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The World Bank

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Report No: PAD1860

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT
ON A

PROPOSED LOAN

IN THE AMOUNT OF
US\$150 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

HUBEI INLAND WATERWAY IMPROVEMENT PROJECT

April 27, 2018

Transport & Digital Development Global Practice
East Asia and Pacific Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective January 9, 2018)

Currency Unit = Renminbi (RMB)
RMB1.00 = US\$0.15
US\$1.00 = RMB6.50

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

CIA-Cumulative Impact Assessment	ICB-International Competitive Bidding
CPS-Country Partnership Strategy	IWT-Inland Waterway Transport
DA-Designated Account	M&E-Monitoring and Evaluation
DWT-Dead Weight Tonnage	MEP-Ministry of Environmental Protection
EA-Environmental Assessment	MOF-Ministry of Finance
EIA-Environmental Impact Assessment	MOT-Ministry of Transport
EMP-Environmental Management Plan	NCB-National Competitive Bidding
ESMP-Environmental and Social Management Plan	NDRC-National Development Reform Commission
FM-Financial Management	PCR-Physical Cultural Resources
FMM-Financial Management Manual	PDO-Project Development Objective
FSR-Feasibility Study Report	PIE-Project Implementation Entity
GEF-Global Environmental Facility	PMO-Project Management Office
GHG-Green House Gas	POE-Panel of Experts
GRS-Grievance Redress Service	RAP-Resettlement Action Plan
GWh-Gigawatt Hour	SA-Social Assessment
HCPDI-Hubei Communications Planning and Design Institute	SORT-Systematic Operations Risk-Rating Tool
HPFD-Hubei Provincial Finance Department	VECs-Valued Environmental Components
HPSB-Hubei Port & Shipping Bureau	WBPO-World Bank Project Office
HPTD-Hubei Provincial Transport Department	WIS-Waterway Information System
HPWRD-Hubei Provincial Water Resource Department	YREB-Yangtze River Economic Belt

Vice President: Victoria Kwakwa

Country Director: Bert Hofman

Senior Global Practice Director: Jose Luis Irigoyen

Practice Manager: Binyam Reja

Task Team Leader: Xiaoke Zhai

CHINA
Hubei Inland Waterway Improvement Project

TABLE OF CONTENTS

	Page
I. STRATEGIC CONTEXT	1
A. Country Context.....	1
B. Sectoral and Institutional Context.....	2
C. Higher Level Objectives to which the Project Contributes	7
II. PROJECT DEVELOPMENT OBJECTIVES	7
A. PDO.....	7
B. Project Beneficiaries	7
C. PDO Level Results Indicators.....	8
III. PROJECT DESCRIPTION	8
A. Project Components	8
B. Project Costs and Financing.....	8
C. Lessons Learned and Reflected in the Project Design.....	9
IV. IMPLEMENTATION	10
A. Institutional and Implementation Arrangements	10
B. Results Monitoring and Evaluation	10
C. Sustainability.....	11
V. KEY RISKS	11
A. Overall Risk Rating and Explanation of Key Risks.....	11
VI. APPRAISAL SUMMARY	13
A. Economic and Financial (if applicable) Analysis	13
B. Technical.....	13
C. Financial Management.....	14
D. Procurement	14
E. Social (including Safeguards).....	15
F. Environment (including Safeguards)	16
G. World Bank Grievance Redress.....	18

Annex 1: Results Framework and Monitoring	19
Annex 2: Detailed Project Description.....	26
Annex 3: Implementation Arrangements	33
Annex 4: Implementation Support Plan	50
Annex 5: Economic Analysis.....	53
Annex 6: Fiscal and Financial Analysis	57

PAD DATA SHEET*China**China: Hubei Inland Waterway Improvement Project (P158717)***PROJECT APPRAISAL DOCUMENT***EAST ASIA AND PACIFIC*

Report No.: PAD1860

Basic Information			
Project ID P158717	EA Category A - Full Assessment	Team Leader(s) Xiaoke Zhai	
Financing Instrument Investment Project Financing	Fragile and/or Capacity Constraints []		
	Financial Intermediaries []		
	Series of Projects []		
Project Implementation Start Date 15-April-2018	Project Implementation End Date 31-Dec-2022		
Expected Effectiveness Date 29-Jun-2018	Expected Closing Date 30-Jun-2023		
Joint IFC No			
Practice Manager/Manager Binyam Reja	Senior Global Practice Director Jose Luis Irigoyen	Country Director Bert Hofman	Regional Vice President Victoria Kwakwa
Borrower: People's Republic of China			
Responsible Agency: Hubei Provincial Transportation Department (HPTD)			
Contact: Telephone No.: (027) 8346-5301	Title: Director-General Email: yakoupmo@163.com		
Project Financing Data (in US\$ Million)			
[X] Loan	[] IDA Grant	[] Guarantee	
[] Credit	[] Grant	[] Other	
Total Project Cost:	515.13	Total Bank Financing:	150.00
Financing Gap:	0.00		

Financing Source						Amount				
Borrower						365.13				
International Bank for Reconstruction and Development						150.00				
Total						515.13				
Expected Disbursements (in US\$ Million)										
Fiscal Year	2019	2020	2021	2022	2023					
Annual	30.00	40.00	45.00	30.00	5.00					
Cumulative	30.00	70.00	115.00	145.00	150.00					
Institutional Data										
Practice Area (Lead)										
Transport & Digital Development										
Contributing Practice Areas										
Energy & Extractives										
Proposed Development Objective(s)										
The project development objective (PDO) is to improve inland waterway transport capacity and reliability along the Han River in support of low carbon development.										
Components										
Component Name						Cost (US\$ Millions)				
Component A: Yakou Navigation-Hydropower Complex						484.96				
Component B: Institutional Strengthening						3.05				
Systematic Operations Risk- Rating Tool (SORT)										
Risk Category								Rating		
1. Political and Governance								Low		
2. Macroeconomic								Moderate		
3. Sector Strategies and Policies								Moderate		
4. Technical Design of Project or Program								Moderate		
5. Institutional Capacity for Implementation and Sustainability								Moderate		
6. Fiduciary								Moderate		
7. Environment and Social								Substantial		
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			
Name	Recurrent	Due Date	Frequency
Preparation of midterm review report		31-May-2019	
Description of Covenant			
The Project Management Office (PMO) shall prepare, under terms of reference satisfactory to the Bank, and furnish to the Bank no later than May 31, 2019, a consolidated midterm review report for the Project, summarizing the results of the monitoring and evaluation activities carried out from the inception of the Project, and setting out the measures recommended to ensure the efficient completion of the Project and to further the objectives thereof.			
Name	Recurrent	Due Date	Frequency
Project Agreement Cumulative Impact Assessment		30-Jun-2019	
Description of Covenant			
The PMO shall conduct the second phase assessment of the cumulative environmental impact assessment of cascade development on the middle and lower reaches of the Han River no later than June 30, 2019, under terms of reference satisfactory to the Bank, and develop an action plan for the implementation of the recommendations in the said assessment by December 31, 2019.			

