea. To achieve this goal, the issues of both water scarcity and water pollution must be addressed in the upper reaches of the respective river basins.

6. Water scarcity has been a long-standing problem in China. According to Water Resources Bulletin in 2014, the country's current total yearly water use exceeds 610 billion m^3, or 75 percent of total available water resources (814 billion m^3) by 2030, and hence, there are limits to its further utilization. Moreover, demand for water is increasing with China's continuing socioeconomic development. The irrigation sector is still China's top water user, accounting for over 60 percent of the total allocated water supply. Around 69 percent of the country's land area is arid or semiarid, characterized by relatively fragile environments, which are easily affected by human activities such as over-extraction of water, if degraded, are often difficult to restore. Groundwater is also seriously overexploited, with 160 areas identified nationwide, covering 190,000 km^2 and representing in aggregate an annual rate of over-extraction of around 21.5 billion m^3. Overexploitation of groundwater resources directly contributes to land subsidence, seawater intrusion, and loss of water resources for agriculture and daily needs.

7. Water pollution and erosion problems are severe in China and have combined to contribute to the degradation of aquatic environments in numerous areas around the country. Some water bodies have been affected and/or are decreasing in size and water quality is declining. In 2014, only 5.9 percent of China's rivers had water classified as Category I (the lowest level of pollution); while 43.5 percent were Category II; 23.4 percent were Category III; 10.8 percent were Category IV; 5 percent were Category V; and 11.7 percent were extremely polluted at above Category V levels. Several critical pollution incidents have also occurred, threatening public safety.

8. Institutional cooperation between the different sectors responsible for issues related to water and environmental management needs to be strengthened. For example, the Ministry of Water Resources (MWR) is responsible for water quality of China's designated water functional areas, while the Ministry of Environment Protection (MEP) manages wastewater discharges. Other institutions with relevant responsibilities include the Ministry of Agriculture and the State Forestry Administration. A lack of integration in planning, target setting, and data sharing makes it difficult to ensure a balance between water resources utilization and environmental protection. Balancing the competing demands for China's water resources in economic development and environment protection and fostering cooperation between water-use related sectors will be vital in ensuring a more sustainable and stable development in the future. The proposed project will involve the cooperation of a number of water-use related sectors.

9. **Government programs.** The Government of China (GoC) has formulated and implemented two major nation-wide water investment programs during the past decade: (a) A Master Plan on National Water Resources approved by the State Council in 2005; (b) the long-term "Irrigated Agricultural Water Saving Investment Program;" and (c) the long-term "Water Pollution Control Investment Program." In addition, there exist special investment programs such as the construction of water transfers from the Yangtze River in the south to address the water scarcity issues in North China (South-North Water Transfer) and others. The purposes of the

government investment programs are to support and promote the country's continued economic growth and environmental sustainability. Through these investment programs, the GoC has been supporting specific investments to address the issues of water scarcity and environmental degradation. These include: (a) the application of improved irrigation technologies to increase water use efficiency to save water; (b) the construction of wastewater treatment plants to reduce water pollution (mostly pollution sources); and (c) the improvement of water and environmental management.

10. **Results of government programs.** The implementation of these investment programs showed much better results in economic development than ecological environmental protection. Specifically, water in the rivers or lakes still does not meet the national standards in both quantity and quality. Two of the main existing issues are: (a) increased water use efficiencies with improved irrigation technologies resulted in more water consumption or ET (evapotranspiration), e.g. expanding irrigated areas, which led to less water returned to rivers, exacerbated groundwater overdraft, and a degraded ecological environment; and (b) increased nonpoint source (NPS) pollution with rapid rural economic development accounting for a bigger portion of the water pollution, and is even more difficult to control than point source pollution.

11. **Future government plans.** The GoC and other institutions and stakeholders increasingly recognize the urgent need to address issues of water scarcity and pollution. During the period of its 12th Five Year Plan (2011–2015), the GoC issued two key policies: (a) the 'Stringent Water Resources Management System' which aimed to enhance the 'Irrigated Agricultural Water Saving Investment Program; and (b) the 'Action Plan for Prevention and Control of Water Pollution,' which aimed to enhance the 'Water Pollution Control Investment Program.' More recently, the GoC, through its soon to be finalized 13th Five Year Plan (2016–2020) will support new, innovative technologies and approaches to address the above major issues and to further improve the sustainable management of water resources and environment in China.

C. Higher Level Objectives to which the Project Contributes

12. The project is aligned with the World Bank's China Country Partnership Strategy 2013–2016 (Report No. 67566 - CN) and is closely related to Strategic Theme One: Supporting Greener Growth, Outcome 1.5 for Demonstrating Sustainable Natural Resource Management Approaches - Implementing approaches of integrated water resources management at the river basin level, addressing multiple uses such as water scarcity, flooding, pollution, water demands, economic instruments, and institutional aspects; and building on the recent China Country Water Resources Partnership Strategy (2013–2020) prepared jointly by the Bank and the GoC.

II. PROJECT DEVELOPMENT OBJECTIVES

A. Project Scope

13. The project's innovative Integrated Water and Environment Management (IWEM) approach attempts to address the twin issues of water scarcity and quality, particularly overexploitation of groundwater. It does this through the application of remote sensing-based ET (RS-based ET) and environmental capacity (EC) assessment tools supported by the creation of a policy and institutional environment to facilitate their application. This second phase project (the

current project) builds on the results of the first phase Global Environmental Facility (GEF) Hai Basin project (P075035) by refining and more fully developing and integrating the EC assessment tool into the IWEM approach and promoting its wider application (upscaling) to other river basins connected with the Bohai Sea. The approach is novel because it attempts to combine the resolution of the two critical water issues in China - of reductions in water quantity and water quality - into a single unified assessment that requires taking an integrated approach for eventual resolution of the issues.

14. In line with national policy guidelines, the water and environment departments have identified water-relevant 'problem areas' in each of the country's provinces. The criteria for the identification of these areas differ for each ministry. For the MWR, these are areas where (a) groundwater resources are being over-extracted; and/or (b) water use effectiveness is equal to or less than 45 percent. For the MEP, these are areas where (a) water quality is Class 5 (the lowest quality category) or worse; and/or (b) water courses characterized by high-quality water are subject to discharges of industrial pollution. These criteria have been applied in project demonstration areas in Hebei Province and in scaling up areas in the three river basins. Based on the above, the total problem areas were identified as accounting for 434,700 km^2. The project activities will be supported in the Shijiazhuang and Chengde municipal cities situated in the Hutuo and Luan Sub-river basins, respectively, of the Hai River Basin and subsequently scaled up to Shijin irrigation areas in the Hai Basin and Hetao irrigation areas in the Yellow River Basin, and to the selected cities of the Liao River Basin. Therefore, the total project area includes both demonstration and scaling up areas, which cover 153,800 km^2 about 35 percent[2] of the total problem areas identified (see Table 1 and project map in annex 7).

Table 1. Estimated Project Coverage of MEP and MWR: 'Problem Areas' versus 'Project Areas' (km^2)

	Hai River Basin	Liao River Basin	Yellow River Basin	Total Problem Areas	Project Areas (Demo + Scaling up)	Coverage %
MEP	218,000	148,000	–	366,000	125,380 (55,367 + 70,013)	34
MWR	43,700	–	25,000	68,700	28,420 (9,400 + 19,020)	41
Total	261,700	148,000	25,000	434,700	153,800	35

B. PDO

15. The project development objective (PDO) is to increase water productivity and reduce pollution discharges in the project areas to mainstream and scale up an innovative approach to integrated water and environmental management in the three river basins entering the Bohai Sea.

16. The PDO will be achieved through: (a) increasing irrigation water use efficiency and all other ways possible to effectively use water under a cap of water consumption; (b) reducing water pollution discharges under a cap of environment capacity; and (c) increasing ecological river flows (reflected by reduction of groundwater resources in the upstream of related rivers). The above

[2] The first GEF Hai Basin Project covered 6.25 percent of the problem areas in the Hai Basin.

measures will minimize the negative impacts on the ecosystem of Bohai Sea, contributing to the achievement of global environmental benefits (GEBs).

C. Project Beneficiaries

17. The primary beneficiaries of the project are the people in the project areas who mostly suffer from water scarcity and water pollution, with lower average income, living in rural and urban areas in proximity to the river courses or living on or around the Bohai coast. These people will benefit from more stable access to water resources and improved water quality. The central, provincial, and local-level departments for water resources, environmental protection, and other relevant departments will also benefit from increased capacity to manage water resources and the environment in an integrated manner, as well as access to innovative technologies and approaches to improve resource utilization and environmental protection.

D. PDO Level Results Indicators

18. **Key results indicators.** The project will develop and scale up the new technologies and approaches to address local issues and eventually, lead to improvements in the Bohai nearshore coastal ecosystem as well as provide valuable experiences and lessons to resolve the multi-country or international transboundary issues in the world, because of the similarity of the issues on shared waters. The key results indicators of the PDO are: (a) policy recommendations made under the project incorporated into the policies on water consumption control issued by MWR and policies on pollution control issued by MEP, respectively; (b) irrigation water productivity increased in demonstration areas; (c) water pollution discharged into the Hutuo and Luan Rivers decreased in the two demonstration areas, respectively; (d) the Integrated Water Environment Management Plan (IWEMP) approach scaled up to cover the MWR- and MEP-defined problem areas in the three river basins; and (e) reductions achieved in overdraft of groundwater in problem areas in Jinzhou and Gaocheng counties of Shijiazhuang City in Hai River Basin.

III. PROJECT DESCRIPTION

A. Project Components

19. Specifically, the PDO will be achieved through implementation of the following project components and activities:

Component 1: Mainstreaming of Innovative Approach on Integrated Water and Environment Management (US$1.20 million of GEF Grant plus US$2.25 million of government financing—total of US$3.45 million).

20. Component 1 will carry out research on new policy options and the application of existing government policies as well as innovative technologies to mainstream the ET/EC-based IWEM approach. Component 1 will also promote the standardization through the development of operational manuals and guidelines, which will be informed by the results of project-supported activities (case studies and researches) in two demonstration areas (Component 2) in the Hai River Basin, to encourage a shift toward more efficient modes of production.

(a) *Subcomponent 1.1. Studies on application of policies and technologies on mainstreaming the IWEM approach*, which will also lead to the formulation of new and/or application of existing policies and technology in support of mainstreaming the IWEM approach. A total of four studies will be supported by GEF Grant under this subcomponent that will address main policy issues in China's water sector.

(b) *Subcomponent 1.2. Preparation of operational manuals and guidelines for the IWEM approach.* The development of a series of five operational manuals and guidelines will be supported under this subcomponent.

Component 2: Demonstration in Hai Basin on the Integrated Water and Environment Management Approach (US$2.80 million of GEF Grant plus US$87.30 million of government financing—total of US$90.10 million).

21. Component 2 will support the preparation and implementation of Target Value Allocation Plans (TVAPs) in two sub-river basins (the Luan and Hutuo), where the possible impact of climate change will be considered. Based on the target ET and EC values allocated, the component will also support preparation and implementation of the IWEMPs in two demonstration city areas—Chengde (water pollution dominant areas) and Shijiazhuang (water overuse dominant areas) in the Hai River Basin. This implementation will lead to improved water productivity, reduced water consumption and water pollution, and increased ecological environment flows in the rivers through the integration of the ET and EC targets to guide and control water extraction, utilization, and pollution discharges. It will be fully supported by results stemming from the activities supported under Component 1.

(a) *Subcomponent 2.1. Application of the IWEM approach in Chengde.* Under this subcomponent a TVAP and an IWEMP will be supported for the Luan sub-basin and the Chengde municipal district, respectively. The implementation of the plan will be complemented by the project-supported activities.

(b) *Subcomponent 2.2. Application of the IWEM approach in Sijiazhuang.* Similar to the activities in the previous subcomponent, a TVAP and an IWMEP will be supported for the Hutuo sub-basin and Shijiazhuang municipal district, respectively, accompanied by several supporting activities.

Component 3: Scaling up the Integrated Water and Environment Management Approach in Three River Basins (US$3.60 million of GEF Grant plus US$3.70 million of government financing—total of US$7.30 million).

22. Component 3 will scale up the ET/EC-based IWEM approach with innovative technologies and policy interventions tested in the two pilot sub-river basins and demonstration cities under Components 1 and 2 to cover additional areas in the Liao, Hai, and Yellow River Basins, respectively. Together with the demonstration projects supported under components, an estimated 35 percent of the 'problem areas' in the three river basins will be covered (see Section 2, Table 1). The development of two platforms with accompanying databases at the national level will also be supported for purposes of monitoring actual ET values and actual water pollution discharges and facilitating the consultation and negotiation of the ET and EC target values needed to meet the

sustainable development objectives among different stakeholders in the scaling up areas. Innovations in technology and management will be scaled up to help achieve new ET and EC targets in the three river basins. Component 3 will be fully supported with the results achieved in Components 1 and 2.

(a) *Subcomponent 3.1. Development of National Water Environment Technology Extension Platform at the MEP.* Under this subcomponent, the project will support the development of national river basin-based EC targets, supported by a Global Information System (GIS) for nationwide environmental quality improvement to enhance the existing Integrated, Intelligent, and International Platform for Environmental Technology (3iPET), and for the Assessment on Effectiveness of Water Pollution Prevention based on the newly introduced River Basin District (RBD) approach.

(b) *Subcomponent 3.2. Development of a National Water Consumption Monitoring and Management Platform at the MWR.* Similar to Subcomponent 3.1., this subcomponent will facilitate the development of a national ET Monitoring and Management Platform that will include support for a GIS for ET management for national irrigation schemes located in the provinces and RS-based ET data production, analysis, and monitoring system for these schemes and additional studies.

(c) *Subcomponent 3.3. Scaling up the IWEM approach in the Liao River Basin.* This subcomponent will support scaling up activities in the Liao River Basin including (i) providing the manuals prepared and training for the new IWEM approach to the local authorities and stakeholders in the scaling up areas; (ii) monitoring and analysis on the current status of water consumption and water pollution as well as water productivity; (iii) effectiveness assessment of the interventions with application of the IWEM approach in the scaling up areas; and (iv) comments and recommendations with proposed actions to continue promoting the IWEM approach.

(d) *Subcomponent 3.4. Scaling up the IWEM approach in the Hai River Basin.* This is the same as Subcomponent 3.3.

(e) *Subcomponent 3.5. Scaling up the IWEM approach in the Yellow River Basin.* This is the same as Subcomponent 3.3.

Component 4: Institutional Capacity Building and Project Management (US$1.90 million of GEF Grant plus US$1.75 million of government financing—total of US$3.65 million).

23. Following the suggestions stemming from the Scientific and Technical Advisory Panel (STAP) review of the project, Component 4 will place considerable emphasis on strengthening the capacity of the central and local governments to support IWEM through consulting services and training, workshop, and study tours.

(a) *Subcomponent 4.1. Regional Integrated Water learning activities.* About one percent of the GEF project grant (US$95,000) will be used to support International Water Learning activities to include the production of at least two project experience notes and one results note, establishment of a project website, and support for project staff's participation in the Biannual International Waters Conferences.

(b) *Subcomponent 4.2. Technical assistance through consulting services.* Provision of technical assistance (TA) from international and domestic consulting services to project entities in support of project management and implementation.

(c) *Subcomponent 4.3. Training and workshops.* A series of training activities and workshops will be supported to increase institutional capacity in the project entities.

(d) *Subcomponent 4.4. Project monitoring and evaluation*. A project-wide monitoring and evaluation (M&E) system will be established.

(e) *Subcomponent 4.5. Project management.* Support will be provided under this subcomponent to cover staff travel and operational costs of the four Project Management Offices (PMOs) (MEP PMO, MWR PMO, Shijiazhuang Joint PMO and Chengde Joint PMO) responsible for project management and implementation. In addition, support will be provided for the development of cooperation framework agreements and periodical coordination meetings between the administrative units responsible for environment and water management.

24. The project's four components are designed to be closely interconnected with each other, a necessary feature of the project design to achieve the PDO. Specifically, Component 1 will provide technical support to Component 2. Component 2 will provide case studies and research results to increase the impact of Component 1. Component 3 will be implemented on the basis of the outputs and outcomes achieved from Components 1 and 2 and the first phase GEF Hai Basin IWEM Project. Finally, Component 4 will provide consulting services, and training opportunities to strengthen capacity to implement Components 1–3.

B. Project Cost and Financing

25. The proposed project supports implementation of the government's broader investment and research program aimed at meeting the 13th Five Year Plan (2016-2020) for irrigated agricultural water savings and water pollution control. The project cost is US$104.5 million which includes US$9.50 million to be financed with the GEF Grant and government funds in the amount of US$19 million and US$76 million (US$95 million in total) out of government research program and investment program. These investment and research activities will be implemented in conjunction with GEF-financed activities in the same project area to support the achievement of the PDO of the project. The detailed project activities to be financed out of the GEF Grant and the government programs are given in tables 1–4 of annex 6 of this document and Table 2 below.

Table 2. Project Financing by Project Component/Subcomponent

Project Component	Total Cost	GEF Financing	
	US$, millions	US$, millions	%
1. Mainstreaming of Innovative Approach on Integrated Water and Environment Management			
1.1 Studies on application of policies and technologies on mainstreaming the IWEM approach	1.85	0.45	24
1.2 Preparation of operational manuals and guidelines for the IWEM approach	1.60	0.75	46

Subtotal	3.45	1.20	34
2. Demonstration in Hai Basin on the Integrated Water and Environment Management			
2.1 Application of the IWEM Approach in Chengde	43.08	1.40	3
2.2 Application of the IWEM Approach in Sijiazhuang	47.02	1.40	2
Subtotal	90.10	2.80	3
3. Scaling up the Integrated Water and Environment Management Approach in Three River Basins			
3.1 Development of National Water Environment Technology Extension Platform at MEP	4.50	1.40	31
3.2 Development of the national ET Monitoring and Management Platform at MWR	2.00	1.40	70
3.3 Scaling up the IWEM Approach in Liao River Basin	0.20	0.20	100
3.4 Scaling up the IWEM Approach in Hai River Basin	0.40	0.40	100
3.5 Scaling up the IWEM Approach in Yellow River Basin	0.20	0.20	100
Subtotal	7.30	3.60	49
4. Institutional Capacity Building and Project Management			
4.1 IW Learning Activities	0.11	0.10	100
4.2 Technical assistance through consulting services	0.42	0.42	100
4.3 Training and workshops	0.60	0.60	100
4.4 Project monitoring and evaluation	0.30	0.30	100
4.5 Project management	2.22	0.47	21
Subtotal	3.65	1.90	52
Total Costs	104.50	9.50	9

C. Lessons Learned and Reflected in the Project Design

26. Over the past three decades, the Bank has assisted in financing over 50 water resource and irrigation, and drainage projects in China. Generally, these projects have been implemented efficiently and time and cost overruns have not been excessive despite periods of sharp price escalation. Key lessons learned from past projects reflected in the design and preparation of the proposed project include the following:

(a) Water resources management needs to have top-down and bottom-up aspects as well as vertical and horizontal integration.

(b) Real water savings in irrigated agriculture requires a reduction in consumptive use.

(c) International and national consultants and technical panels can substantially improve project design, economic impact assessment, and resettlement planning and design.

(d) Detailed organizational and staffing arrangements for project coordination, management and implementation, with a focus that strongly links the PMOs and administrative departments, should be formulated and agreed on before the start of project implementation.

(e) Training on procurement and financial management (FM) should start early in the preparation period and continue throughout implementation.

(f) Counterpart funds and bridge funds should be committed and included in the governments' annual financial budget before project implementation and counterpart funds required from poor counties should be minimized.

27. Other key factors identified by the Bank as being important for project success, such as strong government commitment and ownership, beneficiary participation, necessary operation and maintenance (O&M) plans, a well-designed M&E system, and sustainability of project outcomes, have also been reflected where appropriate in the design of the project.

28. **Impact of climate change** will be considered an important factor to prepare and implement the TVAPs at the sub-river basin level and the IWEMPs at the city and county levels. Specifically, the tasks of the required analysis[3] will be included in the terms of reference (TOR) for the preparation and implementation of the TVAP for each of the two sub-river basins and the IWEMP for each of the two demonstration cities, as planned in Component 2 of the project.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

29. Management and implementation of the project represents a continuation of earlier cooperation between the MEP and the MWR supported by the project provinces participating in the first phase GEF Hai Basin IWEM Project (P075035), which was successfully implemented from 2005 to 2012. The Cooperation Agreement for the IWEM, signed in 2015, between the ministers of the MEP and the MWR, has greatly strengthened and deepened the cooperation between the two ministries at the national level for this project.

30. The organizational structure for project management and implementation is given in Annex 3. It consists of the following:

(a) The Project Steering Committee in MEP, comprised of, inter alia, the Department of Water and Environment Management, the Department of International Cooperation, and the Department of Science, Technology and Standards of MEP, responsible for overall coordination of implementation of the Project; Leaders from the International Cooperation, the Science and Technology Department and the Water Resources Department of MWR, responsible for overall coordination of implementation of the Project;

(b) The Central Project Management Office ("Central PMO"), consisting of the MEP Project ("MEP PMO") Management Office in the Foreign Economic Cooperation Office and the

[3] The Decision Tree Framework by the Bank is planned to assess the vulnerabilities of the project during preparation of the TVAP and to make adjustments to the IWEMP to demonstrate the robustness of the project with regard to the impact of climate change (for details, see https://openknowledge.worldbank.org/handle/10986/22544)

MWR Project Management Office ("MWR PMO") in the China Irrigation Drainage Development Center, responsible for the implementation of Project activities at the national level and for providing technical assistance to the Chengde Joint PMO and Shijiazhuang Joint PMO in Hebei Province;

(c) The Panel of Experts, including both international and domestic experts, established at the central level, responsible for providing technical support to the project management offices at central and municipal levels, respectively.

(d) Sub-grant Project implementation units (PIUs) in public research institutes selected in accordance with eligibility criteria agreed with the World Bank. Sub-grant PIUs are selected to undertake studies which would need stronger ownership of the central and local governments. The PIUs will have strong technical capacity and direct access to the key data and information required to undertake the tasks. Sub-Grant Implementation Agreements will need to be signed for a study between the selected PIU for the study and MEP PMO and MWR PMO, respectively. Reimbursement of the grant funds incurred by the selected PIUs should be based on the disbursement mechanisms as indicated in Section D of Annex 3 to this PAD.

(e) Two municipal joint-PMOs are established for the two demonstration cities respectively – the Chengde Joint Project Management Office ("Chengde Joint PMO"), responsible for the management and implementation of Project activities in Chengde with the technical assistance of Foreign Economic Cooperation Office (FECO) of MEP; and the Shijiazhuang Joint Project Management Office ("Shijiazhuang Joint PMO"), responsible for the management and implementation of Project activities in Shijiazhuang with the technical assistance of China Irrigation and Drainage Development Center (CIDDC) of MWR; and

(f) Five Cooperation Framework Agreements are signed between water and environment departments for the management and implementation of the project: (1) the agreement between MEP PMO and MWR PMO at the central level; (2) the agreement between, on the one hand, the MWR PMO, the Water Affairs Bureau of Shijiazhuang Municipality and other relevant water departments, and on the other hand, the MEP PMO, the Environment Protection Bureau of Shijiazhuang Municipality and other relevant environment departments, for the coordination of the preparation of (i) the TVAP, in consultation with other stakeholders, for the Hutuo Sub-basin; and (ii) the IWEMP for Shijiazhuang; (3) the Agreement between, on the one hand, the MEP PMO, the Environment Protection Bureau of Chengde Municipality and other relevant environment departments, and on the other hand, the MWR PMO, Water Resources Bureau of Chengde Municipality and other relevant water departments, for the coordination of the preparation of: (i) the TVAP, in consultation with other stakeholders, for the Luan Sub-basin; and (ii) the IWEMP for Chengde; (4) the agreement between Chengde Municipal EPB and WRB; and (5) the agreement between Shijiazhuang Municipal WRB and EPB.

31. The CPMO consisting of the MEP PMO and the MWR PMO at the national level, both have benefited from operational experiences in implementing the first phase GEF/World Bank

Hai Basin Project (P075035). The CPMO and its Panel of Experts will provide technical assistance and operational guidance to the Chengde Joint PMO and Shijiazhuang Joint PMO.

B. Results Monitoring and Evaluation

32. Results M&E for this project will be the responsibility of the two professional institutes (water and environment) to be selected and responsible for M&E. These independent and professional M&E institutes will be strongly supported administratively by the MEP/MWR and technically by the Panel of Expert (POE) at the national level. The incremental cost of M&E activities for this project will be fully covered by the GEF Grant in addition to the cost for the data and information collected from various water quantity and quality monitoring stations as required. The M&E Report will be prepared for each calendar year during project implementation starting from 2017 and will be submitted to the Bank before April 30 each year, starting from April 30, 2018.

C. Sustainability

33. The MEP and MWR have committed to the leadership of management and implementation of this project in cooperation with the related local governments and in line with the GEF/Bank's requirements for project financing and the Bank's procurement and financial guidelines. To ensure sustainability of the project, the policy recommendations under this project will be incorporated into the MWR policies on water consumption (or ET) control and MEP policies on pollution control at the national level to mainstream the IWEM as one of the important PDO-level indicators for this project so that policies developed and endorsed could be implemented during the project period and thereafter.

V. KEY RISKS

34. The risk to the project in implementation is rated as Moderate due to its status as a second phase project after the GEF/World Bank's Hai Basin Project (P075035), which was implemented successfully and achieved its PDOs as planned. The two ministries (MEP and MWR) at the national level, which were responsible for the implementation of the first phase project, will also be implementing the proposed project. However, the following risks have been identified and their mitigation measures are proposed as follows:

(a) **Data collection and sharing between water and environment departments.** This will be difficult, particularly for the preparation and implementation of TVAPs and IWEMPs. The proposed mitigation measures, based on the experiences and lessons learned from the first GEF Hai Basin Project, is to sign a special data sharing agreement between water and environment departments in line with the cooperation framework agreement signed between the two departments.

(b) **Compliance with the Bank's procurement and FM guidelines.** Given that Chengde City and Shijiazhuang City did not participate in the first GEF Hai Basin Project, they will have no previous experience in undertaking the procurement and FM activities in line with the Bank's procurement and FM guidelines. The proposed measure to mitigate this risk is to

provide more intensive training to staff of Chengde and Shijiazhuang Joint PMOs on the Bank's procurement and FM guidelines at the beginning of the project implementation.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

Economic Analysis

Approach on cost benefit/net present value (NPV) = US$8.49 million; economic internal rate of return (EIRR) =14.5 percent

35. The preliminary project cost benefit analysis has been conducted mainly for the demonstration of IWEM water activities implemented under Component 2, including the investment cost estimated at about US$49.55 million for the water components, of which US$10.82 million is for the demonstration of IWEM approach in Hai Basin, and US$38.73million for the scaling-up of the IWEMP through the project areas.

36. The project investment in demonstration and scaling up of the Remote Sensing (RS)/Evapotranspiration (ET)/Environment Capacity (EC) technology-based IWEM will entail shifting the traditional water resources management approach to lay emphasis on using/managing water in an economically and environmentally optimal and sustainable fashion. The major project benefits will be derived from the shift from current resource-intensive development patterns to more resource-efficient patterns, which will maximize the economic value of each drop of water while minimizing negative environmental impacts for the sustainable water resources and ecosystem development. Based on the proposed project development objective, the project technical and management interventions will be demonstrated and mainstreamed at the sub-river basin and county and stakeholder levels, selected mostly from physical water scarcity and pollution areas in the Hai, Yellow, and Liao River Basins. The pilot counties and water users/polluters within the sub-river basin will implement the IWEMPs based on the ET/EC targets. Thus the quantifiable benefits will be accrued mainly from: (a) increased water productivity through the reduced consumptive use of water (ET); (b) reduced overexploitation of groundwater with reduced energy and O&M costs; (c) improved water quality with further developed wastewater treatment plants; and (d) increased ecological flows through the implementation of the IWEMPs, including the ET-based water rights, EC-based pollution discharge rights for both point and nonpoint pollutants, and so on.

37. **The economic benefit from the reduction of the groundwater overdraft.** Groundwater is the dominant water resource for water supply in the selected project demonstration areas in Shijiazhuang and Chengde Cities under Component 2. The substantial project quantifiable benefits will be achieved mainly from the reduction of the groundwater 'overdraft' and non-beneficial water losses, which will result in the city/countywide groundwater level stabilization and recovery. The quantifiable benefits from the reduced groundwater overdraft can be divided into two parts: (a) direct benefits to the project beneficiaries from less groundwater drawdown resulting in less energy, O&M, and replacement costs of wells in pumping areas; and (b) benefits to the overall water resources resulting from the preservation of groundwater resources, which can be alternatively used for industry and urban development. According to the project technical design

and identified outcome targets, the annual economic value of the reduced groundwater overdraft has been estimated to reach US$44.7 million by 2030, with the additional annually reduced labor cost at US$9.91 million, energy savings at US$0.74 million, increased crop production benefits at about US$50.21 million, and an EIRR of 14.5 percent (the related economic net present value at about US$8.5 million).

38. Although the environmental benefits have not been included in the economic analysis, the economic benefits achieved from the reduced groundwater exploitation have already been sufficient to economically justify the project. More detailed information is given in annex 5.

Financial Analysis

NPV=US$4.42 million; financial internal rate of return (FIRR) = 10.48 percent

39. Financial analysis has been carried out to indicate: (a) the financial feasibility of the proposed investments for stabilizing groundwater levels in selected demonstration areas; (b) the financial viability and sustainability of the wastewater treatment facilities (WWTFs); and (c) the financial incentives (the increased farmers' income) of beneficiary farmers to participate in the project.

40. The annual incremental financial value of groundwater saving and its related financial benefits on reduced O&M costs, the land, energy, and labor savings, and the increased crop production, were estimated. The results showed that the financial NPV and FIRR were estimated at about US$4.42 million and 10.48 percent, respectively.

41. **Financial sustainability of the WWTFs.** In addition to financing the least-cost selection of the WWTP alternative investments under Component 2, the financial sustainability has been assessed for all three proposed wastewater treatment companies in Kuancheng County and Chengde City. This analysis especially assessed the financial viability of the financed WWTPs by increasing revenues to adequately cover the O&M costs. The projected financial statements of the three wastewater treatment companies have been developed based on their annual business plans and their operations and services. The expected financial income and the O&M costs show that their income covers the O&M cost and hence, all three proposed wastewater treatment companies are financially sustainable and the water utility tariffs are adequate. The detailed analysis results are presented in Table 3 of Annex 5.

42. **Farmer’s income analysis.** The project will increase beneficiary farmers' income and improve their living standards. Based on the farm household information collected in the field, the household income analysis has been conducted, which showed that the project will substantially improve the financial viability of farming through increased annual returns to farm labor and capital investments. The results indicated that the net farm income for each low, medium, and high income households will be increased significantly, comparing to the without-project condition (see the detailed results in Table 4 of Annex 5).

43. **Farmers' ability to pay.** The farm incomes analysis show that project investments generate substantial increases in net farm incomes for all groups of farmers. The reduced O&M costs due to the stabilization of groundwater tables, resulting from the integrated measures, will enhance the financial feasibility and the farmers’ ability to pay. The estimated incremental annual

farm incomes due to the project are financially attractive and provide adequate incentives for farmers to make the proposed investments, take over the full responsibility for O&M, and pay the increased water charges.

B. Technical

44. The project aims to improve water and environment management through the application of an innovative IWEM approach supported by government policies and the application of the latest technologies available worldwide. The approach builds on the results of the first phase GEF-supported Hai River Basin Project and attempts to address the two critical water issues in China – water scarcity and water pollution in terms of water quantity and water quality - into a single unified assessment framework that requires taking an integrated approach for both the framework's application and eventual resolution of the issues themselves.

45. It does this through the application of RS/ET and RS/EC assessment tools supported by the creation of a policy and institutional environment to facilitate their application. The project will use an ET target to control the actual consumptive use of water (actual ET) while using an EC target to control actual water pollution discharges. RS technology will be used to measure ET across the pilot sites in the Hai Basin and scaling up areas in the Liao, Hai and Yellow River Basins, and to find ET targets at the sub-river basin level to allow water flows for basic ecological environment needs (for example, environmental flows in the rivers or to the lakes). Modeling will convert the target ET into water withdrawal patterns to make it operational by water users. Given the target ET, EC targets will also be assessed at the sub-river basin level. Achieving the maximum sustainable levels of ET and EC targets will be the responsibility of authorities (local government and its authorized environment and water resources departments and other stakeholders) in the basin, coordinated and cooperated by the established joint decision-making conference system and mechanisms.

46. The IWEM approach has been tested by a number of water resources and environment projects financed by the GEF Grant and the Bank loans in China whose results have shown its applicability to arid or semiarid areas or regions to effectively control overexploitation of water resources and emission of water pollution in a river basin to maintain green growth and sustainability of its urban and rural areas within the basin.

47. This Second phase project (the current project) builds on the results of the first phase GEF Hai Basin Project by further refining and more fully developing and integrating the EC assessment tool into the IWEM approach (EC and its relation to ET were not fully assessed or analyzed in the previous projects) and promotes its wider application (upscaling) to other river basins connected with the Bohai Sea.

48. The management and implementation of the project represents a continuation of earlier cooperation established between the MEP and MWR supported by the project provinces under the first phase GEF Hai Basin Integrated Water and Environment Management Project (GEF/World Bank Hai Basin Project), which was successfully implemented from 2005 to 2012. These institutional arrangements bode well for the implementation of the second phase project.

C. Financial Management

49. The project will be implemented by MEP PMO at FECO, MWR PMO at CIDDC, Chengde Municipal PMO at Chengde Environment Protection Bureau (CEPB) and Shijiazhaung municipal PMO established under the Shijiazhaung Water Resources Bureau (SWRB) as well as the sub-grant implementing agencies to be selected during project implementation. Two Designated Accounts (DAs) will be opened and maintained at FECO and CIDDC. Assessments of the FM system showed that the sub-grant may not be used effectively and efficiently and the two municipal PMOs and the sub-grant implementing agencies may lack prior experience in managing World Bank-financed projects. The action plan to mitigate the identified FM risks includes: preparation and distribution of an FM manual; provision of extensive training and peer learning; and hiring of professional consultants.

50. With implementation of the proposed actions, the FM arrangements will satisfy the World Bank's requirements under OP/BP 10.00. See Annex 3 for additional information.

D. Procurement

51. The key risk concerning procurement for implementation of the project is that, other than the CPMO under the MEP and MWR, the Chengde Municipal Joint-PMO and Shijiazhuang Municipal Joint-PMO have little previous experience working on Bank/GEF-financed projects and their capacities are not adequate. Nevertheless, the CPMO has successfully implemented several Bank-financed projects in the past, and hence, the project activities are expected to be implemented under the CPMO's guidance. Risk mitigation measures have been discussed with the CPMO and the two municipal joint-PMOs.

52. Procurement will be carried out in accordance with the 'Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers', dated January 2011 and revised in July 2014; 'Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers', dated January 2011 and revised in July 2014; and the provisions stipulated in the Grant Agreement. National Competitive Bidding (NCB) shall be carried out in accordance with the Law on Tendering and Bidding of the People's Republic of China promulgated by Order of the President of the People's Republic of China on August 30, 1999, subject to the modifications stipulated in the Legal Agreement to ensure consistency with Bank Procurement Guidelines. A brief summary of the procurement capacity and risk assessment, risk mitigation measures, and project procurement arrangement is provided in Annex 3.

E. Social (including Safeguards)

53. The project will promote an innovative approach (RS/ET/EC-based) to IWEM with demonstration pilot activities in the Hai River Basin, which will lead to a scaling up of the approach to other 'problem areas' in the Hai, Liao, and Yellow River Basins in North China. Residents in rural and urban areas under the project, together with the population along the coastline, will benefit from a more stable access to water resources and improved water quality. To this end, an Environmental and Social Management Framework (ESMF) was set up at project preparation to outline a Social Assessment (SA) study for analyzing and addressing the project's potential

impacts, positive and negative, on local people. The project will pilot demonstrative practices of RS/ET/EC-based IWEM in two cities in the Hai River Basin, supported by the establishment of new facilities and structures necessary for the IWEM implementation. Some wastewater treatment plants and pipeline networks will be built which may entail land acquisition and population relocation. OP 4.12 is therefore triggered.

54. Resettlement Policy Framework (RPF): The IWEM pilots in the Hai River Basin are not scheduled to start until 2017. The feasibility studies and specific design for the wastewater treatment plant and pipeline network in the two scheduled cities were not finalized at the time of appraisal. As a result, a Resettlement Policy Framework (RPF) was prepared during project preparation to ensure that the necessary Resettlement Action Plans (RAPs) will be developed in time for those subprojects designed under Component 2 during the course of project implementation in which resettlement may be required. Because the project will have no physical investment but improvements for water and environment management and policy advocacy in the scaling up areas in the Liao, Hai, and Yellow River Basins, project social assessment (SA) will continue evaluating impact of management interventions of the project.

55. Gender Issues: The project ensures that gender consideration is mainstreamed into project design and implementation. Based on gender-disaggregated data, project SA in the ESMF has identified different needs, roles, and priorities of men and women, and specified women's demands and aspirations to project activities so that women could benefit from the project as expected. On the ground, women farmers participate in the project through water user associations (WUAs), and they should account for 50 percent of local WUA membership. In the upper levels of project management, women's participation should take 40 percent in the PMOs and the related research units. Meanwhile, SA also made sure about any particularity of project impacts on women and raised corresponding measures to avoid and mitigate the specific impacts and risks, if any, in project safeguard instruments, such as the RPF and RAP.

56. Citizen Engagement: The project will prepare and implement IWEMPs in Shijiazhuang City and Chengde City of Hebei Province, which will be supported by all other project activities. A participatory approach will be adopted to mobilize not only the farmers but also city citizens including different departments of governments to participate in the preparation and implementation of the IWEMPs. As one of the important activities of IWEMPs, farmers will be mobilized through existing WUAs and FEPAs (Farmer Environment Protection Associations) to carry out irrigated agricultural water savings to increase their water productivities while reducing water consumption and pollution discharges. Citizens will be mobilized through different water use sectors in the two cities to reduce the water use and pollution discharges; and government departments, particularly the water and environment departments, will participate in the preparation and implementation of Target Values (ET and EC) Allocation Plans (TVAPs) as important part of the IWEMP. During preparation and implementation of TVAPs and IWEMPs, the mechanisms/project arrangements will be made for capacity building for citizen engagement through which the citizens will have a possibility to provide their feedback on implementation of the project activities, and this feedback would be used to adjust the project design/implementation as needed to improve the project outcomes.

F. Environment (including Safeguards)

57. The project will build on the success of the first phase Hai River Basin IWEM Project. The project seeks to mainstream the IWEM approach in the selected areas. It is classified as a Category B project and triggers Environmental Assessment (OP 4.01) and Natural Habitats (OP 4.04).

58. **OP 4.01- Environmental Assessment (triggered).** The project is expected to bring about overall environmental benefits, such as potential improvement of water quality and reduction of water consumption in the selected area. It is not likely to bring about any significant negative environmental impacts. However, there will be some adverse impacts associated with the physical investments under Component 2 (for example, provision of water saving irrigation facilities, and wastewater/waste treatment plants at the township level) which aim to reduce water consumption and control pollution discharges. These physical investments are likely to involve small-scale construction, which cause short-term construction nuisance and bring about management of waste/wastewater during the operation phase. The details of these activities cannot be determined until relevant studies (for example, IWEM) under Component 1 are completed during project implementation.

59. **OP 4.04 - Natural Habitats (triggered).** The project does not pose a risk of contributing to any significant conversion (loss) or degradation of natural habitats, either directly (through construction) or indirectly (through human activities induced by the project). Given that there are opportunities for benefits to natural habitats, this policy is triggered.

60. **Environment and Social Management Framework (ESMF).** An ESMF has been prepared, setting out the guidelines and procedures to address the environmental impacts of the project activities. The ESMF includes, among others: (a) the Bank's safeguards policies to be taken into account in the development of the TA activities financed under the project; (b) guidelines and procedures to address environmental issues caused by the demonstration activities; (c) Environmental Code of Practice to address general construction related impacts; (d) institutional arrangements; and (e) public consultation.

61. **Public consultation and disclosure.** In accordance with OP 4.01, public consultations have been conducted during the ESMF preparation process, including meetings with project affected people and local EPBs. The consultation on the draft ESMF was undertaken in December 2015. Feedback and concerns from the consultation have been addressed in the project design and in the ESMF. The ESMF was locally disclosed at the government website on January 8, 2016, and disclosed on the Bank InfoShop on February 16, 2016.

G. World Bank Grievance Redress

62. Communities and individuals who believe that they are adversely affected by a Bank-supported project may submit complaints to existing project-level grievance redress mechanisms or the Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed to address project-related concerns. Project affected communities and individuals may submit their complaint to the Bank's independent Inspection Panel that determines whether harm occurred, or could occur, because of the Bank's noncompliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly

to the Bank's attention and the Bank management has been given an opportunity to respond. For information on how to submit complaints to the Bank's corporate GRS, visit http://www.worldbank.org/GRS. For information on how to submit complaints to the Bank's Inspection Panel, visit www.inspectionpanel.org.