Name	Recurrent	Due Date	Frequency	
Dam Safety Report	X		Yearly	
Description of Covenant				
The PMO shall maintain and provide all support and cooperation to the dam safety expert panel until the completion of the Project to: (i) advise the Project Implementing Entity on matters relative to dam safety and other critical aspects of the Project Dams, their appurtenant structures, the catchment areas, the areas surrounding the reservoirs, and downstream areas; (ii) inspect and evaluate the safety status of the upstream dams, their appurtenances, and performance history; (iii) review and evaluate the compliance of the upstream dams’ operation and maintenance procedures along with the related national standards and pursuant to the Dam Safety Plans; and (iv) provide written reports of findings and recommendations for any remedial work to ensure safety of upstream dams. The reports should be furnished to the Bank by December 25 of each calendar year.				
Name	Recurrent	Due Date	Frequency	
Annual Work Plan	X		Yearly	
Description of Covenant				
The PMO shall: (a) prepare a draft annual work plan and budget summarizing the Project activities proposed to be undertaken in the following calendar year and the related proposed budget including the amount of counterpart funds to be made available for such purposes; and (b) furnish to the Bank – for its review and comments - the Project annual plan by December 31 in each year, beginning in calendar year 2018; (c) taking into account the Bank’s comments, finalize and approve the annual plan satisfactory to the Bank (Annual Plan); and (d) thereafter ensure the implementation of the Project during the following calendar year in accordance with the Annual Plan agreed with the Bank and in a manner satisfactory to the Bank. The Project Implementing Entity shall not amend, suspend, abrogate, or waive said Annual Plans or any provision thereof without the prior written agreement of the Bank.				
Conditions				
Source of Fund	Name		Type	
Description of Condition				
Team Composition				
Bank Staff				
Name	Role	Title	Specialization	Unit
Xiaoke Zhai	Team Leader (ADM Responsible)	Senior Transport Specialist	Transport	GTD10
Alejandro Alcala Gerez	Team Member	Senior Counsel	Legal	LEGES
Zhuo Yu	Team Member	Finance Officer	Disbursement	WFACS
Jianjun Guo	Procurement Specialist (ADM Responsible)	Senior Procurement Specialist	Procurement	GGOPP

Yi Geng	Financial Management Specialist	Senior Financial Management Specialist	Financial Management	GGOEA
Bernard Aritua	Peer Reviewer	Senior Infrastructure Specialist	Transport	GTD06
Chunlin Zhang	Peer Reviewer	Lead Private Sector Specialist	Private Sector Development	GFPCPN
Chunyan Li	Team Member	Senior Finance Assistant	Disbursement	WFACS
Hua Tan	Team Member	Senior Transport Specialist	Transport	GTD10
Jian Xie	Team Member	Senior Environmental Specialist	Environment	GEN01
Limei Sun	Team Member	Program Assistant	Operation Support	EACCF
Ning Yang	Environmental Safeguards Specialist	Senior Environmental Engineer	Environment	GEN2A
Simon David Ellis	Peer Reviewer	Program Leader	Transport	ECCWB
Songling Yao	Social Safeguards Specialist	Senior Social Development Specialist	Social	GSU02
Todd M. Johnson	Peer Reviewer	Lead Energy Specialist	Energy	GEE09
Xiaodan Huang	Team Member	Environmental Specialist	Social	GEN2A
Ximing Zhang	Team Member	Senior Dams Specialist	Water	GWAGP
Yi Yang	Team Member	Operations Analyst	Operational Analysis	GTD10
Extended Team				
Name	Title	Office Phone	Location	
Chuntai Zhang	Economist Consultant		Beijing	
Harrie de Leijer	IWT, Port and Logistic Consultant			
Jiang Dai	Consultant		Yicheng	
Jianming Zhao	Geotechnical Specialist		Beijing	

Locations					
Country	First Administrative Division	Location	Planned	Actual	Comments
China	Hubei	Yicheng		X	
Consultants (Will be disclosed in the Monthly Operational Summary)					
Consultants Required? Consultants will be required					

I. STRATEGIC CONTEXT

A. Country Context

1. Over the past three decades, China has achieved remarkable economic growth and had lifted more than 700 million people out of poverty by 2016¹. The Gross Domestic Product (GDP) per capita increased from US\$225 in 1978 to US\$8,305 in 2016². However, China faces a huge challenge to achieve its development target of lifting the remaining poor out of poverty by 2020³, in particular the over 70 million poor farmers, as economic development has not been balanced and there are growing disparities between the more prosperous eastern/coastal provinces and the less developed western and central regions.

2. China's 13th Five-Year Plan (FYP, 2016-2020) aims to shift the growth pattern and achieve a medium-high economic growth in a more balanced, inclusive and sustainable manner. The FYP pursues innovative, coordinated, green, open, and shared development strategies to enhance the quality and benefits of economic development. To minimize the disparity between regions, it calls for strategic plans and a policy framework to support the development of the western and central regions. The FYP also calls for accelerating the establishment of a modern multi-modal transportation system and logistics system in central China, in order to foster growth among city clusters and metropolitan areas along the main transport corridors.

3. The rebalancing of the Chinese economy has a spatial component. Industrial production and new economic sectors are shifting or being established in new economic zones in the less developed inland regions. The designation of the Yangtze River Economic Belt (YREB) as a principal economic corridor is a key national strategy to promote the industrial development of inland regions by expanding or relocating industries from the traditional manufacturing hubs in the east, such as the lower reaches of the Yangtze River Delta, to the middle and upper reaches of the Yangtze River. The YREB covers nine provinces (Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan, Sichuan, Yunnan, and Guizhou) and two municipalities (Shanghai and Chongqing) with a total area of 2.05 million square kilometers. It accounts for more than 40 percent of China's Gross Domestic Product (GDP). At the core of the YREB strategy is the intensive utilization of the Yangtze River and major tributary rivers as freight transportation corridors.

4. The new manufacturing zones that have been established in central and western part of China are far away from major consumption centers and ports. This requires an efficient multimodal transport that can move freight over long distance in a sustainable manner. Yet, for long distance freight transport, the more cost effective and environmentally friendly IWT mode has been underutilized due to lack of intermodal connectivity, uniformity in standards, and efficient logistic management.