Annex 1: Results Framework and Monitoring

Country: China

Project Name: GEF Mainstreaming Integrated Water and Environment Management Project (P145897)

Results Framework

Project Development Objectives							
The PDO is to increase water productivity and reduce pollution discharges in the project areas to mainstream and scale up an innovative approach to integrated water and environmental management in the three river basins entering the Bohai Sea.							
These results are at Project Level							
Project Development Objective Indicators (5 indicators)							
Indicator Name	**Baseline**	**Cumulative Target Values**					
		2017	**2018**	**2019**	**2020**	**2021**	**End Target**
1. Policy Recommendations made under the project incorporated into the policies on water consumption control issued by MWR and policies on pollution control issued by MEP, respectively (measuring unit: the number of policies issued and implemented by MWR and MEP).	MEP: 0	0	1	1	2	2	2
	MWR: 0	0	1	1	2	2	2
2. Water pollution discharged into the Hutuo and Luan Rivers reduced in the two demonstration areas Chengde and Shijiazhuang (measuring unit: tons of COD, NH3-N, TN, and TP per year).	COD: 0	404	807	3,230	5,652	8,074	8,074
	NH3-N: 0	27	55	219	383	547	547
	TN: 0	134	268	400	530	670	670
	TP: 0	17	33	50	68	85	85
3. Water productivity increased in (a) two demonstration rural areas Gaocheng and Jinzhou; and (b) scaling-up areas in Shijin and Hetao irrigation areas (measuring unit: kg of grain production per m^3)	Demo: 1.10	1.14	1.17	1.20	1.23	1.26	1.26
	Shijin: 1.10	1.14	1.17	1.20	1.23	1.26	1.26
	Hetao: 1.19	1.21	1.23	1.25	1.27	1.29	1.29

4. Reductions achieved in overdraft of groundwater in 2 demonstration sites in Hai River Basin (Gaocheng and Jinzhou) (measuring unit: million m^3 per year)	0	18.04	36.08	54.12	72.17	72.93	72.93
5. IWEMP approach demonstrated and scaled up to cover MEP and MWR-defined problem areas in 3 river basins (measuring unit: km^2)	MWR: 0	4,278.4	8,556.8	12,835.2	17,113.6	28,420	28,420
	MEP: 0	0	55,367	93,058	108,810	125,380	125,380

Intermediate Results Indicators (17 indicators)							
Indicator Name	**Baseline**	**Cumulative Target Values**					
		2017	**2018**	**2019**	**2020**	**2021**	**End Target**
Component 1: **Mainstreaming of Innovative Approach on Integrated Water and Environment Management**							
1. All study reports prepared and completed as planned with good quality (measuring unit: the number of study reports prepared, revised, and completed with good quality)	0 (GEF financed)	0	4 (First draft completed)	4 (Final reports completed with good quality)	4	4	4
	0 (Government financed)	0	5 (First draft completed)	5 (Final reports completed with good quality)	5	5	5
2. Operational manuals/guidelines completed and accepted with good quality (measuring unit: the number of operational manuals prepared, revised, and completed with good quality)	0 (GEF financed)	0	5 (First draft completed)	5 (Final manuals completed with good quality)	5	5	5
Component 2: Demonstration in Hai Basin on Integrated Water and Environment Management							
3. All study reports prepared and completed as planned with good quality (measuring unit: the number of study reports prepared, revised, and completed with good quality)	0 (GEF financed)	0	10 (First draft completed)	10 (Final reports completed with good quality)	10	10	10
	0 (Government financed)	0	10 (First draft completed)	10 (Final reports completed with good quality)	10	10	10

4. RS/ET/EC-based TVAPs prepared and implemented with good quality for Luan sub-river basin and Hutuo sub-river basin respectively, and the IWEMPs prepared and implemented for Chengde Municipal City and Shijiazhuang Municipal City and extension plans prepared for scaling-up areas, respectively (measuring unit: TVAP IWEMP and extension plan prepared, revised, and completed with good quality and implemented with good results)	0 (TVAP GEF financed)	0	2 (First draft completed)	2 (Final plan completed with good quality)	2	2	2
	0 (IWEMP, MTR and ICR GEF financed)	0	2 (2 first draft IWEMPs completed)	2 (2 final IWEMPs completed with good quality)	4 (2 MTR reports prepared for implementation of IWEMPs and 2 scaling-up plans for the other two river basins)		2 (2 ICR reports on implementation and scaling-up of the plans with good results); 8 reports in total
5. Capacity building for citizen engagement in preparation of TVAPs and IWEMPs - Channels are institutionalized for citizens to engage with government agencies and other stakeholders (measuring unit: the number of consultation activities)	0	0	2	4	6	8	8
6. Women participation to increase water productivity and reduce water pollution through WUAs during IWEMP implementation (measuring unit: increased percentage of female membership in the WUAs) %	30	30	35	40	45	50	50
7. Construction of the 3 small wastewater treatment plants and pipelines, two in Chengde county and one in Kuancheng county with good quality in demonstration areas as planned (measuring unit: municipal wastewater pollution reduction—N, P & BOD (ton per year).	0 (Government financed)	0	N:534; P:75.9; BOD: 699	N: 1,068; P: 151.8; BOD: 1,398	N: 1,602; P: 227.7; BOD: 2,097	N: 2,136; P: 303.6; BOD: 2,796	N: 2,136; P: 303.6; BOD: 2,796
8. Improved irrigation technologies applied in 2 demonstration counties in Shijiazhuang municipal city (measuring unit: the number of hectares of irrigated areas applied with improved irrigation technologies)	2,660 (Government financed)	2,660	5,320	7,980	10,640	13,300	13,300
Component 3: Scaling up in Three River Basins on Integrated Water and Environment Management							
9. All study reports prepared and completed as planned with good quality (measuring unit: the number of study report prepared, revised and completed with good quality)	0 (GEF financed)	0	7 (First draft completed)	7 (Final reports completed with good quality)	7	7	7

	0 (Government financed)	0	4 (First draft completed)	4 (Final reports completed with good quality)	4	4	4
10. National Water Environment Technology Extension Platform established at the MEP (measuring unit: percentage of software development and study progress completed with good quality)	0 (GEF financed)	0	60	90	100	100	100
11. National ET Monitoring and Management Platform established at the MWR (measuring unit: percentage of software development and study progress completed with good quality)	0 (GEF financed)	0	60	90	100	100	100
12. Annual scaling-up activities carried out and inspection and assessment reports prepared and completed for the scaling-up areas (measuring unit: the number of inspection and assessment reports prepared with actions recommended for improvements)	MEP: 0 (GEF financed)	0	0	2	4	6	6
	MEP: 0 (GEF financed)	0	0	2	4	6	6
Component 4: Institutional Capacity Building and Project Management							
13. Establishment of project website according to IW: LEARN guidelines: (measuring unit: functioning website)	0 (GEF financed)	1	1	1	1	1	1
14. Preparation of project-related experience notes (2) and one results note (1) for IW: LEARN portal: (measuring unit: completed documents)	0 (GEF financed)	0	0	1	2	3	3
15. Establish and made it operational the project monitoring and evaluation (M&E) system: (measuring unit: functioning M&E system capable to generate semi-annual M&E reports).	1 (M&E Baseline Report). (GEF financed)	2 (Semiannual M&E report)	4	6	8	10	10

16. Female staff and specialists participation in the project workshops, study tours and training at the central, provincial, municipal, and county levels (measuring unit: increased percentage of female staff and specialists of the total number)	30	30	32	36	40	40	40
17. Cooperation Framework Agreement reached to facilitate the development and implementation of TVAP/IWEMP between the respective administrative units responsible for environment and water at the central, provincial and municipal levels, respectively (measuring unit: the number of signed agreements)	5 (Draft agreements signed)	5 Updated as necessary	5 Updated as necessary	5 Updated as necessary	5 Updated as necessary	5 Updated as necessary	5 Final agreements
18. Coordination meetings between the respective administrative or management units to support the implementation of the framework agreements at the three levels on an annual basis (measuring unit: the number of meetings held and minutes prepared and completed with decisions and actions recommended for problem resolution)	4 (GEF financed)	8	12	16	20	24	24

Note: COD = Oxygen Demand; NH3-N = Ammoniacal Nitrogen ; TP=Total Phosphorus; TN=Total Nitrogen; NH4-N=Ammonium Nitrogen; N=Nitrogen; P=Phosphorus; BOD=; MTR=Middle Term Review; ICR= Implementation Completion Report

Summary of key project outputs:

1. 40 thematic study reports prepared and implemented (the final number will be subject to procurement packaging for bidding), including 21 reports to be financed by GEF Grant and 19 to be financed by government investment programs;
2. 2 TVAPs prepared and implemented for sub-river basins Hutuo and Luan, respectively;
3. 2 IWEMPs prepared and implemented for demonstrations cities Chengde and Shijiazhuang, respectively;
4. 2 Extension Plans prepared for two extensional areas, respectively;
5. 1 MTR report and 1 ICR prepared for IWEMP implementation;
6. 5 Operational Manuals and Guidelines prepared and implemented for IWEM;
7. 2 platforms with database developed and supported by RS/GIS/ET/EC technologies at MEP and MWR, respectively for scaling up IWEM in 3 river basins;
8. 6 annual inspection and assessment reports prepared for IWEM scaling-up activities in 3 river basins;
9. 1 GEF IW website developed and 3 experience/results notes prepared for GEF IW-Learning activities;
10. 5 Framework Cooperation Agreements prepared and signed between water and environment departments, respectively;
11. 10 semiannual project M&E reports prepared during implementation and 1 project M&E baseline report prepared before negotiations;
12. 24 cooperation meetings held and minutes prepared for problem resolving between water and environment departments, respectively;
13. 2 wastewater treatment plants and pipelines constructed in Chengde City and Kuancheng County constructed; and
14. 13,300 hectares of irrigated area installed with improved irrigation technologies in 4 county demonstration area in Shijiazhuang Municipal City.

Indicator Description

PDO Indicators (5 indicators)				
Indicator Name	**Description (indicator definition)**	**Frequency**	**Data Source / Methodology**	**Responsibility for Data Collection**
1. Policy Recommendations made under the project incorporated into the policies on water consumption control issued by MWR and policies on pollution control issued by MEP, respectively (measuring unit: the number of policies issued and implemented by MWR and MEP)	The MEP policies refer to decree or regulation issued that address pollution control and emission and its trading rights. The MWR policies refer to decrees or regulations that address water consumption-based water resources management and water rights (water use rights) and local water service delivery system.	During project implementation period	Good results achieved in both demonstration and scaling-up areas on water consumption control	MWR PMO supported by consulting service
2. Water pollution discharged into the Hutuo and Luan rivers reduced in the two demonstration areas against control areas, respectively (measuring unit: tons of COD and NH3-N, TN and TP).	COD, NH3-N, TN, and TP are dominant water pollution in the demonstration areas. Water pollution discharge is measured at the pollution discharge outlets of the rivers in the demonstration and scaling-up areas.	Semiannually	Directly measured in the field based on the design of M&E system	MEP PMO supported by Chengde Municipal Joint-PMO with consulting service
3. Water productivity increased in (a) two demonstration rural areas Gaocheng and Jinzhou and (b) scaling-up areas in Shijin and Hetao irrigation areas (measuring unit: kg of grain production per m^3)	Irrigation water productivity refers to grain production per unit of water consumption (ET). It is measured by RS technology and it equals to average amount of grain production over one pixel (5 m x 5 m) of irrigated area per unit of consumptive use of water.	Semiannually	Calculation based on satellite images based on the design of M&E system	MWR PMO supported by consulting service
4. Reductions achieved in overdraft of groundwater in 2 demonstration sites in Hai River Basin (Gaocheng and Jinzhou) (measuring unit: m^3/year).	Annual reductions achieved in net extraction of groundwater resources in MWR demonstration areas where RS/ET/EC-based IWEMP approach and supporting tools have been applied and are evident	Semiannually	Directly measured in the field based on the design of M&E system	MWR PMO supported by Hebei Shijiazhuang Joint PMO with consulting service
5. IWEMP approach demonstrated and scaled up to cover the MEP and the MWR-defined problem areas in 3 river basins (measuring unit: km^2)	Coverage of area (demonstration areas plus scaling-up areas) within the previously defined MEP- and MWR-problem areas in the three river basins in which the IWEMP approach and supporting tools have been applied and are evident	Semiannually	Semiannual inspection and assessment reports prepared and completed for up-scaling areas respectively	MWR PMO and MEP PMO supported by Hebei Shijiazhuang Joint PMO and Chengde Joint-PMO with consulting service

Intermediate Results Indicators (17 indicators)				
Indicator Name	**Description (indicator definition)**	**Frequency**	**Data Source / Methodology**	**Responsibility for Data Collection**
Component 1: Mainstreaming of Innovative Approach on Integrated Water and Environment Management				
1. All study reports prepared and completed as planned with good quality (measuring unit: the number of study report prepared, revised and completed with good quality)	The study reports refer to the thematic studies listed in the table 2 and table 3 of Annex 6 to this PAD. Each study report in the table 2 will need to go through quality enhancement review with revisions and final review and acceptance by the panel of domestic and international experts and the Bank's supervision missions.	During project implementation period	Data and information will be collected by the consulting team under the support from MWR PMO and MEP PMO.	Each thematic study will be undertaken by a consulting team employed in line with the Bank's procurement guidelines (for Table 6.2) and government bidding procedures (for Table 6.3).
2. The study reports refer to the thematic studies listed in the table 2 and table 3 of Annex 6 to this PAD. Each study report in the table 2 will need to go through quality enhancement review with revisions and final review and acceptance by the panel of domestic and international experts and the Bank's supervision missions.	The operational manual /guidelines refer to a standardized procedures, steps and methodologies using RS/ET/EC technologies for integrated water and environment management including (i) RS/ET/EC-based approach for IWEM, (ii) RS-based non-point pollution source control approach; (iii) IWEM-based Integrated Toxic Symptoms; (iv) ET based water accounting and auditing; and (v) ET-based Dual control for groundwater management. Each manual and guidelines will need to go through quality enhancement review with revisions and final review and acceptance by the panel of domestic and international experts and Bank's supervision missions.	To be used during project period and thereafter	Data and information will be collected by the consulting teams under the support from MWR PMO and MEP PMO.	MEP PMO and MWR PMO will be responsible for the manuals/guidelines to be used in the demonstration areas and scaling up areas during the project period and scaling-up period and thereafter.
Component 2: Demonstration in Hai Basin on Integrated Water and Environment Management				
3. All study reports prepared and completed as planned with good quality (measuring unit: the number of study reports prepared, revised and completed with good quality)	The study reports refer to the thematic studies listed in Table 6.2 and Table 6.3 of annex 6. Each study report in Table 6.2 will need to go through QER with revisions and final review and acceptance by the panel of domestic and international experts and the Bank's supervision missions.	During project implementation period	Data and information will be collected by the consulting team under the support from MWR PMO and MEP PMO.	Each thematic study will be undertaken by a consulting team employed in line with the Bank's procurement guidelines (for

				Table 6.2) and government bidding procedures (for Table 6.3).
4. RS/ET/EC-based TVAPs prepared and implemented with good quality for Luan sub-river basin and Hutuo sub-river basin, respectively, and the IWEMPs prepared and implemented for Chengde Municipal City and Shijiazhuang Municipal City and extension plans prepared for scaling-up areas, respectively (measuring unit: the TVAP, IWEMP, and the Extension Plan prepared, revised, and completed with good quality, and implemented with good results)	RS/ET/EC-based TVAP refers to the TVAP to be prepared and implemented at the sub-river basin level. A water consumption balance analysis and environment capacity analysis will need to be undertaken to determine target value of ET, target value of EC, and then ET and EC targets will need to be allocated to each administrative area including Chengde and Shijiazhuang demonstration cities within the sub-river basin. The IWEMP refers to IWEMP prepared for two demonstration cities using the RS/ET/EC technologies. Extension plans refer to the plans to scale up the IWEMP to the problem areas of other two river basins. Each plan will need to go through QER with revisions and final review and acceptance by the panel of domestic and international experts and the Bank's supervision missions.	To be used during project period and thereafter	Data and information will be collected to prepare TVAP by consulting teams under strong support from the MWR PMO and MEP PMO.	MEP PMO and MWR PMO will be responsible for the manuals/guidelines to be used in the demonstration areas and scaling-up areas during the project period and scaling-up period and thereafter.
5. Capacity building for citizen engagement in preparation of TVAPs and IWEMPs - Channels are institutionalized for citizens to engage with government agencies and other stakeholders (measuring unit: the number of consultation activities)	Channels are institutionalized for citizens [e.g. specific groups including female/vulnerable/marginalized population] to engage with government agencies and other stakeholders to the following consultations: 1. provide input/ collaborate on planning and execution of development projects; 2. undertake monitoring, evaluation and oversight of development projects; or 3. exercise control over decision-making and resources to implement development activities	The citizen consultation will be carried out twice a year	Mechanisms/project arrangement will be made for capacity building for citizen engagement through which the citizens will have a possibility to provide their feedback on implementation of the project activities, and this feedback would be used to adjust the project design/implementation as needed to improve the project outcomes.	MEP PMO, MWR PMO, and Chengde Joint PMO and Shijiazhuang Joint PMO will organize the consultation and collect related data and information..
4. Women participation to increase water productivity and reduce water pollution through WUAs during IWEMP implementation (measuring unit: increased percentage of female membership in the WUAs)	The IWEMP prepared under the project will use participatory approach to mobilize farmers to increase water productivity through irrigation scheduling and reduce pollution discharges through reduced use of fertilizer and pesticides. More female farmers will be encouraged to join the WUAs to participate in these project activities.	Twice a year to monitor the increased number of female farmers in the WUAs	Data and information will be collected by the M&E consulting teams under the support from local WRB PMOs	MEP PMO, MWR PMO, and Chengde Joint PMO and Shijiazhuang Joint PMO will be responsible for

				mobilizing women participation and related data and information collection.
5. Construction of three small wastewater treatment plants and pipelines, two in Chengde County and one in Kuancheng County with good quality in demonstration areas as planned (measuring unit: municipal wastewater pollution reduction—N, P & BOD (tons /yr).	Three wastewater treatment plants completed will need to be monitored by the Bank's supervision missions to ensure that they are well operated and functioning for pollution control.	Twice a year to monitor the functioning of the plants	The related data and information will need to be collected by the M&E consulting teams under the support from local the EPBs and MEP PMO.	MWP PMO and the PMOs of the demonstration cities
6. Improved irrigation technologies applied in 2 demonstration counties in Shijiazhuang Municipal City (measuring unit: the number of hectares of irrigated areas applied with improved irrigation technologies)	The improved irrigation technologies refer to drip system, sprinkler system, and low-pressure pipeline system and so on, which will replace the current inefficient irrigation systems to increase water use efficiency under a cap of water consumption or target ET. The project design will ensure that the actual ET with project interventions is less than the current ET before the project. The irrigated areas with improved technologies will need to be monitored by the Bank's supervision missions to ensure that they are well operated and functioning for real water savings. Site: large and medium-sized irrigation districts renovation project in Shijiazhuang municipal district.	Twice a year to monitor the actual ET of the application area	ET and production data will need to be measured and monitored with satellite data supported by field measurement on the irrigated areas with the improved irrigation technologies applied under the support from local WRBs and MWR PMO.	MWR PMO and the PMOs of demonstration cities
Component 3: Scaling up in Three River Basins on Integrated Water and Environment Management				
7. All study reports prepared and completed as planned with good quality (measuring unit: the number of study reports prepared, revised, and completed with good quality)	The study reports refer to the thematic studies listed in Table 6.2 and Table 6.3 of annex 6. Each study report in Table 6.2 will need to go through QER with revisions and final review and acceptance by the panel of domestic and international experts and the Bank's supervision missions.	During project implementation period	Data and information will be collected by the consulting team under the support from MWR PMO and MEP PMO.	Each thematic study will be undertaken by a consulting team employed in line with the Bank's procurement guidelines (for Table 6.2) and government bidding procedures (for Table 6.3).