5. Hubei Province, where the Project is located, is situated in central China along the middle reaches of the Yangtze River. It is at the crossroad of the east-west Yangtze River corridor that connects the western regions with the Yangtze River Delta in the east and the south-north

¹ Source: Information Office of the State Council of the People's Republic of China

² Source: National Bureau of Statistics of the People's Republic of China (exchange rate is US\$1.00 = RMB6.50)

³ Objective of the 13th Five-Year Plan. Domestic rural poverty is defined as an annual net income of RMB2,300 per capita in constant 2010 prices.

expressway and railway corridor that connects the north-central regions with the Pearl River Delta in the south. Wuhan, the capital city of Hubei, is located on the Yangtze River, and is the economic center in the central region and a national transport hub on the Yangtze River.

6. Hubei's 13th FYP (2016-2020) aims to eliminate poverty and boost economic development by taking advantage of its strategic location and transforming itself into the "National Interchange". On one hand, it will accelerate the development and opening of YREB within Hubei Province and establish Wuhan, the provincial capital, as an innovation center and navigation hub. On the other hand, it will also stimulate new growth along the Han River Ecological Economic Belt, where the national automobile industry centers, textiles and clothing production centers, and grain production bases are concentrated.

B. Sectoral and Institutional Context

7. **China has built a massive transport infrastructure over the last thirty years; however, the transport sector is a major source of air pollution and GHG emissions.** Although the transport sector currently contributes about 10 percent of total GHG emission in China, GHG emissions from transport have been rising and are expected to increase in the coming years as motorization continues. Between 2010-2015, total carbon emissions in China grew by 17 percent, while carbon emissions from the transport sector increased by 40 percent. This is because China's freight system is dominated by the road freight transport sector, which is highly fragmented and offers inefficient and unreliable service.

8. **Inland water transport (IWT) is a "greener" mode of transport, but it has not been fully used in China's freight transport market.** In 2016, 83 percent of China's freight was transported by road; 9 percent by waterways, and 8 percent by railways. Nevertheless, the development of inland waterways is critical for China to meet its international commitment to reduce CO₂ emissions per unit of GDP by 60-65 percent from 2005 levels by 2030. An intermodal transport system can shift freight away from high-emission road transport to the more environmentally-friendly waterway system. Inland waterway transport, however, continues to have a low market share in part because it is not integrated with other transport modes and the navigation capacity of many rivers is below standard. The institutional arrangement to coordinate an intermodal transport service is lagging, as each mode was developed separately, and operates in a fragmented, insulated institutional setting. Information exchange does not take place among different service providers and government agencies for lack of a platform to share information among the different mode-specific institutions, service providers and users, making the emergence of a seamless, intermodal freight transport and logistics service difficult.

9. Recognizing these constraints, both the national and local governments have plans to improve inland waterway infrastructure and connectivity between waterways and other modes of transport to promote IWT capacity and utilization. In 2007, the Ministry of Transport (MOT) issued the National Inland Waterway and Port Plan that envisaged the development of a high-class waterway network (defined as Class IV to Class I Standard) with a total length of 19,100 kilometers by 2020, which will connect 25 percent of Chinese cities with a population of over half a million. Subsequently, in September 2014, the State Council issued a Plan for the YREB Integrated Multi-Modal Transport Corridor. The Plan calls for the establishment of an integrated

multi-modal transportation system for the YREB by 2020, comprising the Yangtze River and its tributaries, railways, highways, and aviation.

10. **IWT on the Han River in Hubei Province.** The Han River is the longest tributary in the middle reach of the Yangtze River. It originates from southwestern Shaanxi Province, crosses Hubei Province from the northwest to the southeast, and feeds into the Yangtze River at Wuhan, and has a total of 1,376 kilometers of navigable waterways. Of the 867 kilometers of navigable waterways in Hubei Province, only 4 percent is classified as Class III, capable of handling 1,000 Dead Weight Tonnage (DWT) vessels; and 72 percent are Class IV (capable of handling up to 500 DWT vessels).

11. The hinterland of the Han River is a major producer of agricultural products, fertilizers, building materials and bulk minerals, which are most suitable for waterway transport in terms of cost efficiency. Significant developments in industry and agriculture have taken place along the Han River corridor in the past decade, and IWT is one of transport options. The Han River provides a continuous waterway link to the Yangtze River, and via the Yangtze River to the eastern coast. Freight volume on the Han River increased about 8.8 percent annually during 2000-2013 and reached 21.3 million tons in 2013. However, due to the low navigation standard, only 15 percent of freight was transported by 1,000 DWT or larger vessels; about 51 percent was transported by vessels of 500 to 1,000 DWT⁴. Smaller, older, and low fuel efficiency vessels dominate inland waterway transport along the Han River. Freight on the Han River has to be transshipped for transporting along the Yangtze River as the Yangtze River ports are designed for large vessels; this leads to higher transport costs and lower efficiency.

12. Future growth in freight volume on the Han River is severely constrained by the low standard of the navigation channel and the low water level in the four-month dry season. Commercial vehicles, containers, and other high-volume cargo, which are ideal candidates for long distance waterway transport, cannot be fully accommodated. In addition, the management of inland waterway transport is weak; no waterway information system is available to guide and monitor traffic along the Han River; existing emergency response and safety management systems are insufficient to meet the future demands of transporting bulk industrial products; the capacity of the ports for handling wastes from vessels is inadequate; and environmental protection is a challenge for cascade development. The relatively low skilled IWT labor force further hinders Han River's development into a competitive freight transport mode. The proposed Project will take a comprehensive approach to eliminate infrastructure constraints, improve IWT management capacity and efficiency, and enhance the sustainability of IWT along the Han River.

13. The Hubei Inland Waterway Transport Development Plan (2002-2020) sets specific targets for waterway development: by 2020 classified waterways and high-class waterways are expected to reach 71.7 percent and 27.7 percent respectively of the 8,744 kilometers of navigable waterways⁵. The Plan prioritizes the development of "Three Trunk" waterways, i.e., the Yangtze River, the Han River, and the Liangsha Canal. According to the relevant plans⁶ governing IWT

⁴ Feasibility Study Report

⁵ High class waterways mainly include Class III and above navigational channels, as defined by the national plan.

⁶ These plans include: *Yangtze River Basin Comprehensive Utilization Plan*, issued by the State Council in 1990; *Hubei Inland Waterway Development Plan (2002-2020)*, issued by the Hubei Provincial Government in 2005; and *Han River Comprehensive Utilization Plan (revision)*, issued by the Yangtze River Committee in 2011.

development on the Han River, the waterway from Danjiangkou downstream will be upgraded to Class III standard by 2020, which will enable 1,000 DWT vessels to navigate year-round on the Han River. The waterway upgrade will be implemented through cascade development as the River travels from a higher elevation mountainous area to a lower elevation area. Six cascades⁷ are planned from Danjiangkou downstream: three (Wangfuzhou, Cuijiaying, and Xinglong) have been built and the remaining three (Xinji, Yakou, and Nianpanshan) are planned to be completed by 2020. The Xinji and Nianpanshan Complexes have been approved by central government to be implemented in the 13th FYP.

14. **The proposed Project.** The proposed Project at Yakou is in the middle reach of the Han River. The completion of the Yakou Complex is a critical milestone for the Han River to reach the planned navigation standard by 2020. It will upgrade about 53 kilometers waterway between the Yakou and the Cuijiaying Complex to Class III navigation standard and address a key bottleneck for completed investments at other cascades to realize their full navigation capacity and economic benefits. In addition, the proposed Project will also contribute to: achieving the objectives of the YREB Strategy; enhancing the Yangtze River golden waterway function and the connectivity among eastern, central and western regions; and coordinated development to mitigate the disparities between the more prosperous eastern provinces and the less developed western and central regions.

15. The proposed Project will develop an integrated powerhouse - ship lock complex, which is expected to have environmental and climate change adaptation and mitigation benefits through the promotion of a green transport mode and provision of renewable energy to Yicheng City (which is located 16 kilometers from Yakou). In addition, it will provide gravity flow irrigation to over 5,300 ha of existing farmland and reduce lifting costs significantly, improve flood resilience, and create a better landscape for recreational tourism.

16. The Global Environmental Facility (GEF) is supporting China to prepare a “GEF China Efficient and Green Freight Transport Project” that aims to improve the efficiency and environmental sustainability of China’s freight transport sector. The GEF project will develop key policies, strategies, analytical tools and technical standards at the national level and pilot them in selected provinces. It will finance technical assistance for the strategic plan for improving the integrated development of Han River inland waterway. The technical assistance will focus on commodity flow data collection in the Han River corridor, analysis of freight movement on the transport network (highway, IWT, railway, and air), logistics service value chain stakeholder analysis, identification of bottlenecks in the transport network and the logistics service value chain (skilled labor force, vessel standardization, policy incentives), and plans to improve Han River IWT intermodal connectivity and efficiency.

17. **Bank Support for IWT in China.** Starting with the First Inland Waterways Project in 1995, the Bank has supported seven inland waterway projects in China, with each successive phase introducing important additionality ranging from technical innovation to integrated development and management of multi-purpose IWT, and institutional capacity and environmental aspects. For example, Bank engagement in IWT in China has evolved from removing transport bottlenecks by improving IWT infrastructure, to supporting power-generation facilities as part of integrated

⁷ There are eight cascades in Hubei, including one upstream, Danjiangkou, and six downstream.

powerhouse – ship lock complexes to improve the financial sustainability of IWT, and more recently to providing waterway management systems for coordinating multiple uses of water resources, including navigation, flood control, irrigation, power generation, and environment protection. The Fifth Inland Waterways Project supported the development of the Cuijiaying Complex in Hubei Province.

18. ***Value-added by the Bank.*** China has developed cascade development plans for many rivers and implemented IWT projects to promote waterway transport. However, preserving the ecological systems of the rivers remains a challenge in implementation of the cascade development plans. The Bank will share its experience of IWT projects as well as good practices in the US and Europe. The value added of the Project lies in particular on mitigating the environmental impacts of cascade development along the Han River, improving IWT operation management, and disseminate knowledge and lessons through various measures to maximize benefits from infrastructure development and technical assistances under this project and others in the Hubei IWT system:

- (a) Addressing Cumulative Environmental Effects – One of the key lessons from previous IWT cascade development projects is that recommendations from environmental effects assessments are not implemented well due to coordination complexity among various institutions and stakeholders. Implementing the recommendations often requires a close coordination among multiple government agencies, municipalities, and even provinces. It also demands funds to develop a detailed action plan and set up a mechanism to implement mitigation actions. The Project will finance a detailed cumulative effects study that will incorporate international good practices and lead to a concrete mitigation plan; and support the creation of an inter-agency coordination mechanism to address cumulative effects and achieve eco-system sustainability in the Han River Basin. The experience gained from the Project could also benefit similar cascade development and IWT projects in China and other developing countries.
- (b) Fishery Facilities – Designing and operating fish pass and breeding facilities along the Han River started from the Bank-financed Cuijiaying Complex, which set a good example for domestic projects. At that time, no national standard was available for fish pass design. There is limited information about the performance of the fishery facilities. The Project will provide technical assistance to evaluate the effectiveness of the existing fish pass and breeding facilities in the middle and lower reaches of the Han River and provide recommendations to enhance the performance of fish passes, fish breeding facilities, and fish release programs, including those built under the Project.
- (c) IWT operation – The success of IWT depends on both improved IWT infrastructure and better operation management. The cascade development of the Han River started in 1950s, and previous investments mostly focused on the infrastructure improvement. The Bank financed 5th IWT project helped Hubei to develop and operate the Cuijiaying Complex and provided technical assistance on promoting the waterway sector in Hubei Province, improving navigation safety and waste management within the Cuijiaying reservoir, and financing for the development of waterway transport in Hubei. As the cascade development objective of the Han River is expected to be achieved in the coming years, improving IWT operation management now becomes a priority and is the focus of this project. Building on the capacities developed by the 5th IWT project, the Project will provide technical

assistance in the following areas to further improve IWT operation management and efficiency:

- Waterway Information System (WIS) – The Project will provide technical assistance to pilot the introduction of WIS to improve IWT management between the Yakou and Cuijiaying complexes, and to scale it up to the entire Han River in the future, and integrate it with the WIS along the Yangtze River.
 - IWT Safety Management – Safety management is essential to ensure a smooth IWT operation and environmental protection, as the waterway traffic along the middle and lower reaches of the Han River is expected to increase significantly in the future and diversified goods will be transported by the IWT. The Project will support a study to analyze IWT safety risks, develop appropriate indicators for safety management and emergency response, and provide recommendations to enhance risk management and emergency response capacities along the Han River.
 - Multimodal integration – The improvement of IWT efficiency also relies on adequate integration of IWT with other transport modes. The Bank will support Hubei Province in the promotion of IWT efficiency and intermodal connections along the Han River through the GEF project.
- (d) Knowledge dissemination - The experience and lessons gained from the Project and outputs from the GEF project will be shared and promoted through the TransForm knowledge platform⁸ to help reduce greenhouse gas emissions in the freight sector both in China and Bank client countries.