8. National Water Environment Technology Extension Platform established at the MEP (measuring unit: percentage of software development and study progress completed with good quality)	The Platform refers to a RS/EC technology-based database system to be installed in a server at the MEP, which could calculate EC values for each water system controlling unit area and monitor and distribute the actual water pollution discharges at the key cross-sections of the rivers in the demonstration and scaling-up areas. The Platform established will need to go through QER with revisions and final review and acceptance by the panel of domestic and international experts and Bank supervision missions.	Twice a year to monitor the functioning of the platform	Actual EC values will be calculated for each of the river basins or sub-river basins based on the hydrological data and ecological status of water system controlling unit area, and the actual water pollution discharge will be observed at the key cross-sections of rivers in the demonstration and scaling-up areas.	MEP PMO supported by MWR PMO
9. National ET Monitoring and Management Platform established at the MWR (measuring unit: percentage of software development and study progress completed with good quality)	The Platform refers to a RS/ET technology-based database system to be installed in a server at the MWR, which could produce actual ET values over the irrigated areas to monitor and distribute the actual water consumption for the demonstration and scaling-up areas. The Platform established will need to go through QER with revisions and final review and acceptance by the domestic and international expert panel and Bank supervision missions.	Twice a year to monitor the functioning of the platform	Actual ET values will be calculated and issued to local irrigation management authorities based on the satellite images in line with the design of M&E system	MWR PMO supported by MEP PMO
10. Annual scaling-up activities carried out and inspection and assessment reports prepared and completed for the scaling-up areas (measuring unit: the number of inspection and assessment reports prepared with actions recommended for improvements)	The annual scaling-up activities include (a) providing the manuals prepared and training for the new IWEM approach to the local authorities and stakeholders in the scaling-up areas; (b) monitoring and analysis on the current status of water consumption, water pollution, and water productivity; (c) effectiveness assessment of the interventions with application of IWEM approach in the scaling-up areas; and (d) comments and recommendations with proposed actions to continue promoting the IWEM approach. The annual inspection and assessment report will be prepared by consulting team through field visits to document the impact of the project and make recommendations for improvements in the scaling-up areas.	Once a year starting from 2019 to 2021 to conduct scaling-up activities and prepare reports	The related data and information will need to be collected by M&E consulting teams to prepare reports under the support from the local EPBs and WRBs and MEP PMO and MWR PMO.	MEP PMO and MWR PMO will be responsible for the reports to be prepared in the scaling up areas during the project period.
Component 4: Institutional Capacity Building and Project Management				
11. Establishment of project website in both English and Chinese	GEF International Water Focal Area requirement to produce a project specific website in both English and Chinese that	To be used during project	Number of 'hits' recorded by the site	MEP PMO and MWR PMO,

according to IW: LEARN guidelines. (measuring unit: functioning website)	is linked to the IW: LEARN web portal and provides global access to project information and progress.	period and thereafter		provincial PMOs, and two demonstration city PMOs
12. Preparation of project-related experience notes (2) and one results note (1) for IW: LEARN portal (measuring unit: completed documents)	GEF International Water Focal Area requirements to produce, at minimum, two experience notes for sharing at the IW conferences and one results note documenting the experiences, lessons learned, and achievements stemming from project implementation	Experience notes in time to attend GEF IW conferences and the result note by end of the project	Completed documents	MEP PMO and MWR PMO supported by the municipal district PMOs
13. Establish and made it operational the project monitoring and evaluation (M&E) system: (measuring unit: functioning M&E system capable to generate semi-annual M&E reports).	Project-specific M&E system that tracks and evaluates project progress and supports required recording functions and meets Bank and GEF standards. M&E report will be prepared twice a year and submitted to the Bank's supervision missions for review and comments. The first M&E report should be prepared for the previous full year and submitted to the Bank before February 28 each year during project implementation. The report should update all 20 key performance indictors with data and information observed or collected and detailed evaluation and recommendations for project improvements. The second M&E report should be the update of the first M&E report, with the estimated values for all 20 indicators and submitted to the Bank before August 31 each year during project implementation.	To be used during project period and thereafter	Project progress and budget reports	MEP PMO and MWR PMO, and two demonstration city PMOs
14. Female staff and specialists participation in the project workshops, study tours, training at the central, provincial, municipal and county levels: (measuring unit: increased percentage of female staff and specialists of the total number).	The project will encourage more female staff and specialists to participate in the various workshops, seminars, and domestic and overseas training planned under the project to strengthen their technical capacities.	Twice a year to monitor the number of women participation	To monitor the number of women in the various workshops and training and study tours by M&E consulting teams	The PMOs at central and municipal levels
15. Cooperation Framework Agreement reached to facilitate the development and implementation of TVAP/IWEMP between the respective administrative units	Five Cooperation Framework Agreements are signed between water and environment departments for the management and implementation of the project: (1) the agreement between MEP PMO and MWR PMO at the central level; (2) the agreement between, on the one hand,	To be used during project period and thereafter	The documents on cooperation mechanism will be prepared at central, provincial, and city levels	MEP PMO and MWR PMO, and municipal district PMOs

responsible for environment and water at the central, provincial and municipal levels, respectively (measuring unit: the number of signed agreements).	the MWR PMO, the Water Affairs Bureau of Shijiazhuang Municipality and other relevant water departments, and on the other hand, the MEP PMO, the Environment Protection Bureau of Shijiazhuang Municipality and other relevant environment departments, for the coordination of the preparation of (i) the TVAP, in consultation with other stakeholders, for the Hutuo Sub-basin; and (ii) the IWEMP for Shijiazhuang; (3) the Agreement between, on the one hand, the MEP PMO, the Environment Protection Bureau of Chengde Municipality and other relevant environment departments, and on the other hand, the MWR PMO, Water Resources Bureau of Chengde Municipality and other relevant water departments, for the coordination of the preparation of: (i) the TVAP, in consultation with other stakeholders, for the Luan Sub-basin; and (ii) the IWEMP for Chengde; (4) the agreement between Chengde Municipal EPB and WRB; and (5) the agreement between Shijiazhuang Municipal WRB and EPB.			
16. Coordination meetings between the respective administrative or management units to support the implementation of the framework agreements at the three levels on a semi-annual basis (measuring unit: the number of meetings held and minutes prepared and completed with decisions and actions recommended for problem resolution)	Periodical meetings to be held between water administrative department and environment administrative department at the central and city levels to resolve the related key issues including data sharing and other key issues during project period and thereafter	Twice a year	Minutes and attendance list of the meetings	MEP PMO and MWR PMO, and two demonstration city PMOs

Annex 2: Detailed Project Description

CHINA: GEF Mainstream Integrated Water and Environment Management Project

Context

1. China's water sector dominated by agriculture, domestic, and industrial users is faced by a growing number of challenges that will need to be addressed if it is going to achieve sustainable levels of economic growth. Critical issues include (a) water scarcity, particularly in China's drier north and northwest region; (b) growing imbalances between water supply and demand; (c) the gradual drying up of waterways and increased incidence of overexploitation of groundwater resources; and (d) widespread surface and groundwater pollution. These issues are further exacerbated by the increasing severe effects from drought experience in recent years.

2. The water scarcity and water pollution, contributing to large-scale changes in water quantity and quality, are also affecting downstream users and ecosystems that depend on the resources. In the northeast, China's Bohai Sea is recording growing levels and extent of land-based sources of pollution transported through the three main rivers, the Liao, Hai, and Yellow. Changes in quantity and quality of inflows to the sea are having an impact on fisheries and human health and increasingly threatening the ecological integrity of its critically important coastal and nearshore ecosystems. There is concern that these adverse impacts may eventually spread to China's neighboring countries that border the Yellow Sea, Japan, and North and South Korea.

3. Addressing the issue of the degradation of the Bohai Sea will require maintaining, or wherever required, restoring the necessary ecological flow rates in the main rivers entering the sea. To achieve this goal, the issues of both water scarcity and water pollution must be addressed in the upper reaches of the respective river basins. For this to happen, institutional cooperation between the different sectors responsible for water resources and environmental management in China needs to be strengthened. A lack of integration in planning, target setting, and data sharing makes it difficult to ensure a balance between water resources utilization and environmental protection. Balancing the competing demands for China's water resources and fostering cooperation between sectors will be vital in ensuring more sustainable and stable development in the future.

Innovative IWEM Approach

4. The project's innovative IWEM approach attempts to address the twin issues of water scarcity and quality. It will do this through the application of RS/ET and EC assessment tools supported by the creation of a policy and institutional environment to facilitate their application. This 2nd phase project (the current project) builds on the results of the 1st phase GEF Hai Basin Project by further refining and more fully developing and integrating the EC assessment tool into the IWEM approach and promotes its wider application (upscaling) to other river basins connected with the Bohai Sea. The approach is novel because it attempts to combine the resolution of the two critical water issues in China—of reductions in water quantity and improvements of water quality—into a single unified assessment framework that requires taking an integrated approach for both the framework's application and eventual resolution of the issues themselves.

5. The approach will find out how much water is available to consume (rather than to use) for various economic activities in urban and rural areas without adverse impacts on ecosystems in a

river basin; how to ensure that the actual consumptive use of water does not exceed the amount of water available to consume in a sustainable manner and that the actual water pollution discharges do not exceed the environment capacity of rivers/lakes; and what actions should be taken to have a more balanced social and economic development and ecosystem preservation in a river basin.

6. RS technology measures ET, that is, the actual consumptive use of water in ecological, environmental, agricultural, and urban areas. Relying on the data obtained with the technology, a more reliable water balance analysis shall be made at the river basin level, together with the supplemented consumptive use data available from the industrial and domestic uses through field surveys. Based on the result of the analysis, the target ET (or the allowed or maximum consumptive uses of water) for various economic development activities by different water using sectors shall be worked out under the prerequisite that water resources are allocated to ensure necessary environment flows and eliminate groundwater overdraft for green and sustainable growth in the river basin.

7. Modeling technologies are used to determine target EC for a river basin or a sub-river basin given a target ET, which can be aggregated from water system controlling units within the river basin or the sub-river basin. The actual pollution discharges should be managed to be lower than the target EC. However, the target EC has nothing to do with actual pollution discharges but is highly related to the target ET for various economic activities, including irrigated agricultural, industrial, and domestic water uses.

8. Calculation of EC**.** EC is calculated with generic models used internationally, which would be selected based on the boundary conditions for a sub-river basin such as hydrological regimes (given ET targets for the sub-river basin) and requirements of water environment function zones in the sub-river basin. For example, the Qual-2K model (1D) could be selected for rivers which have less data or river width of less than 200 m; the EFDC model (2D or 3D) could be selected for rivers or lakes which have more data available or river width that is larger than 200 m. The EC calculated represents the maximum pollution discharges allowed to meet the environmental objectives in the given sub-river basin.

9. Given the fixed average amount of water available in the river basin, the higher the target ET, the lower the target EC; this is because the higher target ET makes less environment flows in a river or less inflows to a lake or more groundwater net withdrawal in the river basin. The target ET and target EC are interrelated to each other and need to be worked out together through their interactions at the river basin level. ET determines how much water 'disappears' through consumption and therefore, how much water is left, which would help us decide with trade-offs how much of that would need to be maintained for environment and how much (the maximum) could be consumed by economic activities. EC determines the environment-carrying capacity of the water that is left for environment, which would help us control emissions of pollution discharges.

10. **Incorporating ET and EC into management of water resources and environment.** In many water-scarce areas, policies and measures aimed at reducing the use of water have in reality contributed to increased water consumption or groundwater depletion. Traditional water-saving approaches, such as measures to reduce water losses and inefficiency in irrigation, do not always result in genuine water savings. Instead of water loss, (for example, to replenish groundwater as

canal seepage), they are retained and often used to expand irrigation, industry, or residential areas. These activities increase the level of ET and thus, water consumption also increases. Therefore, this project will focus on controlling consumptive use of water or ET while using EC to determine targets for pollution reduction. RS technology will be used to measure ET across the pilot sites in the Hai Basin and scaling-up areas in the Liao, Hai, and Yellow River Basins, and modeling will convert this into water withdrawal patterns to make it operational by water users. EC will also be assessed for the pilot river basins, as well as basic ecological needs for water (that is, environmental flows). The maximum sustainable levels of ET and EC will be determined, and it will be the responsibility of the authorities (local government, its authorized environment and water resources departments, and other stakeholders) in the basin to achieve these targets through coordination of the established joint decision-making conference system and mechanisms. A platform will also be established to allow the different stakeholders to consult and negotiate how these targets will be met and water resources allocated. Innovations in technology and management will be piloted to help achieve new ET- and EC-based targets in the basins.

11. This new approach on RS/ET/EC-based IWEM will be prepared and carried out jointly by water and environment departments and other related government agencies and stakeholders with participatory approach. The major steps that the project will support in its application are as follows:

(a) A river sub-basin shall be taken as a unit to find out target ET and EC, through preparing and implementing a TVAP, which will consider the impact of climate change[1] and be negotiated and agreed by all related government agencies and stakeholders through a platform called 'Joint Conference Decision Making System.'

(b) Once the ET and EC targets are agreed at the river sub-basin level with participatory approach, they shall be allocated to each of the administrative units in the river basin.

(c) The responsible Water and Environment Departments for their respective administrative units that fall within the river sub-basin shall jointly prepare an IWEMP under the constraints of target ET and EC allocated from the TVAP in consultation with other stakeholders (for example, other government agencies and representatives of water users and polluters).

(d) The responsible water and environment departments for the concerned administrative unit, among others, shall implement and enforce the IWEMP to ensure that the actual ET is less than the ET allocated and the actual pollution discharge is less than the EC allocated from the TVAP.

(e) Online monitoring of actual ET against target ET (by RS technology) and actual pollution discharges against target EC (by water quality monitoring stations) shall be in place to report on a regular basis to leaders of the relevant administrative units where actual ET

[1] The Decision Tree Framework by the Bank is planned for the analysis to assess the vulnerabilities of the project during preparation of the TVAP and to make adjustment to the IWEMP to demonstrate the robustness of the project to the impact of climate change (for details, please refer to https://openknowledge.worldbank.org/handle/10986/22544).

and pollution discharges exceed the targets, in order for these departments to mobilize stakeholders (water users and polluters) to take actions for improvements in time.

(f) The actions to be taken could be related to structural change that convert the current resources-consumption-oriented production mode to a resources-efficient one, which leads production of the same or higher quality products with much less water consumption and much less water pollution discharges for green growth and sustainability.

(g) The existing laws, regulations, rules, and the regulatory system shall be enriched and supplemented as necessary to facilitate the implementation of the above steps.

12. The approach has been partially[1] tested by a number of water resources and environment projects financed by the GEF Grant and the Bank loan in China and have been shown to be applicable to arid or semiarid areas or regions to effectively control overexploitation of water resources and abusive emission of water pollution in a river basin and maintain green growth and sustainability of the urban and rural areas within the basin.

Overview of the Project Area

13. In line with national policy guidelines, the MWR and MEP have identified water-relevant 'problem areas' in each of the country's provinces. The criteria for the identification of these areas differ for the respective ministry. For the MWR, these are areas where (a) groundwater resources are being over-extracted and/or (b) water use efficiency is equal to or less than 45 percent. For the MEP, these are areas where (a) water quality is Class 5 (lowest category) or worse and/or (b) water courses characterized by high water quality are subject to discharges of industrial pollution. These criteria have been applied in four 'problem areas' in demonstration and scaling-up areas identified and selected for activities to be supported under the project (see map in annex 7). Specifically, project activities will be supported in the Shijiazhuang and Chengde municipal cities situated in the Luan and Hutuo Sub-river basins respectively, of the Hai River Basin, and will be subsequently scaled up to the Shijin and Hetao irrigation areas (Hai and Yellow River Basins, respectively) for issues associated with water scarcity and all of the Hebei Province for issues associated with water quality. The demonstration and scaling-up areas cover about 35 percent[2] of the problem areas of the Liao, Hai, and Yellow River Basins, which would adopt and enhance the innovative concept and approach to significantly increase the outflows and reduce the pollution discharges into rivers and further into the Bohai Sea.

Project Components

14. The PDO will be achieved through implementation of the following project components and activities:

Component 1: Mainstreaming of Innovative Approach on Integrated Water and

[1] In addition to using ET target to control actual water consumption in the previous Bank or GEF financed projects, this project introduces EC target to control actual pollution discharges, emphasizing the close relations between ET target and EC target (please refer to the section on innovative IWEM approach of Annex 2).
[2] The first GEF Hai Basin Project covered 6.25 percent of the problem areas in the Hai Basin.

Environment Management (US$1.20 million of GEF Grant plus US$2.25 million of government financing—total of US$3.45 million)

15. Component 1 will carry out research on new policy options and the application of existing government policies as well as innovative technologies to mainstream the ET/EC-based IWEM approach and promote its standardization through the development of operational manuals and guidelines, which will be informed through the results for project-supported activities in two demonstration areas (Component 2) in the Hai River Basin and complemented with case studies and research to encourage a shift toward more efficient modes of production.

(a) Sub-component 1.1. Studies leading to the formulation of new and/or application of existing policies and technology in support of mainstreaming the IWEM approach. A total of 4 Studies will be supported under this sub-component that will address critical policy issues in China's water sector. These include: (i) study on assessment of EC for urban environment (pilot in Chengde); (ii) study on policies on point water pollution source emission rights and their trading (pilot in Chengde); (iii) study on policies on ET-based water rights (water use rights) and trading (pilot in Jinzhou); and (iv) study on policies on local water service delivery system (pilot in Jinzhou);

(b) Sub-component 1.2. Preparation of operational manuals and guidelines for the IWEM approach. The development of a series of 5 operational manuals and guidelines will be supported under this sub-component that include: (i) ET/EC-based IWEM approach (pilot in Chengde and Shijiazhuang); (ii) RS-based non-point pollution source control approach (pilot in Chengde); (iii) IWEM –based integrated toxic symptoms (pilot in Chengde), (iv) ET-based water accounting and auditing (pilot in Chengde and Gaocheng); and (v) ET-based dual control for groundwater management (pilot in Gaocheng).

16. The expected intermediate results indicators under this component are (a) 4 study reports prepared and completed as planned and (b) 5 operational manuals/guidelines completed.

Component 2: Demonstration in Hai Basin on Integrated Water and Environment Management Approach (US$2.80 million of GEF Grant plus US$87.30 million of government financing—total of US$90.10 million)

17. Component 2 will support the preparation and implementation of TVAPs in two sub-river basins and the IWEMPs in two demonstration city areas in the Hai River Basin. This implementation will lead to improved water productivity, reduced water consumption and water pollution, and increased ecological environment flows into the rivers through the integration of ET and EC targets to guide and control water extraction, utilization, and pollution discharges. It will be fully supported by results stemming from activities supported under Component 1.

(a) Sub-component 2.1. Application of the IWEM Approach in Chengde. Under this sub-component a TVAP and IWEMP will be supported from Luan Sub-basin and the Chengde municipal district respectively. The impact of climate change will be considered during preparation of the TVAP. The implementation of the plans will be complemented by all project-supported activities planned under this project including the key ones as follows: (i) preparation and implementation of ET/EC-based TVAP for Luan sub-basin and IWEMP

for Chengde; (ii) demonstration on integrated monitoring and evaluation of ecological and water quality status in the Luan River sub-basin (Hai River Basin); (iii) demonstration on ET-based EC quota management in sub-river basin of the Luan river; (iv) demonstration on RS-based non-point pollution source control approach; (v) demonstration on water consumption-based water accounting and auditing in both industrial factories and irrigation sites (Chengde and Gaocheng); and (vi) Demonstration on point water pollution source emission rights and their trading.

(b) Sub-component 2.2. Application of the IWEM Approach in Shijiazhuang. Similar to the activities in the previous sub-component a TVAP and IWMEP will be supported for the Hutuo Sub-basin and Shijiazhuang municipal district, respectively. The implementation of the plans will be complemented by all project-supported activities planned under this project including the key ones as follows: (i) preparation and implementation of ET/EC-based TVAP for Hutuo Sub-basin (Hai Basin) and IWEMP for Shijiazhuang; (ii) demonstration of ET-based dual-control for groundwater management (Gaocheng), (iii) demonstrations on water consumption-based water accounting and auditing in both irrigation sites and industrial factories (Gaocheng and Chengde); (iv) Demonstration on scientific irrigation management at WUA (Jin-Zhou); (v) demonstration on water pricing reform and local water service delivery system; and (vi) demonstration on ET-based water rights and trading (Jin-Zhou).

18. The expected intermediate results indicators under this component are (a) two RS/ET/EC-based TVAPs prepared, (b) two RS/ET/EC-based IWEMP prepared for each of the demonstration cities in the Hai Basin, (c) improved irrigation technologies applied in the field demonstration areas as planned, and (d) two wastewater treatment plants and pipelines constructed in the demonstration areas.

Component 3: Scaling up the Integrated Water and Environment Management Approach in Three River Basins (US$3.60 million of GEF Grant plus US$3.70 million of government financing—total of US$7.30 million)

19. Component 3 will scale up the ET/EC-based IWEM approach with innovative technologies and policy interventions tested in the two pilot sub-river basins and demonstration cities under the previous components (1 and 2) to cover additional areas in the Liao, Hai, and Yellow River Basins, respectively (35 percent of the problem areas are in the three river basins). The development of two platforms with accompanying databases will also be supported for the purposes of monitoring actual ET values and water pollution discharges to facilitate the consultation and negotiation of the values needed to meet the allocated ET and EC targets among different stakeholders. Innovations in technology and management will be piloted to help achieve new ET and EC-based targets in the three river basins. Component 3 will be fully supported with the results achieved in Components 1 and 2.

(a) Sub-component 3.1. Development of National Water Environment Technology Extension Platform at MEP. Under this sub-component the project will support: (i) Development of national GIS platform for EC-based river basin management; (ii) development of Integrated, Intelligent and International Platform for Environmental Technology (3iPET);

and (iii) assessment on effectiveness of water pollution prevention moving towards River Basin District (RBD) Approach (pilot in Cheng-De).

(b) Sub-component 3.2. Development of a National Water ET Monitoring and Management Platform at MWR. Similar to above, the sub-component will support the development of national ET monitoring and management platform that will include support for: (i) development of GIS platform for monitoring of irrigated agricultural water savings and groundwater management; (ii) development of RS/ET-based Assessment on Water Consumption in Irrigation Areas of Semi-arid Regions; (iii) study on RS/ET-based acquisition of irrigation data and information; and (iv) study on RS-based ET monitoring and analysis in irrigation districts.

(c) Sub-component 3.3. Scaling up the IWEM Approach in Liao River Basin. This sub-component will support annual M&E on scaling-up the IWEM approach in Liao River basin in cities Shen-Yang, An-Shan, Pan-Jing, and Fu-Shun. The detailed activities include: (i) providing the manuals prepared and training for the new IWEM approach to the local authorities and stakeholders in the scaling-up areas; (ii) monitoring and analysis on the current status of ET and water pollution and water productivity; (iii) effectiveness assessment of the interventions with application of IWEM approach in the scaling-up areas; and (iv) comments and recommendations with proposed actions to continue promoting the IWEM approach.