19. **Maximizing Development Impacts.** IWT is an important program for Hubei Province, which plans to invest US\$6.15 billion in developing the IWT sector in the 13th FYP. The government's financing for IWT program is considerably larger than the proposed Bank loan, and the Bank loan would be used strategically to introduce innovations and better management practices of an integrated intermodal IWT system along the Han River. The practices and experience gained from the Project will help Hubei Province to improve the effectiveness of its funds through better project preparation, procurement and contract management, and strengthened institutional capacities. In addition, a reliable and high-standard waterway transport service will create new business opportunities for commercial and private investments in ports, industry, and agriculture along the Han River corridor, such as upgrading the existing substandard ports with private sector financing, providing more vessels to meet new transport demands, as well as attracting more industrial and agricultural investments as lower cost and higher efficiency IWT increases the competitive edge of local industrial and agricultural products.

20. The GEF project will provide a grant of US\$ 8,246,095 to the MOT and selected pilot provinces. Of this, about US\$300,000 will be allocated to support a technical assistance on improving the integrated development of the Han River inland waterway in Hubei Province. The outputs of the technical assistance will also benefit other IWT corridors in China, as well as the YREB multimodal freight transport corridor development.

21. China and other countries face the challenge of better utilizing water resources and reducing the environmental impact of cascade development along rivers. The experience gained

⁸ Transport Transformation and Innovation Knowledge Platform (TransFORM) was jointly established in 2014 by the MOT and the World Bank to facilitate knowledge dissemination between China and other developing countries

from the proposed Project will benefit similar activities in Hubei and other provinces in China. In addition, the Bank's experience with IWW projects in China (in particular this project) can be shared with other Bank clients undertaking the development of their inland waterways.

C. Higher Level Objectives to which the Project Contributes

22. The proposed Project is consistent with the World Bank Group's China Country Partnership Strategy (CPS) for 2013-2016, discussed by the Board on November 6, 2012 and supports two of the strategic themes of the CPS:

- *Strategic Theme 1: Supporting Greener Growth.* IWT development on the Han River will contribute to improving IWT transport efficiency, inducing modal shift from more polluting/emitting transport modes, enabling the navigation of larger and energy efficient vessels to reduce greenhouse gas (GHG) emissions, and conserving arable land. In addition, hydropower will provide renewable energy and reduce coal consumption in the power sector.
- *Strategic Theme 2: Promoting More Inclusive Development.* The proposed Project will promote transport connectivity in a cost-effective way, particularly for products and markets, between the lagging inland cities along the Han River and the more prosperous eastern coastal regions.

23. The proposed Project supports the World Bank's twin goals of alleviating extreme poverty and boosting shared prosperity. Economic development of Yicheng City was about average in Hubei Province, and the City had about 20,880 registered extreme poor people in 2014. The Project will improve Yicheng's connectivity with YREB, lower transport costs, and sustain local economic development and poverty reduction.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

24. The Project Development Objective (PDO) is to improve inland waterway transport capacity and reliability along the Han River in support of low carbon development.

B. Project Beneficiaries

25. Residents along the Han River are expected to benefit from economic development and ecological improvement brought about by the greener transport mode and clean energy. The main beneficiaries of the Project are expected to be: (i) ship and port operators on the Han River who will experience a more reliable waterway with higher navigation standards; (ii) industry and businesses along the Han River who will be able to access waterway transport with higher capacity and lower transport costs; and (iii) residents of Xiangyang and Yicheng, who will be supplied additional renewable energy. The total number of beneficiaries is estimated to be about 5.61 million, of whom 49.39 percent are expected to be women⁹.

⁹ Source: Bureau of Statistics, Xiangyang Municipality

C. PDO Level Results Indicators

26. Achievement of the PDO will be measured by the following outcome indicators:
- Traffic passing through the Yakou Complex (to measure improvement in IWT capacity)
 - Navigability of 1,000 DWT vessels (to measure reliability of the waterways)
 - CO2 emission reduction (to measure contributions to low carbon development)

III. PROJECT DESCRIPTION

A. Project Components

27. **Component A: Yakou Navigation-Hydropower Complex - US\$484.96 million (US\$148.455 million IBRD Loan).** Construction of the Yakou Infrastructure Complex, comprising *inter alia*, the following structures: (i) A Grade III ship lock of up to 1,000 DWT vessel capacity; (ii) dam sluice gates; (iii) a powerhouse of up to 75 MW capacity; (iv) a connection dam in three sections, connecting structures between the Han River banks; (v) fish pass and fish reproduction facilities; and (vi) a dam crest-access bridge in several sections along the ship lock, sluice gates and powerhouse.

28. **Component B: Institutional Strengthening - US\$3.05 million (US\$1.17 million IBRD Loan).** Carrying out of: (i) technical assistance activities and training to enhance the institutional capacity of the IWT management authorities, particularly in areas related to IWT management, Project management, sectoral policies, environment management, safety management, and waterway information systems; and (ii) a detailed Cumulative Impact Assessment (CIA) and mitigation plan development for the conservation of fisheries and habitats in the Han River.

B. Project Costs and Financing

29. **Lending Instrument.** The lending instrument for the proposed Project is Investment Project Financing. The World Bank loan of US\$150 million will be a US Dollar denominated, commitment-linked variable spread loan, based on the six-month London Inter-Bank Offered Rate (LIBOR) plus an additional variable spread, with all available conversion options, level repayment of principal, a commitment fee of 0.25 percent on the undisbursed loan balance and a front-end fee of 0.25 percent, and a final repayment period of 25 years, including a 5-year grace period.

30. **Project Cost and Financing.** The estimated project cost, including financing costs, is RMB3.35 billion (US\$515.13 million equivalent), to be funded by an IBRD loan of US\$150.00 million and counterpart funds of US\$365.13 million equivalent. The table below indicates the project cost and financing plan.

Project Cost and Financing Plan
(US\$ million)

Project Components	Project cost	Counterpart Funding	IBRD Financing
Component A. Yakou Navigation-Hydropower Complex	484.96	336.505	148.455
Component B. Institutional Strengthening	3.05	1.88	1.17
Total Project Basic Costs	488.01	338.385	149.625
Physical and price contingencies	18.65	18.65	-
Total Project Costs	506.66	357.035	149.625
Interest and Commitment Fee during implementation	8.098	8.098	-
Front End Fees	0.375	-	0.375
Total Financing Required	515.133	365.133	150.00

C. Lessons Learned and Reflected in the Project Design

31. The project design incorporates lessons learned from international and domestic inland waterway development experience as well as Bank experience on policy work and projects in China and in other countries.

32. **Waterway Information System (WIS).** A 2009 Bank study on Sustainable Development of Inland Waterway Transport in China identified long-term development of river information services as one of the main operational issues. Application of WIS will improve utilization of the navigation channel, productivity of vessels, navigation safety, and environmental protection. The Project therefore includes technical assistance to support the study and pilot application of a WIS for the Han River.

33. **IWT Connectivity to Intermodal Transport Network.** The Bank's experience in similar projects has shown that the sustainability of IWT depends on: (i) connectivity to the overall intermodal transport network; and (ii) collaboration between the public sector and the private sector in promoting IWT. Technical assistance under the GEF project will support activities to: (i) study the logistics service value chain, identify cost drivers, and pinpoint constraints; (ii) help the public sector to engage the private sector and identify the missing links, for example, land, ports, financing, operational inefficiency, crew training, and inter-modal integration; and (iii) propose policy recommendations on coordinated port planning, development, vessel standardization, and management of an integrated multimodal transport network, in particular the integration of IWT.

34. **Environmental Sustainability.** The Bank-financed Fifth IWT project and the subsequent Shihutang IWT project included fish passes, fish reproduction facilities, and fish habitat conservation measures. Cumulative effect assessments for cascade development were carried out in the past decade or so under Bank-financed IWT and water resource projects in China. The Project will incorporate best practices in water resources and environmental management, as well as lessons from previous projects, for example, cumulative environmental effects assessment of cascade development and corresponding mitigation measures, and conservation of natural habitats. An innovation of the Project to enhance environmental sustainability is to develop an inter-agency

coordination mechanism and implement a coordinated dam operation plan (i.e., ecological scheduling) for fish protection and restoration.

35. **Dam Safety.** Previous inland waterway projects have demonstrated the importance of involving a Panel of Experts (POE) early to provide technical guidance on design, construction, and operational issues of dams. The Project Management Office (PMO) has already appointed a POE to review the design, supervise construction and the early stage of operation, as well as to review the safety plans prepared by the PMO. The POE has also reviewed the safety status of the existing Cuijiaying Dam.

36. **Capacity for Safeguards Implementation and Supervision.** To properly implement and manage safeguards, the “Lessons Learned and Agenda for Action” Report of the Uganda Transport Sector Development Project recommends: (i) ensuring adequate borrower institutional capacity on environmental and social issues; (ii) identifying key environmental and social risks that need to be addressed; and (iii) handling complaints from affected individuals or communities. This project incorporates steps to address these recommendations.

IV.IMPLEMENTATION

A. Institutional and Implementation Arrangements

37. Hubei Provincial Transport Department (HPTD), on behalf of Hubei Province to implement the proposed Project, has entrusted the Hubei Port & Shipping Bureau (HPSB) - an entity under HPTD responsible for overall administration of IWT in Hubei Province, including navigation channels, ports, and shipping - to implement the proposed Project. HPSB will be responsible for overall coordination with other related government agencies (for example, Hubei Water Resources Department, Xiangyang Municipality, and Yicheng City, management agencies of other complexes along the Han River), and for supervising project implementation. The World Bank Project Office (WBPO) under HPTD will act as the liaison office with the Bank and coordinate institutional strengthening activities.

38. HPTD has established a dedicated PMO, the Yakou Complex Management Office, to prepare and implement the Project. The PMO comprises units for technical design, safeguards, procurement, supervision, contract management, financial management, results monitoring and evaluation. Key staff of the PMO have experience with Bank-financed projects and are familiar with Bank policies. The PMO will also engage experienced consultants to support the carrying out of detailed design, preparation of bid documents, supervision of construction, and monitoring compliance and implementation results. Detailed designs and bid documents of the first two contracts have been prepared for advance procurement. The PMO has also developed the TORs for technical assistance under Component B. HPTD had made counterpart funds of RMB512 million available for the Project in 2017.

B. Results Monitoring and Evaluation

39. The Results Framework provided in Annex 1 will be the main tool for monitoring and evaluation of project outcomes and intermediate outcomes/outputs. The PMO will develop annual working plans, collect the required monitoring and evaluation (M&E) data, and report the results as part of the Project Reports. The PMO has set up internal and external monitoring mechanisms.

Independent consultants are engaged to evaluate and monitor the safeguards compliances of the Project. The Bank task team will carry out semi-annual implementation support missions on site to review project implementation progress, discuss key issues, and provide supports to facilitate the project implementation. Between the semi-annual missions, the PMO will communicate major implementation issues and urgent events with the Bank task team through adequate means such as emails and calls. A mid-term review of the Project will be conducted by the PMO and the Bank task team by May 31, 2019 to review the overall project implementation status, evaluate the intermediate results and the likelihood of achieving the PDO, and agree on actions to accommodate any unexpected changes.

C. Sustainability

40. The overall sustainability of the proposed Project comes from its integral role in IWT development on the Han River, as well as its focus on ensuring environmental sustainability of the cascade development along the River and proper O&M planning and implementation. On its completion by 2020 along with the other cascades from Danjiangkou downstream, the river section between Danjiangkou and Hankou will be upgraded to Class III and will enable larger vessels to navigate through. The improved IWT infrastructure is expected to achieve high utilization, because of: (i) significant economic development potential in the hinterland of the Han River; (ii) increasing demand to link the western/central regions with the eastern coastal region; and (iii) enhanced management capacity. HPTD has proved its capacity to operate similar complexes, which lays a solid foundation for operating the Yakou Complex.

41. Revenues from the powerhouse will be used to support the operation and maintenance of the Yakou Complex. Power generated by the Yakou Complex will supply renewable energy to local power distribution companies, and the experience of the Cuijiaying Complex shows that the revenue from power sale will be sufficient to meet the operation and maintenance costs of the Complex. In addition, multiple innovations introduced under the Project to facilitate the development and implementation of the ecological scheduling, close coordination among different dam operators, fish pass, and so on, will promote environmental sustainability and improved efficiency of the IWT operation. Technical assistance and training provided by the Project will also contribute to further strengthening the institutional capacity of HPTD for proper operation and management of the IWT cascade.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

42. The overall risk to achieving the PDO is rated Moderate, as shown in the SORT table in the Data Sheet. Individual risk categories are all rated moderate, except for Environmental and Social (which is rated substantial) and Political and Governance (which is rated low).

43. **Environment and Social Safeguards.** The Project triggers five Bank safeguard policies. Considering the nature of the proposed infrastructure, the size of the project's area of influence, and the cascade development planned for the Han River, the Project may bring about both short- and long-term environmental and social impacts that need to be managed. Based on experience under the Bank-financed Fifth Inland Waterway Project on the Han River and similar projects, the

safeguard risks are being mitigated through: (i) setting up a strong institutional arrangement and assigning dedicated staff with Bank safeguard management experience; (ii) engaging experienced consultants to conduct comprehensive environmental and social assessments and to develop safeguard action plans based on a mitigation hierarchy of avoidance and minimization, including a budget for compensation; (iii) engaging multi-stakeholders (including government agencies, potentially affected people, and NGOs) and building an inter-agency coordination mechanism, which are critical for addressing the cumulative impacts associated with cascade development; (iv) establishing local resettlement offices and training staff during project preparation; and (v) including technical assistance activities in the project design to support further cumulative impact assessment, monitoring and enhancement of fish pass facilities, and ecological scheduling on the Han River during project implementation. The outputs of the TAs will be used to protect the Han River ecosystem and enhance environment sustainability.