(d) Sub-component 3.4. Scaling up the IWEM Approach in Hai River Basin. This sub-component will support annual M&E on scaling-up the IWEM approach in Shijin irrigation area in Hai River basin (the detailed activities are as same as above).

(e) Sub-component 3.5. Scaling up the IWEM Approach in Yellow River Basin. This sub-component will support annual M&E on scaling-up the IWEM approach in He-Tao irrigation area in Yellow River Basin (the detailed activities are as same as above).*Subcomponent 3.1. Development of National Water Environment Technology Extension Platform at the MEP.* Under this subcomponent, the project will support (i) the development of a national river basin-based EC GIS to support nationwide environmental quality improvement; (ii) the platform (3iPET), which includes the development of database and software platform, hardware, and environmental training; and (iii) assessment on effectiveness of water pollution prevention moving toward the RBD approach.

20. The expected intermediate results indicators under this component are (a) National Water Environment Technology Extension Platform established at the MEP, (b) National ET Monitoring and Management Platform established at the MWR and (c) semiannual inspection and assessment reports prepared and completed for the three upscaling areas, respectively.

Component 4: Institutional Capacity Building and Project Management (US$1.90 million of GEF Grant plus US$1.75 million of government financing—total of US$3.65 million)

21. Following the suggestions stemming from the STAP review of the project, Component 4 will place considerable emphasis on strengthening the capacity of the central and local governments to support integrated water and environmental management through consulting

services and training, workshops, and study tours.

(a) Sub-component 4.1. Regional IW learning activities. One percent of the GEF project grant (US$95,000) will be used to support International Water (IW) Learning activities to include the production of at least two project experience notes and one results note, establishment of a project website and support for project staff participation in the Biannual International Waters Conferences;
(b) Sub-component 4.2. Technical assistance through consulting services. Provision of TA from both domestic and international expertise to project entities in support of project implementation;

(c) Sub-component 4.3. Training and workshops. A series of training activities and workshops will be supported to increase institutional capacity in the project entities.

(d) Sub-component 4.4. Project monitoring and evaluation. The establishment of a project-wide M&E system for project monitoring and evaluation;

(e) Sub-component 4.5. Project management. Support will be provided under this sub-component to cover staff, equipment travel and operational costs of the 5 PMOs responsible for project implementation. In addition, support will be provided for the development of Framework agreements reached to facilitate the development and implementation of TVAP/IWEMPs between the respective administrative units responsible for environment and water and (b) coordination meetings between the respective administrative units to support the implementation of these framework agreements.

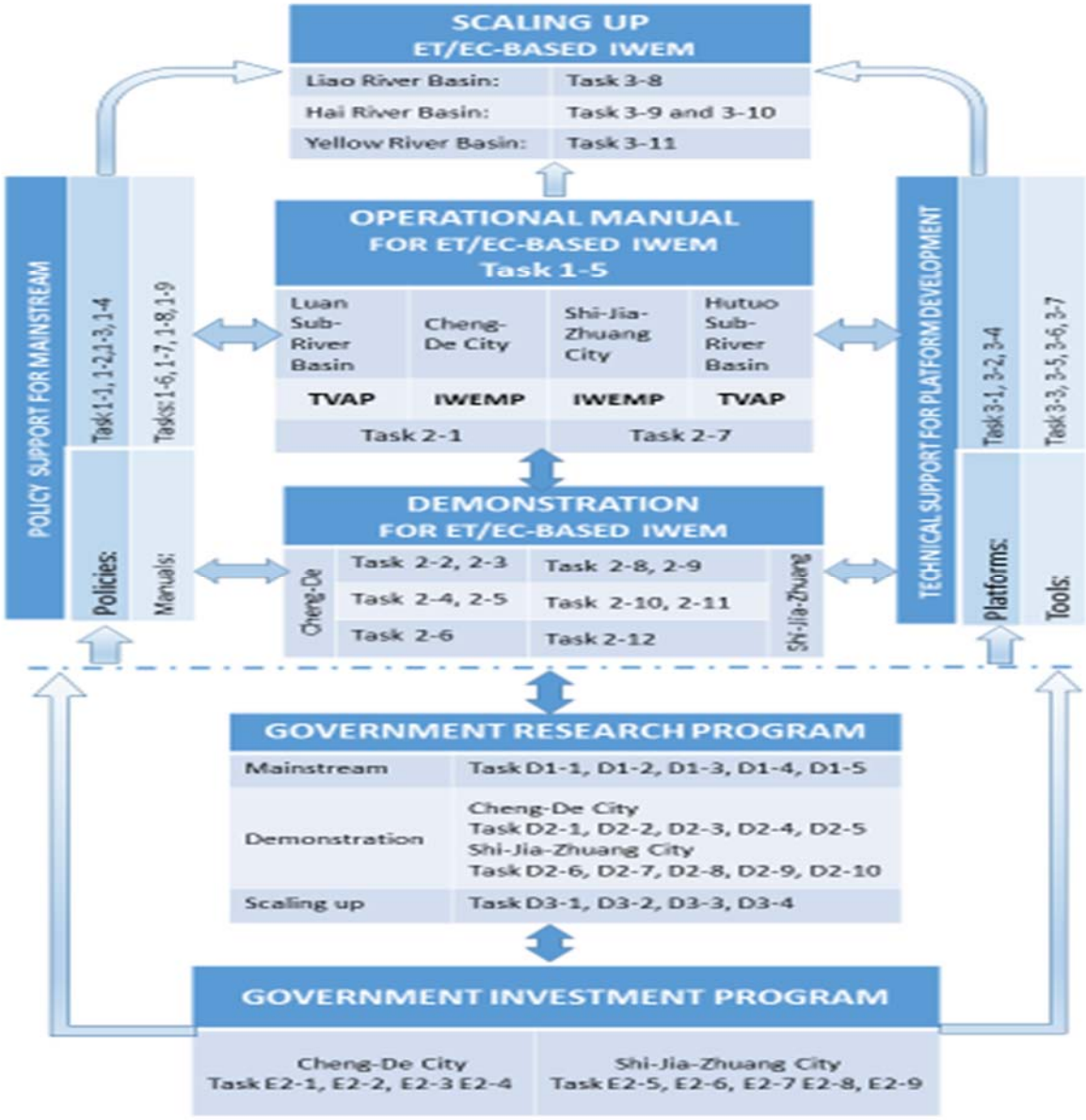
22. The expected intermediate results indicators under this component are (a) establishment of project website according to IW: LEARN guidelines; (b) preparation of two project-related experience notes and one results note for the IW:LEARN portal; (c) establishment of operational project M&E system; (d) framework agreements reached to facilitate the development and implementation of TVAPs/IWEMPs between the respective administrative units responsible for environment and water at three levels (at the municipal district level, two agreements will be signed for the two demonstration municipal districts); and (e) coordination meetings between the respective administrative units to support the implementation of the framework agreements at the three levels on a semiannual basis.

23. The project's four components are designed to be closely interconnected with each other, a necessary feature of project design to achieve the PDO. Specifically, Component 1 will provide technical support to Component 2. Component 2 will provide case studies and research results to increase the impact of Component 1. Component 3 will be implemented on the basis of the outputs and outcomes achieved from Components 1 and 2 and the 1st phase GEF Hai Basin IWEM Project. Finally, Component 4 will provide consulting services and training opportunities to implement Components 1–3.

24. **Project concept and design framework.** All project activities (or tasks) with the total cost of US$104.5 million, including GEF financing US$9.5 million and government financing US$95

million, have been given in tables 6.1–6.4 of annex 6. These project activities or tasks will all contribute to the preparation and implementation of the IWEMP in demonstration cities Chengde and Shijiazhuang, and in scaling-up areas in the three river basins, Hai River Basin, Liao River Basin, and Yellow River Basin. The project concept and design framework is given in Figure 2.1.

Figure 2.1. Project Concept and Design Framework



Annex 3: Implementation Arrangements

China: GEF Mainstream Integrated Water and Environment Management Project

Project administration mechanisms

1. The management and implementation of the project represents a continuation of earlier cooperation between the MEP and MWR supported by the project provinces participating in the 1st phase GEF Hai Basin Integrated Water and Environment Management Project (GEF/Bank Hai Basin Project), which was successfully implemented from 2005 to 2012. The minutes on cooperation for the IWEM signed recently in 2015 between the ministers of the MEP and MWR have greatly strengthened and deepened the cooperation between the two ministries at the national level for this project.

2. The organizational structure for project management and implementation is given in annex 3 of this document. It consists of the following:

(a) The Project Steering Committee in MEP, comprised of, inter alia, the Department of Water and Environment Management, the Department of International Cooperation, and the Department of Science, Technology and Standards of MEP, responsible for overall coordination of implementation of the Project; Leaders from the International Cooperation, Science and Technology Department and the Water Resources Department of MWR, responsible for overall coordination of implementation of the Project;

(b) The Central Project Management Office ("Central PMO"), consisting of the MEP Project ("MEP PMO") Management Office in the Foreign Economic Cooperation Office and the MWR Project Management Office ("MWR PMO") in the China Irrigation Drainage Development Center, responsible for the implementation of Project activities at the national level and for providing technical assistance to the Chengde Municipal Joint PMO and Shijiazhuang Municipal Joint PMO in Hebei Province;

(c) The Panel of Experts, including both international and domestic experts, established at the central level, responsible for providing technical support to the project management offices at central and municipal levels, respectively.

(d) Sub-grant Project implementation units (PIUs) in public research institutes selected in accordance with eligibility criteria agreed with the World Bank. Sub-grant PIUs is selected to undertake a few studies because such studies would need stronger ownership of the central and local governments and substantial inputs from government designated public research institutes, which have strong technical capacity and direct access to the key data and information required to undertake the tasks. Sub-Grant Implementation Agreements will need to be signed for a study between the selected PIU for the study and MEP PMO and MWR PMO, respectively. Reimbursement of the grant funds incurred by the selected PIUs should be based on the disbursement mechanisms as indicated in Section D of Annex 3 to this PAD.

(e) Two municipal joint-PMOs are established for the two demonstration cities respectively – the Chengde Joint Project Management Office ("Chengde Joint PMO"), responsible for the management and implementation of Project activities in Chengde with the technical assistance of FECO of MEP; and the Shijiazhuang Joint Project Management Office ("Shijiazhuang Joint PMO"), responsible for the management and implementation of Project activities in Shijiazhuang with the technical assistance of CIDDC of MWR; and

(f) Five Cooperation Framework Agreements are signed between water and environment departments for management and implementation of the project: (1) the agreement between MEP PMO and MWR PMO at the central level; (2) the agreement between, on the one hand, the MWR PMO, the Water Affairs Bureau of Shijiazhuang Municipality and other relevant water departments and, on the other hand, the MEP PMO; Environment Protection Bureau of Shijiazhuang Municipality and other relevant environment departments, for the coordination of the preparation of (i) the TVAP, in consultation with other stakeholders, for the Hutuo Sub-basin, and (ii) the IWEMP for Shijiazhuang; (3) the Agreement between, on the one hand, the MEP PMO, the Environment Protection Bureau of Chengde Municipality and other relevant environment departments, on the other hand, the MWR PMO, Water Resources Bureau of Chengde Municipality and other relevant water departments, for the coordination of the preparation of (i) the TVAP, in consultation with other stakeholders, for the Luan Sub-basin, and (ii) the IWEMP for Chengde; (4) the agreement between Chengde Municipal EPB and WRB; and (5) the agreement between Shijiazhuang Municipal WRB and EPB.

3. The CPMO consisting of the MEP PMO and the MWR PMO at the national level, both have benefited from operational experiences in implementing the 1st phase GEF/World Bank Hai Basin Project. The CPMO and its Panel of Experts will provide technical assistance and operational guidance to the Chengde Joint PMO and Shijiazhuang Joint PMO.

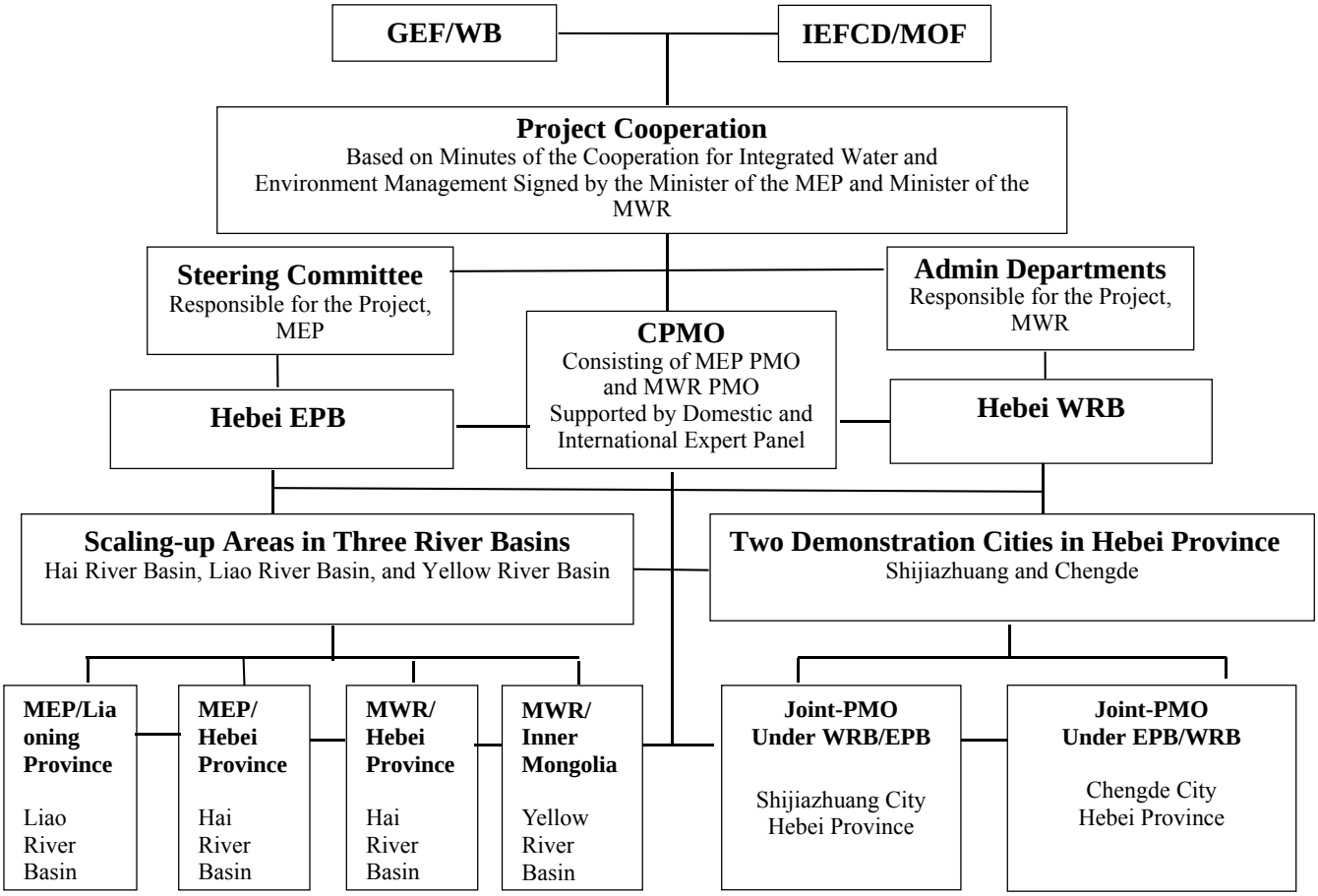
Monitoring and Evaluation

4. Results M&E for this project will be the responsibility of the two professional institutes (water and environment) to be selected and responsible for M&E. These independent and professional M&E institutes will be strongly supported administratively by the MEP/MWR and technically by the POE at the national level. The incremental cost of M&E activities for this project will be fully covered by the GEF Grant in addition to the cost for the data and information collected from various water quantity and quality monitoring stations as required.

Sustainability

5. The MEP and MWR have committed to the leadership of management and implementation of this project in cooperation with the related local governments and in line with the GEF/Bank's requirements for project financing and the Bank's procurement and financial guidelines. To ensure sustainability of the project, the MWR and MEP are committed to issuance of the policies on water consumption (or ET) control and EC control at the national level to mainstream the IWEM as one of the important PDO-level indicators for this project, so that the policies developed and issued could be implemented during the project period and thereafter.

Figure 3.1. Organizational Structure of Project Management and Implementation for the GEF Mainstreaming IWEM Project



Note: IEFCD = International Economic and Financial Cooperation Department under MOF.

Financial Management, Disbursements, and Procurement

Financial Management

6. The main FM risk identified is that (a) the GEF financing under sub-grant will be used for sub-projects executed by different implementing entities to be selected during project implementation in accordance with the selection criteria and procedures to be agreed with the Bank, which may result in the grant proceeds are not used in an economical and effective way for the defined eligible expenditures; and (b) the Chengde Joint PMO and Shijiazhuang Joint PMO and the sub-grant PIUs to be selected may be lack of experience in managing the Bank operations.

7. To address the above risks, the following risk management measures have been agreed: (a) preparation and issuance of a Financial Management Manuals including the FM and disbursement mechanism for sub-grant, acceptable to the Bank, to standardize project FM procedures; (b) the FM function for sub-grant will be centralized at the relevant PMOs; (c) in addition to FM and disbursement training provided by the Bank during project preparation, the Bank and the central PMOs that have experience with Bank operations will provide FM and disbursement training and workshops for knowledge sharing during project implementation.

8. The project will be implemented by four implementing agencies who will have daily FM responsibilities for the project activities they execute. MEP PMO at FECO and MWR PMO at CIDDC have extensive experience with the Bank operations, but Chengde Joint PMO at CEPB and Shijiazhuang Joint PMO at SWRB are new to the Bank/GEF financed projects. Each implementing agency has assigned one FM team comprising one manager, one accountant and one cashier from their existing financial departments. In addition, the sub-grant to be implemented by several entities subordinated to MEP, MWR, CEPB and SWRB will be selected during project implementation in accordance with the selection criteria and procedures to be agreed with the Bank. To ensure efficient and effective project financial management (FM), the sub-grant related FM functions, including project accounting and financial reporting, will be centralized at the MEP PMO and MWR PMO. Meanwhile, each of the sub-grant implementing entities is required to assign one FM staff member as a focal point to be responsible for collecting and maintaining project accounting documents, doing separate bookkeeping of the sub-grant activities and preparing the payment request as well as reconciling with the relevant PMOs on a regular basis.

9. Overall, the project FM risk is assessed as substantial.

10. **Budgeting.** The annual Project Implementation Plan (PIP), including the funding budget, will be prepared by each implementing agency. Budget variance analysis will be conducted on a semi-annual basis by the four implementing agencies to identify significant variances from plan that may need corrective actions. The Bank will work with the implementing agencies to supervise the project budgeting system, to enhance budget preparation, and budget execution reporting during project implementation.

11. **Funds flow.** The GEF grant will flow from the World Bank into the designated accounts (DAs) that will be respectively set up and managed by FECO for MEP-related and Chengde related project activities; by CIDDC for MWR-related and Shijiazhuang related project activities. Chengde Joint PMO and Shijiazhuang Joint PMO will prepare the payment requests and submit

to FECO and CIDDC respectively for review and further payment from the DA. For MEP PMO and MWR PMO, payments from the DAs will follow the existing internal payment review procedures of FECO and CIDDC which have been assessed as satisfactory to the Bank. Withdrawal applications will be prepared and submitted to the Bank by FECO, CIDDC for reporting expenditures paid from DAs, requesting replenishment of DAs, as well as requesting reimbursement or direct payment from the Bank.

12. **Accounting and financial reporting**. The administration, accounting and reporting of the Project will be set up in accordance with Circular #13: "Accounting Regulations for World Bank Financed Projects" issued in January 2000 by the MOF. The standard set of project financial statements has been agreed between the World Bank and MOF.

13. The project accounting and financial reporting reflect both the GEF grant and counterpart funds financed transactions. The four implementing agencies will be respectively responsible for daily project FM work including project accounting and financial reporting. The FM function for sub-grants will be centralized at MEP PMO and MWR PMO. Original accounting documents for project activities will be retained by each implementing agency. Two interim unaudited financial reports (IFRs) are required. MEP PMO will consolidate the project reports for project activities executed by MEP PMO and Chengde Joint PMO. And MWR PMO will consolidate the project reports for project activities executed by MWR PMO and Shijiazhuang Joint PMO. The two IFRs (format in accordance with the aforementioned Circular #13 agreed with MOF) will be prepared and furnished to the Bank by the MEP and MWR PMOs respectively no later than 45 days following each semester (the due dates will be August 15th and February 15th), in form and substance satisfactory to the Bank.

14. Computerized accounting systems, Yongyou and Jindie have been adopted by MWR PMO. The two computerized accounting systems to be used for this project have been widely used and working well in China including under China's World Bank projects. MEP PMO at FECO is using a self-developed computerized accounting system which has been successfully used in Bank operations for years. A separate project accounting profile will be set up in the existing system according to the requirements of Circular#13. A tailored chart of accounts to accommodate the project features will be elaborated in the FMM agreed with the Bank.