44. **Dam Safety.** The impact of upstream dams on the safety of the Yakou Dam has been assessed, which confirms that the Dam would be safe even under extreme scenarios. The POE provided guidance on the engineering design, construction, and operational aspects of the Yakou Dam to ensure compliance with the requirements of the Bank's Safeguards Policy on Safety of Dams.

45. **Technical Design.** The technologies required by the Project are mature and are available in China. Experience from previous Bank-financed IWT projects highlights the importance of proper geotechnical and hydrological investigations at the design stage to avoid changes to primary design parameters during construction and consequent cost overruns. The hydrological investigations also include the likelihood of future climate change impacts on river flow regimes to ensure that the design and operation of the Yakou Complex is climate resilient. Coordinated dam operation along the Han River will further increase the resilience of the Complex to extreme events. In addition, the design and operation of the IWT cascade take into account the health of the riverine ecosystem to sustain its rich biodiversity. The Bank has worked closely with the PMO to improve the quality of designs, with particular attention to geotechnical investigations and alternative analysis.

46. **Traffic forecast.** The development of the Yakou Complex will lead to a higher navigation standard between Yakou and Cuijiaying, which enhances the reliability and attraction of IWT. However, traffic growth will also depend on other factors, for example, local economic development, the completion and operation of the other complexes downstream, intermodal connections, and sectoral policy support. The traffic forecast is based on the development objectives of the 13th FYP of Hubei Province and historical IWT traffic growth data along the Han River. A lead panel at the provincial level has been established to coordinate and monitor the progress of implementation of the planned complexes and related dike reinforcement projects along the Han River. The Project and the proposed GEF efficient and green freight project will provide technical assistance and training, strengthen institutional capacity for IWT management in Hubei, and enhance IWT competitiveness through improved management, efficiency, intermodal connections, and sectoral policies.

47. **Linked project.** Due diligence was conducted during Project preparation to identify linked projects and related risks. The main risks include the coordination of project requirements on safeguards management, implementation schedule, and technical designs. The PMO has

communicated these requirements with the other agencies responsible for linked projects. The coordination mechanism at the provincial level will also reduce these risks. The Bank task team will engage with provincial and local governments and provide support to ensure smooth implementation of the Project.

VI. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

48. **Economic Analysis.** The identified economic benefits of the Project include: transportation cost savings; increased utility of renewable energy; reduced operation and maintenance (O&M) costs of the navigation channel; increased agricultural production and reduced O&M costs owing to improved irrigation systems; and local and global environmental benefits through reduced GHG emissions. These benefits will, in the medium and long term, boost the local and regional economic development of the Han River hinterlands in northern Hubei Province. Cost-benefit analysis indicates that the project's economic internal rate of return (EIRR) is 13.02 percent. Sensitivity analysis (assuming a 10 percent increase in costs and 10 percent decrease in economic benefits) shows that the project would still yield an acceptable EIRR of 8.59 percent. Annex 5 provides more details of the economic analysis.

49. **Climate Co-Benefits.** The proposed Project has substantial climate benefits as the Yakou Complex will contribute to waterway transport growth and efficiency improvement, CO2 emission reduction by attracting freight transport from road to waterway, and provision of renewable energy to the market. The Complex will also integrate climate resilient design to endure extreme climatic events, increase resilience to climate change induced frequent flooding, and reduce the vulnerability of the waterway transport sector to climate change induced prolonged dry season and low water level.

50. **Financial Analysis.** Analysis of HPTD's financial capacity shows that revenues had increased substantially in the past few years, mainly from government fiscal allocations and expressway operations. Government fiscal allocations to HPTD are likely to continue to increase as revenues from transport related charges (for example, vehicle purchase tax and fuel tax allocations) are increasing in line with rapid motorization in Hubei province and in China.

51. HPTD's discretionary funds will be adequate to provide the required counterpart funds for project implementation. Counterpart fund requirements for the Project will not significantly impact HPTD's normal operation and maintenance budget. However, HPTD should budget its expenditures carefully and allocate the required funds for the Project in line with the implementation schedule. HPTD aims to reduce debt from 65.5 percent of discretionary revenue in 2015 to 38.0 percent in 2020. (See Annex 6 for details.)

B. Technical

52. The feasibility study and the preliminary design of the Project are based on information and data obtained from various development plans of governments and detailed investigations of geological and hydrological conditions of the Han River in terms of meteorology, hydrology, geomorphology, geology and sediment transport, and the status of the current navigation channel. Alternative analyses, hydraulic model tests, and design optimization were carried out with a focus

on key technical elements, including characteristic water levels, dam site and axis of dam, general layout and number of sluice gates, installed capacity of the powerhouse, and construction diversion schemes. In addition, an imitation ecological fish pass has been designed to create a friendlier environment for fish migration. Comments from the POE and the Bank have been incorporated as appropriate.

C. Financial Management

53. Bank loan proceeds, including oversight of the designated account (DA), will be managed by the Hubei Provincial Finance Department (HPFD). The financial management (FM) capacity assessment identified the major FM risk to be the involvement of multiple agencies in project implementation and possible lack of coordination between them. To mitigate this risk, the following actions will be taken: (i) the PMO will have adequate qualified staff; (ii) disbursement arrangements will be streamlined to improve efficiency; (iii) the project Financial Management Manual (FMM) prepared by the PMO will standardize FM and disbursement procedures; and (iv) the Bank will closely monitor project FM arrangements and their satisfactory implementation. With the implementation of the proposed actions, the project's FM arrangements satisfy the Bank's requirements under OP/BP10.00.

D. Procurement

54. Procurement will be conducted by the PMO under the supervision of HPTD and HPFD, with assistance from a procurement agent company. An assessment of the PMO's capacity to manage procurement under the supervision of HPTD and HPFD identified the following key risks: (i) inappropriate qualification criteria may result in lack of competition in procurement; (ii) potential substantial quantity and/or price variations during project implementation, including cost overruns and significant design changes between detailed design (which is the basis for contracts) and preliminary design (which is the basis for bid documents); and (iii) other unforeseen large quantity and/or price variations. Agreed mitigation measures include: (i) market analysis to inform appropriate qualification criteria; and (ii) provision of Bank support in contract management through (a) training, (b) sharing of good practices on supervising major works contracts, and (c) advising when necessary on the interpretation of contract clauses and on contract variations. The procurement plan for the Project has been prepared by the PMO. It will be updated annually or as required to reflect project implementation needs. A summary of the procurement capacity assessment and project procurement arrangements is provided in Annex 3.