15. The task team will monitor the accounting process, including the adequacy of the financial management system, especially during the initial stage to ensure complete and accurate financial information is provided in a timely manner.

16. **Internal control.** The FECO and CIDDC have adequate financial management regulations in place. In addition, the project related accounting policy, procedures and regulations were issued by MOF, and the FMM will be prepared and issued to standardize the project FM procedures. For the sub-grant, measures to ensure robust internal control are addressed in the section on disbursement.

17. **Audit.** The Audit Service Center of the China National Audit Office (CNAO) for Foreign Loan and Assistance Projects has been identified as the project auditor. The auditor has extensive experience with the Bank financed operations. According to the World Bank Policy on access to Information, the audit reports for all investment lending operations for which the invitation to

negotiate was issued on or after July 1, 2010, need to be made publicly available in a timely fashion and in a manner acceptable to the Bank. Audit reports will be made publicly available on the website of CNAO. Following the World Bank's formal receipt of the audited financial statements from the borrower, the World Bank will also make them available to the public in accordance with the World Bank Policy on Access to Information. The responsible agency and timing is summarized in table 3.1.

Table 3. 1 The Responsible Agency and Timing

Audit Report	Submitted by	Due date
Consolidated Project Financial Statements prepared by FECO and audited by Audit Service Center of CNAO	MEP PMO at FECO	June 30 of each calendar year
Consolidated Project Financial Statements prepared by CIDDC and audited by Audit Service Center of CNAO	MWR PMO at CIDDC	June 30 of each calendar year

Disbursements

18. Three disbursement methods are available to the project: advance, reimbursement, direct payment. Supporting documents required for Bank disbursement under different disbursement methods will be documented in the Disbursement Letter issued by the Bank.

19. Two DAs in US dollar will be opened at a commercial bank acceptable to the Bank and will be managed by FECO and CIDDC. One segregated DA will be opened and maintained by CIDDC. For FECO, the advance for the GEF project will be pooled with FECO's existing USD account for Bank-financed operations. For the pooled DA, a separate ledger account that tracks receipts and uses of the GEF resources will be maintained by FECO. The ceiling of the DAs will be determined and documented in the Disbursement Letter.

20. The Bank loan will be disbursed against eligible expenditures (taxes inclusive) as in table 3.2 below.

Table 3. 2. Eligible Expenditures (taxes inclusive)

Category	GEF Grant (USD Millions)	
	Amount of the Grant Allocated [1]	**Percentage of Expenditures to be financed**
(1) Eligible Expenditures for the Recipient's Respective Part of the Project (MEP) and the Project Participant's Respective Part of the Project (Chengde Joint PMO)	**4.750**	**100**
(a) Sub-grants	0.800	100
(b) Goods, non-consulting services, consultants' services, Training and Workshops, and Incremental Operating Costs	3.950	100

[1] To be confirmed again and finalized during project negotiations with the PMOs.

(2) Eligible Expenditures for the Recipient's Respective Part of the Project (MWR) and the Project Participant's Respective Part of the Project (Shijiazhuang Joint PMO)	**4.750**	**100**
(a) Sub-grants	0.800	100
(b) Goods, non-consulting services, consultants' services, Training and Workshops, and Incremental Operating Costs	3.950	100
Total	**9.500**	100

21. GEF Grant and Government funds will fully (100%) finance different project activities, respectively. No retroactive financing is under this project.

22. **Performance Based Disbursement Mechanism for Sub-grant** For the sub-grant, the GEF grant will be disbursed to the selected implementing entities according to the signed sub-grant agreements. The following financing principles and measures should be followed by relevant parties to ensure that robust internal control systems are in place to make sure the project funds are used for the intended purpose effectively and economically.

a) Selection of Sub-grant implementing entities: The sub-grant implementing entities will be selected according to the selection criteria and procedures agreed with the Bank.

b) Eligibility of Expenditures: GEF financing would follow the financing principles of the Bank's Investment Project Financing (IPF) lending instrument which finances project expenditures. As such, the Bank's financing through sub-grants is subject to the actual incremental cost incurred by the sub-grant implementing entities for the specific tasks. The eligibility of Bank financing shall be clearly defined in the Grant Agreement and sub-grant agreements.

c) Amount of Financing: The Bank's task team shall review and provide no objection to the detailed cost estimate proposed by the PIUs and agree a pre-determined financing ceiling of the sub-grant amount (the ceiling of the total sub-grant should normally not exceed 15% of the total GEF Grant in line with the principle of competitive bidding of the Bank's procurement policies). The Bank will finance actual incremental expenditures up to the sub-grant ceiling. The Bank's financing through sub-grants cannot be more than the actual incremental expenditures incurred for the sub-grant tasks. In terms of the incremental labor cost, in case the Bank agrees to finance it under the sub-grant, the standard labor cost should follow domestic remuneration rates and policies. In addition, to mitigate the risk of overcharging labor cost, beside a verification requirements, the Bank may define an amount or % of total sub-grant amount as a ceiling for the labor cost.

d) Expenditure reporting: Statement of Expenditures (SOE) need to be provided by the sub-grant implementing entities for the PMOs' review while requesting payments from the Designated Accounts to ensure the cumulative expenditures incurred are more than or equal to the sub-grant amount disbursed by the Bank.

e) Verification mechanism: The PMOs or a contracted third party independent verification entity, as well as the Bank, if needed, shall verify the outputs by milestones and the

cumulative actual expenditures incurred. The grant disbursement will be based on verification certificates issued by the PMOs. If the sub-grant amount already received by the implementing entities is found to exceed the actual cost incurred, the over withdrawn amount should be refunded to the Designated Account or the Bank.

f) FM arrangements: FM arrangements shall follow the principle of efficiency and effectiveness. If the sub-grant activities will be implemented through several PIUs, to mitigate the FM risk, a centralized FM arrangement is required, i.e. the sub-grant related FM function including project accounting and financial reporting shall be centralized at the PMOs. Meanwhile, the sub-grant implementing entities will be required to maintain specific memorandum accounting records for the agreed GEF financing and reconcile with the PMOs. The sub-grant implementing entities will also keep all original documents such as contracts, invoices, and the verification reports. Annual financial audits and routine FM supervision missions will be performed to ensure proper FM practices are maintained at both the PMOs and the implementing entities.

g) Disbursement arrangement: Payment terms by milestones shall be worked out from technical and financial aspects and agreed with the relevant PMOs and PIUs.

h) Procurement arrangement: Procurement under the sub-grants should follow the Bank's procurement guidelines, if goods or outsourcing services are required.

23. Sub-grant agreement: The PMOs shall sign sub-grant agreements with the sub-grant PIUs to specify: (a) the scope or TOR for the work as well as the expected output by milestones; (b) total financing and source of financing for each activity; (c) the implementation schedule; (d) technical requirements; (e) supervision; (f) milestones, verification; (g) payment terms; (h) final acceptance; (i) anti-corruption requirements; (j) non-compliance penalties; (k) FM requirements; (l) procurement requirements if needed; etc. Refund of GEF financing from the PIUs to Designated Account or the Bank will be required in case of non-compliance. The sub-grant agreements need to be acceptable to the Bank before signing.

24. **Supervision Plan**. The supervision approach for this Project is based on its FM risk rating, which will be evaluated on a regular basis by the FMS in line with the FMSB's FM Manual and in consultation with relevant task team leader. The initial FM supervision will focus on financial staff training and compliance with the Bank's FM and disbursement related requirements as well as the quality and timeliness of project accounting and financial reporting.

Procurement

25. The overall project risk for procurement is assessed as Substantial.

26. **Institutional responsibilities.** The CPMO, consisting of the MEP PMO and MWR PMO, has been established. The MEP PMO and MWR PMO will manage the procurement aspects of national-level activities under Components 1, 3, and part of 4 in parallel. With regard to the procurement aspects of the demonstration city level under Component 2, on the side of MEP, the procurement aspects of the demonstration city level are expected to be managed by the Chengde Joint PMO under the Municipal Environment Protection Bureau, supported by the municipal

WRB, while on the side of the MWR, the procurement aspects of the demonstration city level are expected to be managed by Shijiazhuang Joint PMO under the municipal Water Resources Bureau, supported by the municipal EPB.

27. **Risks.** The key issue and risk concerning procurement for implementation of the project are the inadequate capacity and experience in procurement and the possible influence of domestic procurement practice. In view of these risks, the following actions will take place during project preparation and implementation: (a) preparation of a Procurement Management Manual to standardize the procedure of procurement and enhance the coordination and monitoring function of the PMO; (b) provision of training to the CPMO, Chengde Joint PMO and Shijiazhuang Joint PMO on procurement procedures in Bank-financed projects; (c) where necessary, early procurement support missions by the Bank's procurement specialist; and (d) annual field procurement supervision missions to review procurement actions where needed.

28. **Applicable guidelines.** Procurement will be carried out in accordance with the 'Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers', dated January 2011 and revised in July 2014; 'Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers', dated January 2011 and revised in July 2014; and the provisions stipulated in the Grant Agreement. National Competitive Bidding (NCB) shall be carried out in accordance with the Law on Tendering and Bidding of the People's Republic of China promulgated by Order of the President of the People's Republic of China on August 30, 1999, subject to the modifications stipulated in the Legal Agreement to ensure consistency with Bank Procurement Guidelines.

29. The following types of procurement are foreseen:

(a) **Procurement of goods.** Goods procured under this project will include equipment and instruments under Component 4. Procurement will be done using the Bank's Standard Bidding Documents for all International Competitive Bidding (ICB) and National Model Bidding Documents agreed with or satisfactory to the Bank for all NCB.

(b) **Selection of consultants.** Consultants selected under this project will provide services to Components 1, 2, 3, and 4. Selection will be conducted using the Bank's Standard Request for Proposals for all Quality- and Cost-Based Selection and Quality-Based Selection. Consultants that are universities and government research institutions will be selected in accordance with the provisions of paragraph 1.13(c) and 2.8 of the Consultant Guidelines.

30. **Training, workshops, and study tours.** Plans for training, workshops, and study tours will be developed by the CPMO and included in the project annual work plan for Bank review. Expenditures incurred in accordance with the approved plans for training and workshops will be the basis for reimbursement.

31. **Procurement Plan.** The Procurement Plan is being prepared by the four PMOs respectively and consolidated by the CPMO and will be agreed with the Bank. It will be made

available in the project's records and on the Bank's external website. The Procurement Plan will be updated annually or as required to reflect implementation needs and improvements in institutional capacity.

32. **Frequency of procurement supervision.** Prior review supervision will be carried out through the Bank. Procurement post reviews will be carried out by the Bank every 12 months. The procurement post review sampling ratio will be one out of ten contracts.

33. **Thresholds for prior review and procurement method.** The thresholds for procurement method and prior review will be determined after the capacity asessment is completed.

34. **Thresholds for prior review and procurement method**. The initial thresholds for procurement/selection method and prior review are indicated in table 3.3:

Table 3.3. Thresholds for Procurement Method

Description	Thresholds	
Goods	(-)	ICB
	< US$10,000,000	NCB
	< US$100,000	Shopping
Consultant Services	(-)	QCBS/QBS
	≤ US$300,000	CQS

Table 3.4. Thresholds for Prior Review

Description	Contracts subject to Prior Review	
Goods	ICB	All
	NCB	First NCB goods contract by each PIU irrespective of value and all contracts ≥ US$1,000,000
	Direct contracting	All
Consulting Services	Consulting firm competitive selection	First contract by each PIU for each selection method irrespective of value and all contracts ≥ US$500,000
	Individual consultant selection	Only in exceptional cases and identified in Procurement Plan
	SSS (firm)	All
	SSS (individual)	≥ US$50,000

Note: QCBS = Quality- and Cost-Based Selection; QBS = Quality-Based Selection; CQS = Selection Based on the Consultants' Qualifications; SSS = Single-Source Selection; IC = Individual Consultant selection procedure.

35. **Advance contracting and retroactive financing.** No contract is envisaged to be procured using advance contracting or retroactive financing.

Environment Safeguards

36. The project is classified as a Category B project and triggers Environmental Assessment (OP 4.01) and Natural Habitats (OP 4.04).

37. **OP 4.01 - Environmental Assessment (triggered).** The proposed project will build on the success of the Hai River Basin IWEM Project, which implemented an integrated approach to water resource management and pollution control in the Hai River Basin and developed water resources management technology and experience. The proposed project seeks to mainstream the IWEM approach and integrate the use of ET and EC to optimize water use in the selected areas. As such, the project is not likely to cause any significant environmental issues. However, there will be some adverse impacts associated with the physical investments under Component 2, which aim to reduce water consumption and control pollution discharges. The fund to finance infrastructure under the project will be coming from the government counterpart funds. These activities will include provision of water saving irrigation facilities and wastewater/waste treatment plants at the township level. Though aiming to reduce water consumption and control pollution discharges, these demonstration activities likely involve small-scale construction that cause short-term construction nuisance and entail management of waste/wastewater during the operation phase. The details of these activities cannot be determined until relevant studies (for example, IWEM) under Component 1 are completed during project implementation.

38. However, project investments supported through co-financing for water resources/quality management studies may have downstream environmental and social impacts. Activities funded under Component 2 will support the preparation and implementation of water resource management plans for demonstration cities, including demonstration subprojects (for example, provision of water saving irrigation facilities and wastewater/waste treatment plants at the township level). Though aiming to reduce water consumption and control pollution discharges, these demonstration subprojects will likely involve small-scale construction activities that may cause short-term, small-scale environmental impacts and entail management of waste/wastewater during the operation phase. The details of these activities cannot be determined until relevant studies are completed during project implementation.

39. **OP 4.04 - Natural Habitats (triggered).** The project does not have the potential to cause any significant conversion (loss) or degradation of natural habitats, either directly (for example, through construction) or indirectly (for example, through human activities induced by the project). Given that there are opportunities for benefits to natural habitats, this policy is triggered.

40. **ESMF.** An Environmental Management Framework (as part of the ESMF) has been prepared, setting out the guidelines and procedures to address the environmental impacts of the project activities. The Environmental Management Framework includes, among others, the following:

(a) The Bank's safeguards policies to be taken into account in the development of the TA activities financed under the project. Draft TORs for the proposed studies (for example, IWEMP) will include requirements for the analysis of potential environmental and social issues and how they will be addressed.

(b) Guidelines and procedures to address environmental issues caused by physical activities financed by the project. Each of the proposed demonstration investments will be screened for their potential social and environmental impacts to identify/define; safeguards policies triggered; EA category; safeguards instruments to be prepared; and consultation and disclosure requirements.

(c) Environmental Code of Practice to address the general construction-related impacts

(d) Institutional arrangements

41. **Public consultation and disclosure.** In accordance with OP 4.01, public consultations have been conducted during the ESMF preparation process, including meetings with the project-affected people and local EPB. The consultation on the draft ESMF was undertaken in December 2015. Feedback and concerns from the consultation have been addressed in the project design and in the ESMF. The ESMF was locally disclosed at the governmental website on January 8, 2016, and disclosed at the Bank's InfoShop on February 16, 2016.

Social and Resettlement Safeguards

42. The purpose of the project is to promote the innovative approach of ET/EC-based the IWEM to the IWEM and demonstrate pilots in the Hai River Basin subsequent to which the project approach will be scaled up to selected 'problem' areas elsewhere in the Hai, Liao, and Yellow River Basins. The ET/EC-based IWEM application will strengthen water and environment management with a positive impact on water conservation and water quality in the three river basins in the long run. In the short run, however, new facilities and structures will be built for IWEM implementation in the pilot area, and land acquisition will take place for the civil construction. OP 4.12 - Involuntary Resettlement is hence triggered.

43. **OP 4.12 - Involuntary Resettlement (triggered).** For water quality control, small wastewater treatment plants and pipeline network at the township level will be constructed in the project demonstrative pilot areas in the Hai River Basin, and for water saving, irrigation facilities and improved technologies will be installed. All these will entail land acquisition and population relocation and trigger this policy. Accordingly, resettlement safeguard instruments were hence prepared.

44. Because the IWEM pilots in the Hai River Basin are scheduled to start from 2017 onward, all the scheduled wastewater treatment plant and pipeline network and irrigation facilities and new technologies in the two selected pilot cities, Shijiazhuang and Chengde, have not yet finalized their feasibility studies and design details at the project appraisal stage. At this point, an RPF has been prepared during project preparation to ensure the necessary RAPs to be developed in time when those subprojects and activities causing resettlement are designed under Component 2. The RPF was disclosed on the PMO's website and local libraries in January 2016 and was available at the InfoShop on February 16, 2016.

45. **ESMF.** The study, piloting, and scaling-up of the ET/EC-based IWEM under the project will bring great benefits to local people and societies with more stable access to water resources and improved water quality. In the meantime, while the integrated water management is intensively planned and the related measures rigorously designed under the project, there may be certain social impacts associated with implementation of the management plan. An ESMF was set up in project preparation to outline an SA study for analyzing the project potential impacts, both positive and negative, during project implementation, and addressing the methods and measures to avoid or/and mitigate the adverse impacts in the pilot and upscaling practice areas. The SA will result in a Social Management Plan together with the project Environment Management Plan in

accordance with OP 4.01, as well as in a Due Diligence Review (DDR) covering the overall project area and influence.

46. **DDR.** A DDR is also outlined to monitor and evaluate the practice and results of land acquisition and population resettlement entailed by prior or ongoing implementation of infrastructure construction, if any, in the project pilot practice areas, in compliance with the relevant national laws and regulations, as well as the Bank social policies.

Annex 4: Implementation Support Plan

CHINA: GEF Mainstream Integrated Water and Environment Management Project

Strategy and Approach for Implementation Support

1. The Implementation Support Plan articulates the Bank's approach to help borrowers achieve the expected project results based on the project's nature and risk profile. Its purpose is to put more attention on the inputs and actions required to facilitate better risk management, better results, and increased institutional development while ensuring compliance with the Legal Agreements to meet the Bank's fiduciary obligations. The Implementation Support Plan puts particular emphasis on (a) monitoring and evaluating results on the ground, (b) facilitating the timely implementation of the risk management measures, and (c) providing the necessary technical advice to the implementing agencies to build capacity.

2. **Technical support.** The Bank team has provided extensive technical expertise during project preparation and will continue to provide extensive technical support to the MEP PMO, MWR PMO and the two city-level PMOs to effectively monitor and implement the project activities according to the Project Implementation Plan for the project activities. Training and TA activities will also be provided through international and domestic workshops on the innovative IWEM approach during project implementation by the Bank.

3. **Procurement.** Procurement implementation support would include the following:

   (a) Facilitation of a multistage training program targeting procurement staff of the MEP PMO and MWR PMO (even though they have experience in conducting procurement activities for the GEF/Bank projects), particularly to the Chengde Joint PMO and Shijiazhuang Joint PMO - given that both joint PMOs have no previous experience in managing procurement activities financed by the Bank Loan /GEF Grant—to help them fully understand the Bank's procurement guidelines

   (b) Review of procurement documents and timely provision of feedback on results of prior and post reviews to the parties concerned

   (c) Monitoring procurement progress against the agreed Procurement Plan for the GEF Grant

4. **Financial management.** The project FM will be reviewed and evaluated on a regular basis by the Bank's FM specialist. The FM specialist will join the Bank's supervision missions and review the implementation of the FMM prepared for the project. The specialist will also provide technical support to the project implementing agencies and help with timely resolution of potential FM issues or any issues identified by the auditors. The review and monitoring will include the evaluation of the adequacy of the FM arrangements, disbursement processes, on-lending arrangements, counterpart fund allocations, and document filing systems.

5. **Environmental and social safeguards**. The Bank project's environmental and social development experts will supervise the implementation of the project. They will provide guidance to the project implementing agencies on how to best address relevant issues that arise during

project implementation in line with the Environment Policy Framework, Social Framework, and RPF prepared for this project. They will also help ensure that the planned community and stakeholders' consultations have been undertaken during the project design phase and will continue during the project implementation stage.

Table 4.1. Implementation Support Plan

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First 12 months	1. Training on innovative IWEM approach 2. Project M&E 3. Procurement training 4. FM and disbursement 5. Safeguards training	1. RS/ET/EC technology-based IWEM 2. M&E skills 3. Procurement 4. Reimbursement and disbursement 5. Safeguards on environment and social and resettlement	5–6 Bank staff or domestic and international consultants hired by the Bank for 3–4 trips	n.a.
12–48 months	1. Project implementation and supervision 2. FM, procurement, and safeguards 3. M&E	1. Technical 2. Safeguards 3. FM 4. Procurement	5–6 Bank staff or domestic and international consultants employed by the Bank, 2 trips per person annually	n.a.
Other				

Annex 5: Economic and Financial Analysis

CHINA: GEF Mainstream Integrated Water and Environment Management Project

Economic:
Approach on Cost Benefit / NPV=US$8.49 million; EIRR = 14.5%

6. The Project Development Objective (PDO) is to increase water productivity and reduce pollution discharges in the project areas to mainstream and upscale an innovative approach to integrated water and environmental management in the three river basins entering the Bohai Sea. The total IWEM Project investment costs are estimated at US$104.5 million, including US$9.5 million from GEF Grant and US$95 million from the government counterpart funds. The preliminary project cost benefit analysis has been conducted mainly for the demonstration of IWEM activities implemented under Component 2, including the investment cost estimated at about $49.55 million for the water components, of which $10.82 million for the demonstration of IWEM approach in Hai Basin, and $38.73million for the scaling-up of the IWEMP through the project areas

Economic Assessment

7. The project investment in demonstration and scaling-up of the RS/ET/EC technology-based IWEM will entail shifting the traditional water resources management approach to emphasize on using/managing water in an economically and environmentally optimal and sustainable fashion. The major project benefits will be derived from the shift from current resource-intensive development patterns to more resource-efficient patterns, which will improve irrigation water productivity to maximize the economic value of each drop of water while minimizing negative environmental impacts, for the sustainable water resources and ecosystem development. Based on the proposed PDO, the project's technical and management interventions will be demonstrated and mainstreamed at the river basin, county, and on-farm levels, selected mostly in physical water scarcity and pollution areas in the Hai, Yellow, and Liao River Basins. The pilot counties and water users/polluters within the sub-river basin will implement the IWEMPs based on the ET/EC targets. Thus the quantifiable benefits will be accrued in demonstration counties mainly from (a) increased water productivity through the reduced consumptive use of water (ET); (b) reduced overexploitation of groundwater with reduced O&M costs (mainly for energy and labor); (c) improved water quality with further developed wastewater treatment plants; and (d) increased ecological flows through the implementation of the IWEMPs.

8. In addition, there are numerous non-quantifiable social and environmental benefits that will be captured and achieved: (a) the reduction of pollution, especially the water pollution discharged into the Hutuo and Luan Rivers, will result in improved availability of drinking water sources with improved water quality, improved health and livelihood, and improved ecosystem at the river basins and the related Bohai sea; (b) the improved river basin management capacity with project activities implemented jointly by the national river basin and local water and environment authorities, through their effective cooperation and coordination mechnisms built and tested during the project's life; and (c) the improved water supply conditions will contribute directly to a reliable and sustainable industrial, agricultural, and economic development.

9. **The economic benefit from the reduction of the groundwater overdraft.** The groundwater is the dominant water resource for water supply in the selected project demonstration areas in Shijiazhuang and Chengde Cities under Component 2. The project will achieve the substantial benefits mainly from the reduction of the groundwater 'overdraft' and nonbeneficial water losses and result in the city/countywide groundwater level stabilization and recovery. The benefits from the reduced groundwater overdraft can be divided into two parts—(a) direct benefits to the project beneficiaries from less groundwater drawdown resulting in less energy, O&M, and replacement costs of wells in pumping areas and (b) benefits to the overall water resources resulting from preservation of the groundwater resource, which can be alternatively used for industry and urban development. According to the project's technical design and identified outcome targets, the project pilot counties will be expected to reduce the shallow groundwater exploitation by 96.57 million m³ by 2030, covered by 1.27 million Mu (105,750 ha) in six counties, including the amount to be achieved by 5 percent in 2016, 60 percent in 2017, 90 percent in 2020, and 100 percent in 2030, respectively[1] .Based on an alternative cost of CNY 2.96 per m³ (or US$0.46 per m³ on average) for the groundwater supply, the annual economic value of the reduced groundwater overdraft has been estimated at about US$44.66 million by 2030, with the additional annually reduced energy saving at US$0.74 million, the labor saving at US$9.91 million, and the increased crop production (due to the land saving for the closed canals and increased yield) at US$50.21 million. The project will, therefore, contribute to the preservation of a valuable natural resource, groundwater, which is the main source for cities, towns, industries, agriculture, and drought relief, and contribute to the sustainable use of groundwater in the North China plains.

10. The economic evaluation criterion provided by the project authorities on the 'Economic evaluation method and parameters of construction project (Second Edition)' and 'Water conservancy construction project economic evaluation criterion' (SL72-94) have been applied. The details are presented in the section on the main assumptions of the project financial and economic analysis in this annex.

11. **Environment benefits.** The project's environment benefits will be achieved mainly through various demonstration investment activities related to the comprehensive water quality improvement measures in selected river basin pilot areas, such as in the Luan River trunk stream in Chengde City and the Hutuo River sub-basin in the Shijiazhuang City areas, which aim to (a) operate the environment flow and flow process measures for the reservoirs along the project river basin to protect the eco-environment of the Sub-river basins and ensure that the water quality and quantity requirements will be fully met at a certain time and space; (b) implement the basin-based Integrated Pollution Source Management Plan to meet the anticipated water quality improvement targets (following the concrete control indicators for COD and NH3-N, and so on); (c) adopt key industrial pollution source management at the river basin level, to adjust the industrial structure and phase out the process and products that are highly energy consuming and seriously polluting (for example, papermaking, chemical, dyeing, wine brewing, and so on), according to the deadlines stipulated by the local government; (d) improve urban sewage treatment pipeline collection system and build pilot sites of municipal sewage treatment and reuse; and (e) prevent agricultural NPS.

12. Upon implementation of the pilot component, the annual COD and N-NH4 will be reduced by 19,268 tons and 1,704 tons respectively, and about 20,972 tons in total will be reduced from

[1] Reduction of groundwater overdraft and governance - long-term planning".

Sub-river basins to rivers flowing into the Bohai Sea in 2020. In addition, with the implementation of the measures of eco-flow discharge of reservoirs, integrated management of river basin polluting sources, and establishment of river basin environmental management organizations, the project's 2020 and 2030 water quality targets will be fully met for all Sub-river basins in Chengde. The baseline and targeted surface water quality indexes are presented in Table 5.1 to show the environment benefits achieved by the project (in the without- and with-project scenarios).

Table 5.1. Baseline and Target Values of Surface Water Quality Monitoring Sections for Chengde Demonstration Area (unit: mg per l)

Section		**Shangbancheng Bridge**	
		Baseline	**Target**
Water Quality Level		IV	III
1	DO ≥	3	5
2	COD million ≤	10	6
3	COD ≤	30	20
4	BOD_5 ≤	5.12	4
5	NH_3-N ≤	1.40	1.0
6	TP calculated in P≤	0.20	0.2 (lake, reservoir 0.05)

13. **Other benefits.** The agriculture, social, and farm household income benefits, related to the on-farm employment (labor days) creation through the project implementation and the increased farm household incomes through the increased high value agriculture productions, have not been included in the EIRR calculation. The reduced groundwater overdraft does not imply any reduction in the other benefits.

14. The EIRR of the project investments under Component 2 (US$49.55 million) considering only the economic benefits from the reduced groundwater overdraft in the demonstration areas—without taking into account the several other benefits mentioned above—was estimated at 14.5 percent and the related economic net present value at about US$8.5 million. The described partial EIRR result indicates that although the environmentally and agriculturally derived benefits in the economic analysis have not been included, the economic benefits achieved from the reduced groundwater exploitation have already been sufficient to economically justify the project.

15. **Sensitivity and risk analysis.** The economic sensitivity and risk analysis was carried out for the following scenarios: (a) total investment costs increased by 10 percent, mainly due to increased O&M cost for new irrigation facilities; (b) benefits decreased by 10 percent due to low energy and labor savings caused by low irrigation (on-farm) efficiency; and (c) investment increased by 10 percent and benefit decreased by 10 percent. The results showed that even with consideration of the risks mentioned above, the estimated EIRRs are higher than the opportunity cost of capital (OCC) of 8 percent, which is also sufficient to economically justify the project. Measures have been taken in project preparation and included under the project to reduce these risks and minimize their effects. The detailed results are presented in Table 5.2.

Table 5.2. Summary of the Economic Analysis Results

Plan	Investment Increase or Decrease Ratio (10%)	Benefit Increase or Decrease Ratio %	Internal Rate of Return %	Economic Net Present Value (CNY 1000)	Benefit-cost Ratio
Basic information	0	0	14.46	54,398.5	1.16
Investment increased by 10%	10	0	11.09	29,434.2	1.08
Benefit decreased by 10%	0	−10	10.99	26,690.5	1.08
Investment increased by 10% and benefit decreased by 10%	10	−10	8.17	1,726.1	1.01

Financial Assessment

Financial:

NPV=US$4.42 million; FRR = 10.48%

16. The financial analysis has been carried out to indicate (a) the financial feasibility of the proposed investments for stabilizing groundwater levels in selected demonstration areas, (b) the financial viability and sustainability of the WWTFs, and (c) the financial incentives (the increased farmers' income) of beneficiary farmers to participate in the project.

17. The integrated ET measurement, monitoring, and management measures implemented in the project areas will result in groundwater savings and consequent reductions in groundwater overdraft, which will stabilize the groundwater levels and reduce the pumping O&M and replacement costs for groundwater wells, including energy, land, and labor savings. The annual incremental financial value of the groundwater saving and its related financial benefits on reduced O&M costs; the land, energy and labor savings; and the increased crop production were estimated. The results showed that the FIRR were estimated at about 10.5 percent.

18. **Financial sustainability of WWTFs.** In addition to financing the least-cost selection of WWTP alternative investments under Component 2, the financial sustainability has been assessed for all three proposed wastewater treatment companies in Kuancheng County and Chengde City, especially the financial viability of the financed WWTPs by increasing revenues to adequately cover the O&M costs. The projected financial statements of three wastewater treatment companies have been developed based on the annual business plans and their operations and services. The annual wastewater treatment targets and related revenue and costs have been estimated by each year, such as the increase in number of people/areas to be served, increased total amount of treated and recycled wastewater, improvements in the collection-to-billing ratio, projected annual income and O&M costs, and so on. As can be seen from Table 5.3, the three wastewater treatment companies are expected to have an annual income (with full production capacity) of about CNY 13.14 million and a full O&M cost (including the repair cost) of CNY 6.71 million, with a finacial rate of return after tax at 8.2 percent for the Chengde Taipingzhuang Sewage Treatment Plant; an annual income of CNY 11.17 million, a full O&M cost of CNY 7.25-8.7 million and a financial

rate of return after tax at 7.3 percent for the 2nd phase of Kuancheng County Sewage Treatment Plant; and an annual income of CNY 10.16 million, an O&M cost of CNY 8.97 million, and a financial rate of return after tax at 7.8 percent for the disposal project of sludge for sewage treatment plant in Chengde. The expected financial income and the O&M costs in the table show that their income covers the O&M cost and hence, all three proposed wastewater treatment companies are financially sustainable and their water utility tariffs are adequate. The detailed analysis results were presented in Table 5.3.

Table 5.3. Financial Benefits and Sustainability of 3 Wastewater Treatment Plants in Chengde City and County

Wastewater Treatment Plants	Recycle Water Project, Chengde Taipingzhuang Sewage Treatment Plant	2nd Phase of Kuancheng County Sewage Treatment Plant	Disposal Project of Sludge for Sewage Treatment Plant in Chengde
Income (full capacity)	CNY 13.14 million per year	CNY 11.17 million per year	CNY 10.16 million per year
Water tariff	CNY 0.3 per ton	CNY 1.53 per ton	CNY 115 per ton (disposal cost for nutrition soil and sludge)
Treated water volume	43.80 million tons per year	7.3 million tons per year	78,840 tons per year
Annual O&M costs	CNY 6.71 million	CNY 7.25–8.7 million	CNY 8.97 million
FIRR (pretax)	10.72%	8.8%	8.58%
FIRR (after-tax)	8.16%	7.3%	7.8%
COD emission reduction	2,190 tons per year	2,190 tons per year	NA
NH3-N emission reduction	219 tons per year	5 tons per year	NA

19. **Farm income analysis.** The project will increase beneficiary farmers' income and improve their living standards. Based on the farm household information collected in the field, the household income analysis has been conducted. The farm model analysis shows substantial increase in beneficiary farmers' income with the comprehensive implementation of integrated groundwater saving facilities/technologies. Several items have been considered to calculate and assess the impacts on typical household income, such as increased crop productions, incremental taxes (agricultural tax, specialty tax and fee, and so on), a water charge which will cover the full O&M costs for the groundwater irrigation, and so on. The project will substantially improve the financial viability of farming through increased annual returns to farm labor and capital investments. The results indicated that the net farm income for each low-, middle-, and high-income household will be increased significantly, compared to the without-project condition. The growth rate of household income will range from about 10.1 percent for the high-income households, 16.4 percent for the middle-income households, and 21.9 percent for the low-income farm households, respectively (see the detailed results in Table 5.4).

20. **Farmers' ability to pay.** The farm incomes analyses show that project investments generate substantial increases in net farm incomes for all groups of farmers. The reduced O&M costs due to the stabilization of the groundwater tables resulting from the integrated measures will enhance financial feasibility and the farmers' ability to pay. The estimated incremental annual farm incomes due to the project are financially attractive and provide adequate incentives for farmers

to make the proposed investments, take over the full responsibility for O&M, and pay the increased water charges.

Table 5.4. Typical Farm Household Average Increased Income

Household Income Levels	Number of HH	Baseline			Year 6		Growth Rate (%)	
		Number of Family Members	Average Income per HH (CNY)	Per Capital Income (CNY)	Average income per HH (CNY)	Per capital Income (CNY)	Annual Growth Rate	Total Increased Growth Rate
High income	4	3	4,878	1,626	5,368	1,789	2.01	10.1
Medium income	4	3	4,091	1,364	4,763	1,588	3.28	16.4
Low income	4	4	4,333	1,083	5,280	1,320	4.37	21.9
Average	12	10	4,434	1,358	5,137	1,566	3.07	15.3

Note: HH = Household

Main Assumptions for Financial Analysis

21. The following assumptions have been used for financial analysis:

a. All input and output prices used in the analysis are 2015 constant prices provided by the Project authorities. The opportunity cost of capital (OCC) in China is estimated at 8 percent (the discount rate);

b. The economic life has been assumed to be 15 years, including 5 years for the project implementation and 10 years for the operations;

c. Investment costs include taxes, duties, and physical contingencies. Total investment costs include civil works, equipment, staff training and technical assistance, study/demonstration for different irrigation and environmental technologies and services, etc. in subproject areas;

d. The tax and other fees have been considered in the financial analysis. The total estimated tax and fees are at about Y14.72 million, mainly including Value added tax (VAT), urban construction and maintenance tax and education surcharge;

e. The annual O&M costs were estimated based on different irrigation technologies and waste water treatment facilities, which cover repair, maintenance, electricity and fuel (mainly for pumping costs), management, overhead, etc. The annual operation and maintenance costs are estimated at Y144.03 million, including the energy cost at Y19.5 million, repair costs at Y70.2 million, maintenance costs at Y46.8 million, and management and the other costs at Y3.9 million based on the technical regulations in China;

f. The improved cannel lining, low pressure pipeline, sprinkler irrigation, micro irrigation will take place in Shenze, Wuji, Jinzhou, Gaocheng, Zhengding and Luquan demonstration counties of the Hutuo River Basin. By the end of 2030, the water saving areas will be developed by1.27 million mu (about 110,000 ha) in these counties, which will reduce the exploitation of shallow groundwater at about 96.57 million m3. The quantitative benefits

include water resources saving, energy saving, labor saving, land saving, and increased crop production;

g. Water saving benefit: the alternative cost of water (the average water price at Y2.96/m³) has been applied to calculate the total economic water saving benefits. The agricultural water price (Y0.67/m³) was applied for financial analysis;

h. Energy saving benefit: energy saving benefit = water saving amount × average well lift (m) / Wells efficiency coefficient × electricity cost. According to the relevant statistical data of Shijiazhuang and the planning report, combined with the relevant field research, the average lift of wells is 40m, the well efficiency coefficient is 0.55 and the electricity cost is Y0.67/Kw·h;

i. Labor saving benefit: Labor saving benefit = the average labor day saving per mu × labor price per day × the implementation areas. According to the relevant statistical data of Shijiazhuang, combined with the relevant field research, the average labor day saving per mu is 0.5 person/day, the unit labor price per day is Y100/day;

j. Land saving benefit: By transfer from canal irrigation to the pipeline or drip irrigation, the crop area will be increased, that can be calculated by land saving coefficient × (wheat yield per mu × Wheat unit price + Corn yield per mu × Corn unit price) × the implementation area. According to the relevant statistical data of Shijiazhuang, combined with the relevant field research, the land saving coefficient of the implementation is 0.5%, the Wheat yield is about 450kg /mu, the unit price of wheat is Y2.4/kg, and the corn yield is 650 kg/mu, the unit price of corn is Y2/kg;

k. Increase crop production benefit: Increase production benefit = increase yield per mu × unit price × the implementation area. According to the relevant statistical data with the relevant field research, the average incremental yield for wheat is about 35kg/mu and corn 65kg/mu;

l. The amount of applied agricultural inputs (mainly for seeds, fertilizers and plastic geomembranes for the farm income analysis) were considered at the average levels for all irrigation technologies in each subproject area; and

m. The above related rates are provided by" Water conservancy construction project economic evaluation criterion" (SL72-2013) in China.

Main Assumptions for Economic Analysis

22. The economic analysis followed the assumptions used in the financial analysis, except for the differences indicated below:

a. All Project costs, including Project investment, physical contingencies, and O&M costs have been considered in estimating the economic costs of the Project, but price contingencies, taxes, duties and other charges were omitted;

b. World Bank commodity price projections or export prices actually realized in China were used to estimate farm gate prices in constant 2000 terms. These were then used to A standard conversion factor of 1 was applied to all non-traded items; and

c. All economic values were converted to local currency at the prevailing official exchange rate of Y6.4 to US$1.0, and a discount rate of 8 percent was used to approximate the opportunity cost of capital in China.

Table 5.5. Unit Price and Assumptions Applied at the Cost and Benefit Analysis

Name	Unit Price	Name	Unit price
Industrial water price	CNY 5.25 per m^3	Land saving coefficient	0.50%
Agricultural water price	CNY 0.67 per m^3	Yield/wheat	450 kg per Mu
Average water price	CNY 2.96 per m^3	Wheat price	2.4 CNY per kg
Average lift of wells	40 m	Yield/corn	650 kg per Mu
Wells efficiency coefficient	0.55	Corn price	CNY 2 per kg
Electricity cost	0.67 per KWh	Average incremental wheat production	35 kg per Mu
Average labor saving per Mu	0.5 day per Mu	Average incremental corn production	65 kg per Mu
Labor rate/day	CNY 100 per day	–	–

Table 5.6. The Water Saving Volume and Areas in Demonstration Counties

No.	County Name	Water Saving Measure								Total	
		Canal Seepage Control		Low Pressure Pipeline		Sprinkler Irrigation		Micro Irrigation			
		Area 10,000 Mu	Water Saving Amount 10,000 m^3	Area 10,000 Mu	Water Saving Amount 10,000 m^3	Area 10,000 Mu	Water Saving Amount 10,000 m^3	Area 10,000 Mu	Water Saving Amount 10,000 m^3	Area 10,000 Mu	Water Saving Amount 10,000 m^3
1	Lu-Quan	2.1	51.3	1.8	82.5	4.5	267.1	7.4	816.2	15.8	1,217
2	Gaocheng	1.3	31.5	5.9	266.8	4.3	255.8	8.5	936.5	20.0	1,491
3	Wu-Ji	1.0	23.9	6.2	277.2	4.5	267.1	10.9	1,200.4	22.5	1,769
4	Shen-Ze	2.4	58.9	3.5	155.8	2.2	129.0	7.1	784.1	15.1	1,128
5	Zheng-Ding	0.1	3.5	4.1	184.5	2.0	120.0	5.8	634.3	12.0	942
6	Jing-Zhou	–	–	15.6	701.1	8.9	535.9	17.0	1,873.4	41.5	3,110
Total		6.9	169.1	37.1	1,667.9	26.4	1,574.9	56.7	6,244.9	126.9	9,657

Table 5.7. Estimates on the Total Expected Increase of Freshwater Flows and Reduction of Pollution to Bohai Sea

River Basins Sub-river Basins	Area (km^2)	Without-project: Baseline Pollution Discharges to Rivers to Bohai Sea in 2014 (ton)		With-project: Estimated Pollution Discharges to Rivers to Bohai Sea in 2020 (ton)		Reduced Pollution to Rivers and Bohai Sea in ton		Without-project: Baseline Water Consumption (ET) and Outflow to Rivers/Bohai Sea in 2014 in million m^3		With-project, Without-project: Baseline Water Consumption (ET) and Outflow to Rivers/Bohai Sea in 2020 in million m^3		Reduced Water Consumption (ET) and Increased Outflow to Rivers/Bohai Sea in 2020 in million m^3	
		COD	N-NH4	COD	N-NH4	Reduced COD	Reduced N-NH4	Water Consumption or reduced ET	Outflow to Bohai Sea	Water Consumption or reduced ET	Outflow to Bohai Sea	Reduced Water Consumption or ET	Increased Outflow to Bohai Sea
1. Hai River Basin	**318,200**												
1.1 Project areas in Luan sub-basin (demo + upscaling area)	MEP (55,367 + 32,458) = 87,825	69,787	5,511	68,391	5,401	**(1,396)**	**(110)**	695.80	n.a.	661.01	n.a.	34.79	13.92
Whole sub-basin	55,522	219,113	18,574	217,717	18,464	**1,396**	**110**	790.2	709	750.7	724.8	**(39.5)**	**(15.8)**
1.2 Project areas in Hutuo sub-basin (demo + upscaling area)	MWR = (9,400 + 9,800 – 2,400 *overlap)* = 16,800	333,854	21,846	327,177	21,410	**(6,677)**	**(436)**	803.2	n.a.	763	n.a.	18.7	n.a.
Whole sub-basin	24,690	333,854	21,846	327,177	21,410	**6,677**	**436**	1,180.4	0	1,121.4	0	**(59)**	0
2. Yellow River	**752,442**												

River Basins Sub-river Basins	Area (km^2)	Without-project: Baseline Pollution Discharges to Rivers to Bohai Sea in 2014 (ton)		With-project: Estimated Pollution Discharges to Rivers to Bohai Sea in 2020 (ton)		Reduced Pollution to Rivers and Bohai Sea in ton		Without-project: Baseline Water Consumption (ET) and Outflow to Rivers/Bohai Sea in 2014 in million m^3		With-project, Without-project: Baseline Water Consumption (ET) and Outflow to Rivers/Bohai Sea in 2020 in million m^3		Reduced Water Consumption (ET) and Increased Outflow to Rivers/Bohai Sea in 2020 in million m^3	
		COD	N-NH4	COD	N-NH4	Reduced COD	Reduced N-NH4	Water Consumption or reduced ET	Outflow to Bohai Sea	Water Consumption or reduced ET	Outflow to Bohai Sea	Reduced Water Consumption or ET	Increased Outflow to Bohai Sea
Basin													
2.1 Scaling-up areas in Hetao irrigation district	11,620	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,880	n.a.	1,786	n.a.	n.a.	47
Whole irrigation district	263,768	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	42,675	23,690	40,541.3	24,756.9	**(2,133.8)**	**(1,066.9)**
3. Liao River Basin	**229,000**												
3.1 Scaling-up areas in Hun and Tai sub-river basins	37,555 (MEP)	447,431	47,984	438,483	47,024	**(8,948)**	**(960)**	1892.8	n.a.	1892.8	n.a.	0.0	0.0
Whole sub-basin	27,327	559,758	57,922	548,563	56,764	**11,195**	**1,158**	2,956.3	21,726	2956.3	21,791	**0.0**	**0.0**
Total						**(17,021) 19,268**	**(1,506) 1,704**					**(2,232.3)**	**(1,082.7)**

Annex 6: Project Cost Estimates

CHINA: GEF Mainstream Integrated Water and Environment Management Project

Table 6.1. Project Component and Financing (Total Cost US$104.50 million)

Project Component	Total Cost	GEF Financing	
	US$, millions	US$, millions	%
1. Mainstreaming of Innovative Approach on Integrated Water and Environment Management			
1.1 Studies on application of policies and technologies on mainstreaming the IWEM approach	1.85	0.45	24
1.2 Preparation of operational manuals and guidelines for the IWEM approach	1.60	0.75	46
Subtotal	3.45	1.20	34
2. Demonstration in Hai Basin on the Integrated Water and Environment Management			
2.1 Application of the IWEM Approach in Chengde	43.08	1.40	3
2.2 Application of the IWEM Approach in Sijiazhuang	47.02	1.40	2
Subtotal	90.10	2.80	3
3. Scaling up the Integrated Water and Environment Management Approach in Three River Basins			
3.1 Development of National Water Environment Technology Extension Platform at MEP	4.50	1.40	31
3.2 Development of the national ET Monitoring and Management Platform at MWR	2.00	1.40	70
3.3 Scaling up the IWEM Approach in Liao River Basin	0.20	0.20	100
3.4 Scaling up the IWEM Approach in Hai River Basin	0.40	0.40	100
3.5 Scaling up the IWEM Approach in Yellow River Basin	0.20	0.20	100
Subtotal	7.30	3.60	49
4. Institutional Capacity Building and Project Management			
4.1 IW Learning Activities	0.11	0.10	100
4.2 Technical assistance through consulting services	0.42	0.42	100
4.3 Training and workshops	0.60	0.60	100
4.4 Project monitoring and evaluation	0.30	0.30	100
4.5 Project management	2.22	0.47	21
Subtotal	3.65	1.90	52
Total Costs	104.50	9.50	9

Table 6.2. List of Project Outputs (2016–2021) to be financed with GEF Grant (US$9.50 million)

Project Components	GEF Financing				
	US$ Million	MEP	MWR	HB-CD	HB-SJZ
1. Mainstreaming of Innovative IWEM Approach	**1.200**	**0.600**	**0.600**		
1.1 Studies on application of policies and technologies on mainstreaming the IWEM approach	**0.450**				
1-1 MEP: Study on Assessment of EC for Urban Environment (Pilot in Chengde)	0.100	0.100			
1-2 MEP: Study on Policies on Point Water Pollution Source Emission Rights and Their Trading (Pilot in Chengde)	0.100	0.100			
1-3 MWR: Study on Policies on ET-based Water Rights (water use rights) and Trading (Pilot in Jin-Zhou)	0.150		0.150		
1-4 MWR: Study on Policies on Local Water Service Delivery System (Pilot in Jin-Zhou)	0.100		0.100		
1.2 Preparation of operational manuals and guidelines for the IWEM approach	**0.750**				
1-5 MEP/MWR: Operational Manual on ET/EC-based IWEM Approach (Pilot in Chengde and Shijiazhuang)	0.300	0.150	0.150		
1-6 MEP: Operational Manual on RS-based None-Point Pollution Source Control Approach (Pilot in Chengde)	0.100	0.100			
1-7 MEP: Operational Manual on IWEM based Integrated Toxic Symptoms (Pilot in Chengde)	0.100	0.100			
1-8 MWR: Operational Manual on ET-based Water Accounting and Auditing (Pilot in Chengde and Gaocheng)	0.150	0.050	0.100		
1-9 MWR: Operational Manual on ET-based Dual Control for Groundwater Management (Pilot in Gaocheng)	0.100		0.100		
2. Demonstration in Hai Basin for IWEM Approach	**2.800**			**1.400**	**1.400**
2.1 Application of the IWEM Approach in Chengde	**1.400**				
2-1 Chengde/MEP/MWR: Preparation and Implementation of ET/EC-based TVAP for Luan Sub-basin and IWEMP for Chengde	0.350			0.350	
2-2 Chengde/MEP: Demonstration on Integrated Monitoring and Evaluation of Ecological and Water Quality Status in the Luan River Sub-Basin (Hai River Basin)	0.400			0.400	
2-3 Chengde/MEP: Demonstration on Implementation of ET-based EC Quota Management in Sub-River Basin of the Luan River	0.150			0.150	
2-4 Chengde/MEP: Demonstration on RS-based None-Point Pollution Source Control Approach	0.200			0.200	

2-5 Chengde/Gaocheng/MEP/MWR: Demonstration on water consumption-based water accounting and auditing in both industrial factories and irrigation sites	0.200			0.200	
2-6 Chengde/MEP: Demonstration on Point Water Pollution Source Emission Rights and Their Trading	0.100			0.100	
2.2 Application of the IWEM Approach in Si-Jia-Zhuang	**1.400**				**1.400**
2-7 Shijiazhuang/MWR/MEP: Preparation and Implementation of ET/EC-based TVAP for Hutuo Sub-Basin (Hai Basin) and IWEMP for Shijiazhuang	0.350				0.350
2-8 Shijiazhuang /MWR: Demonstration on ET-based Dual Control for Groundwater Management (Gaocheng)	0.150				0.150
2-9 Demonstration on water consumption-based water accounting and auditing in both irrigation sites and industrial factories (Gao-Cheng and Cheng-De)	0.200				0.200
2-10 Shijiazhuang /MWR: Demonstration on Scientific Irrigation Management at WUA (Jin-Zhou)	0.400				0.400
2-11 Shijiazhuang/MWR: Demonstration of Water Pricing Reformation and Local Water Service Delivery System (Jin-Zhou)	0.150				0.150
2-12 Shijiazhuang/MWR: Demonstration of ET-based Water Rights and Trading (Jin-Zhou)	0.150				0.150
3. Scaling up the IWEM Approach in Three River Basins	**3.600**	**1.800**	**1.800**		
3.1 Development of National Water Environment Technology Extension Platform at MEP	**1.400**				
3-1 MEP: National GIS Platform for EC-based River Basin Management	0.600	0.600			
3-2 MEP: Development, Operations and Management of Pollution Control Technology Extension Platform (3iPET)	0.600	0.600			
3-3 MEP: Assessment on Effectiveness of Water Pollution Prevention moving towards River Basin District (RBD) Approach (Pilot in Chengde)	0.200	0.200			
3.2 Development of the national ET Monitoring and Management Platform at MWR	**1.400**				
3-4 MWR: Development of GIS Platform for Monitoring of Irrigated Agricultural Water Savings and Groundwater Management	0.650		0.650		
3-5 MWR: Development of RS/ET-based Assessment on Water Consumption in Irrigation Areas of Semi-arid Regions	0.350		0.350		
3-6 MWR: Study on RS/ET-based Acquisition of Irrigation Data and Information	0.200		0.200		
3-7 MWR: RS-based ET Data Monitoring and Analysis of Irrigation Districts	0.200		0.200		
3.3 Scaling up the IWEM Approach in Liao River Basin	**0.200**				

3-8 Liao River Basin/MEP: Annual M&E on scaling-up the IWEM Approach in Liao River Basin (in Cities of Shen-Yang, An-Shan, Pan-Jing, and Fu-Shun)	0.200	0.200			
3.4 Scaling up the IWEM Approach in Hai River Basin	**0.400**				
3-9 Hai River Basin/MWR: Annual M&E on scaling-up IWEM Approach (Shijin Irrigation Area in Hai River Basin)	0.200		0.200		
3-10 Hai River Basin/MEP: Annual M&E on scaling-up IWEM Approach in Water Pollution Areas selected (in Cities of Xing-Tai, Tang-Shan and Lang-Fang)	0.200	0.200			
3.5 Scaling up the IWEM Approach in Yellow River Basin	**0.200**				
3-11 Yellow River Basin /MWR: Annual M&E on Scaling up IWEM (He-Tao Irrigation Area in Yellow River Basin)	0.200		0.200		
4. Capacity Building and Project Management	**1.9000**	**0.8450**	**0.3290**	**0.1050**	**0.6210**
4.1 IW Learning Activities	**0.1050**	**0.0525**	**0.0525**		
4-1 Website development	0.0100	0.0050	0.0050		
4-2 Preparation of two project experience notes	0.0200	0.0100	0.0100		
4-3 Result summary notes	0.0100	0.0050	0.0050		
4-4 IW bi-annaul conferences	0.0650	0.0325	0.0325		
4.2 Technical assistance through consulting services	**0.4200**	**0.2100**	**0.0540**		**0.1560**
4-5 Consulting services & technical assistance (international)	0.2400	0.1200	0.0240		0.0960
4-6 Consulting services & technical assistance (domestic)	0.1800	0.0900	0.0300		0.0600
4.3 Training and workshops	**0.6000**	**0.2700**	**0.1200**	**0.0300**	**0.1800**
4-7 Training & workshops (international)	0.4000	0.2000	0.1000		0.1000
4-8 Training & workshops (domestic)	0.2000	0.0700	0.0200	0.0300	0.0800
4.4 Project monitoring and evaluation	**0.3000**	**0.1500**			**0.1500**
4-9 Project monitoring and evaluation	0.3000	0.1500			0.1500
4.5 Project management	**0.4750**	**0.1625**	**0.1025**	**0.0750**	**0.1350**
4-10 Project management	0.4750	0.1625	0.1025	0.0750	0.1350
Total	**9.5000**	**3.2450**	**2.7290**	**1.5050**	**2.0210**

Note: CD = Chengde; SJZ = Sijiazhuang.

Table 6.3. List of Project Outputs (2016–2021) to Be Financed with Government Research Programs (US$19.00 million)

Project Components	Financing
	US$, millions
1. Mainstreaming of Innovative Approach on Integrated Water and Environment Management	**2.25**
1.1 Studies on application of policies and technologies on mainstreaming the IWEM approach	**1.40**
D1-1 MEP: Study on Computation of the Targets on Environmental Quality at the River Basin Level	1.20
D1-2 Shijiazhuang/MWR/MEP: Study on Detail Rules on Implementation of National Water Pollution Control Action Plan	0.10
D1-3 Chengde/MEP/MWR: Study on Detail Rules on Implementation of National Water Pollution Control Action Plan	0.10
1.2 Preparation of operational manuals and guidelines for the IWEM approach	**0.85**
D1-4 MWR: Report on Development of Management Information System on Groundwater Management (reduction of overdraft) in Hebei Province	0.15
D1-5 MEP: Report on Development of National Permit System on Water Pollution Emission and Its Trading and Management	0.70
2. Demonstration in Hai Basin on Integrated Water and Environment Management	**11.30**
2.1 Application of the IWEM approach in Chengde	**3.73**
D2-1 Chengde/MEP: Plan for Reaching National Water Quality Standard at National River Cross Sections (Chengde County, Gao-Xin District, and Ping Quan County) (2017-2021)	0.15
D2-2 Chengde/MEP: Report on Development of Water Quality Automatic Monitoring System in Low-Middle River Reach of Luan River Basin	1.25
D2-3 Chengde/MEP: Strategic Plan for Ecological Protection and Development of Panlong Lake (Kuancheng County) (2016–2017)	1.20
D2-4 Chengde/MEP: Report on Capacity Building Project for Surface Water Environmental Monitoring in Chengde (Ping-Quan County) (2016-2017)	0.35
D2-5 Chengde/MEP: Report on Development of Office Automation System for Environmental Protection in Chengde (1st Phase) (Shuang-Qiao District) (2016-2017)	0.78
2.2 Application of the IWEM approach in Sijiazhuang	**7.57**
D2-6 Shijiazhuang/MWR: Study on Irrigation Technologies with Mixed Brackish and Fresh Water in Hebei Province(2017-2022)	0.47
D2-7 Shijiazhuang/MWR: Report on ET-based Water Resources Assessment in Hebei Province (2017-2022)	2.32
D2-8 Shijiazhuang/MWR: Study on Groundwater Recharge in Hebei Province (2017-2022)	0.31
D2-9 Shijiazhuang/MWR: Study on Water Resources Carrying Capacity in Hebei Province(2017-2022)	3.69
D2-10 Shijiazhuang/MWR: Study on Effectiveness of Water Saving with Different Irrigation Technologies (2017-2022)	0.78
3. Scaling up the Integrated Water and Environment Management Approach in Three River Basins	**3.70**

Project Components	Financing
	US$, millions
3.1 Development of National Water Environment Technology Extension Platform at the MEP	**3.10**
D3-1 MEP: Development of Tools for Environment Target Management in River Basins	1.20
D3-2 MEP: Development of Integrated Environment Management Platform (Model for NPS)	0.60
D3-3 MEP: Nationwide Assessment with Surveys on Regime of Groundwater Quality and the Status of its Basic Environment	1.30
3.2 Development of the National ET Monitoring and Management Platform at the MWR	**0.60**
D3-4 MWR/CAS-WS14: Production of ET Values for the 1km x 1km resolution at Hai River Basins	0.60
3.3 Scaling up the IWEM approach in the Liao River Basin	–
3.4 Scaling up the IWEM approach in the Hai River Basin	–
3.5 Scaling up the IWEM approach in the Yellow River Basin	–
4. Institutional Capacity Building and Project Management	**1.75**
4.1 Regional IW learning activities	–
4.2 Technical assistance through consulting services	–
4.3 Training and workshops	–
4.4 Project monitoring and evaluation	–
4.5 Project management	**1.75**
D4-1 MEP: Cost for Project Management	0.50
D4-2 MWR: Cost for Project Management	0.50
D4-3 Hebei Province: Cost for Project Management	0.75
Total	**19.00**

Table 6.4. Project Outputs (2017 to 2020) to be financed with Government Investment Programs (US$76.00 millions)

Project Components	Description of Government Investment Programs	Financing US$, millions
1. Mainstreaming of Innovative Approach on Integrated Water and Environment Management		**0.00**
1.1 Studies on application of policies and technologies on mainstreaming the IWEM approach		–
1.2 Preparation of operational manuals and guidelines for the IWEM approach		–
2. Demonstration in Hai Basin for Integrated Water and Environment Management		**76.00**
2.1 Application of the IWEM approach in Chengde		**37.95**
E2-1 Chengde/MEP: Project on utilization of treated municipal wastewater in Chengde	The program is located in Shuang-Qiao District of Chengde City. The goal is to update the pumping capacity, clean water pond, and chloride-adding workshop; construction of pipelines of reclaimed water delivery. The program plans to be implemented from 2017 to 2018.	11.74
E2-2 Chengde/MEP: Construction of Kuancheng County wastewater treatment plant and pipelines networks (2nd phase)	The program is located in Kuancheng County of Chengde City. The treatment capacity is 10,000 ton per day, including construction of pumping stations, treatment pond, secondary sludge settlement pond; procurement of submerged pumps, trash-racks, hoists, and so on. The length of the pipeline is 20 km. The program plans to be implemented from 2017 to 2018.	7.39
E2–3 Chengde/MEP: Harmless disposal of sludge for sewage treatment plant in Chengde County	Build a harmless disposal project of sludge for sewage treatment plant in Chengde. Covering an area of 13,000 m^2, the project will be built at the site in the northwest of Taipingzhuang Sewage Treatment Plant, which is situated at Taipingzhuang village, Dashimiao township, Shuangqian district, Chengde. With annual sludge treatment capacity of 73,000 tons, the project will consist of 2 fermentation areas. Each fermentation area, with 8 fermentation rooms, has a capacity of 36,500 tons per year. The content of the construction will include raw material warehouse, workshop, finished products warehouse, and biofilter. The project aims to realize recycling and utilization for sludge, reduce sludge discharge, avoid second-time pollution, and ensure a stable operation of the sewage treatment plant.	15.63
E2–4 Chengde/MEP: Implementation of the Plan for Reaching National Water Quality Standards at National River Cross Sections	The program is located in Chengde County, Gao-Xin District, and Ping Quan County. The goal is to reach the national water quality standard at national river cross sections in the Luan River. The program plans to be implemented from 2017 to 2021.	3.19
2.2 Application of the IWEM approach in Sijiazhuang		**38.05**
E2–5 Shijiazhuang/MWR: Rehabilitation of Large- and Middle-Scale Irrigation Districts	The program is located in Ping-Shan County, Yuan-Shi County, Lu-Quan County, and Jing-Xing County. The goal is to rehabilitate the large- and middle-scale irrigation systems, including 200 km of canal lining, and development of 13,300 ha of water saving irrigation areas. The program plans to be implemented from 2017 to 2022.	9.37

Project Components	Description of Government Investment Programs	Financing US$, millions
E2–6 Shijiazhuang/MWR: Improvement of engineering works for wastewater discharge outlet in important water function zones	The program is likely to be located in Ping-Shan County and Ling-Shou County. The goal is to prepare the layout plan of wastewater discharge outlets and to rehabilitate the wastewater discharge outlet in important water function zones. The program plans to be implemented from 2017 to 2022.	12.50
E2–7 Shijiazhuang/MWR: Development of Water Resources Monitoring System	The program is likely to be located in selected places of Shijiazhuang. The goal is to construct the water control stations, groundwater monitoring stations, and water quality monitoring stations. The program plans to be implemented from 2017 to 2022.	14.00
E2–8 Shijiazhuang/MWR: Development of Water Engineering Management and Service Delivery System	The program is located in selected places of Shijiazhuang. The goal is to establish the water supply and allocation system for South-North Water Transfer projects, establish the information-sharing platform for water security, standardize the service delivery system, and construct the monitoring and control facilities and the dedicated communication pipelines. The program plans to be implemented from 2017 to 2022.	1.40
E2–9 Water Sector Reform and Innovation Study	The program is located in selected places of Shijiazhuang. The goal is to develop the demonstration areas for water saving and utilization of reclaimed water and to conduct training on fundamental research of water resources including systematic studies on water sector reform and economic issues. The program plans to be implemented from 2017–2022.	0.78
3. Scaling up the Integrated Water and Environment Management Approach in Three River Basins		**0.00**
3.1 Development of National Water Environment Technology Extension Platform at the MEP		–
3.2 Development of the national ET Monitoring and Management Platform at the MWR		–
3.3 Scaling up the IWEM Approach in the Liao River Basin		–
3.4 Scaling up the IWEM Approach in the Hai River Basin		–
3.5 Scaling up the IWEM Approach in the Yellow River Basin		–
4. Institutional Capacity Building and Project Management		**0.00**
4.1 Regional IW learning activities		–
4.2 Technical assistance through consulting services		–
4.3 Training and workshops		–
4.4 Project monitoring and evaluation		–
4.5 Project management		–
Total		**76.00**

Annex 7: Map of the Project

CHINA: GEF Mainstream Integrated Water and Environment Management Project

(WB Map_CHN42167)