55. **Applicable Guidelines.** Procurement will be carried out in accordance with: "Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits & 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 & Grants by World Bank Borrowers" dated January 2011 and revised in July 2014; and the provisions stipulated in the Loan Agreement and Project Agreement.

E. Social (including Safeguards)

56. The Project will generate social benefits, including cheaper connectivity, flood protection, and low-cost irrigation. The Project will also generate some negative impacts, for which various World Bank social safeguards policies have been triggered to mitigate the impacts. The proposed Project triggers OP 4.12, Involuntary Resettlement, because of its potential adverse impacts on local communities, such as land loss, house and structure damage, and social disturbance. The standalone social assessment (SA) has established the social baselines, identified and consulted stakeholders (including poor households and women), examined and addressed social risks triggered by the Project. The findings and recommendations of the SA are reflected in the project design. The PMO has prepared the Resettlement Action Plan (RAP), the Resettlement Policy Framework (RPF), and the SA in compliance with OP 4.12 and OP 4.01. A grievance redress mechanism is included in the RAP and the RPF. The draft reports were locally disclosed on June 1, 2016 and were disclosed in the Bank's external website on August 21, 2016 (SA), October 20, 2016 (RPF), and the RPF was updated and redisclosed on August 22, 2017.

57. Resettlement at the dam site has commenced. The RAP has been updated to reflect the implementation status. A resettlement monitoring report has been prepared, which concludes that resettlement implementation is as per the RAP and is compliant with OP 4.12.

58. **Gender.** Gender considerations have been integrated in project design, in particular through the Social Assessment, which noted that most of the 713 women interviewed had concerns on land loss and house demolition. The women preferred cash compensation and job creation as restoration measures. Most women supported the proposed resettlement activities and preferred to build their own houses. Women's opinions and participation will be further encouraged during project implementation to increase their awareness of the Project. Gender is embedded in the project Results Framework and gender disaggregated information will be included in semi-annual progress reports. The Bank and the PMO will follow on feedback from women on resettlement measures and training, and take actions as needed to enhance gender equality.

59. **Measures to Minimize Resettlement Impacts.** The Project has taken a number of steps to reduce inundation, including: (i) optimizing reservoir design water level to reduce inundation by 87 ha; (ii) implementing protection measures to avoid the relocation of 144 households (545 persons) in Yaowan Village; (iii) improving engineering designs to include relief wells, water pipes and pipe-shaped culverts to provide additional protection for an affected area of 27.42 square kilometers; and (iv) raising 926 ha of cultivated land in situ to reduce inundation by 94 percent.

60. **Linked Activities.** Three linked activities have been identified: (i) reservoir bank reinforcement project managed by Hubei Provincial Water Resources Department (HPWRD); (ii) new power transmission line project for the new powerhouse; and (iii) Wanyangzhou Wetland Park project within the reservoir. The PMO is coordinating with relevant entities to ensure that resettlement plans of the linked projects are prepared in compliance with the RPF.

61. **Monitoring.** Mechanisms for internal and external monitoring have been included in the RAP and the RPF. Internal monitoring, to be conducted by the PMO resettlement office and county resettlement offices, will focus primarily on physical progress. The external monitoring agency will monitor and report on progress of resettlement implementation every six months.

62. **Citizen Engagement.** The RAP and the RPF were prepared based on extensive consultation with stakeholders, including different levels of governments, village leaders, and the affected individuals. Affected households, enterprises, and others were identified through the census and inventory. Project information was provided to the affected persons via newspapers, TV, posters and public meetings. Meetings were held with involved local authorities and PMO staff on resettlement policies and mitigation of negative impacts. Focus group discussions and extensive key informant interviews were conducted with local government officials and the affected villages to finalize compensation rates, relocation arrangements, and livelihood restoration measures.

63. **Labor Influx.** During the five-year construction period, most of the labor required by contractors is expected to be provided by the local labor market. It is estimated that on average there will be an influx of 100 construction workers on site; during the peak construction period the number will increase to around 200. Considering that the population of Yicheng was over 500,000 in 2016, the impact of the labor influx is low. To mitigate risks associated with the influx of construction labor, the PMO will prepare a construction management plan, which will include codes of conduct for inclusion in all construction contracts. A grievance redress system will be in place to promptly handle complaints from affected individuals and communities, including associated impacts from labor influx. Independent monitoring will be carried out by the external monitoring consultant. In addition, China's regulation on citizens outside of registered permanent residence (which includes construction labor) requires them to register with local authorities and comply with local regulations, including social and environmental regulations.

F. Environment (including Safeguards)

64. The Project is assigned Category A due to the nature and magnitude of the environmental and social impacts associated with the Project during construction and operation. Four Bank environmental safeguard policies are triggered: (i) OP4.01 Environmental Assessment (EA); (ii) OP4.04 Natural Habitats; (iii) OP4.11 Physical Cultural Resources; and (iv) OP4.37 Safety of Dams. The following EA instruments were prepared: (i) an Environmental Effects Assessment (EIA); (ii) a supplemental Environmental and Social Impact Assessment (ESIA), including a stand-alone Cumulative Impact Assessment (CIA) report; (iii) an Environmental and Social Management Plan (ESMP) for the Yakou Complex; (iv) an ESMP for flood protection works; and (v) an Environmental and Social Assessment Executive Summary. The original EIA was approved by the Ministry of Environmental Protection (MEP) in February 2016, before the Bank team started Project preparation. Hence the PMO engaged an accredited EIA consultant to prepare the supplemental EA instruments to meet Bank safeguard policy requirements. The EA instruments are acceptable to the Bank.

65. The Project will bring about environmental and social benefits by reducing GHG emissions and environmental footprints. In addition, the Project will enhance irrigation, flood control, and recreational opportunities that will benefit local communities. The Project's anticipated environmental and social impacts include: (i) construction impacts related to water and air pollution, noise, loss of aquatic, terrestrial and riparian habitats, soil erosion and solid wastes, social disturbance, labor influx, health and safety concerns; and (ii) operational impacts on river hydrology, water quality, fishery resources, groundwater, infrastructure facilities, and aquatic, terrestrial and riparian habitats primarily due to impoundment of the River and navigation-related

safety risks. These impacts have been assessed in the Project EIA/ESIAs and mitigation plans are included in the project technical designs and ESMP to avoid, mitigate or compensate these impacts.

66. In addition to the Project level impact assessment, the CIA assessed the cumulative effects of cascade development and other development activities envisaged along the middle and low reaches of the Han River. The CIA: identified key valued environmental components (VECs); conducted trend analysis of historical and current development actions and impacts; assessed potential cumulative effects due to various development activities and programs on the key VECs; and proposed actions to address institutional issues, for example, enhancing basin-wide inter-agency coordination and developing adaptive monitoring and management plans to address cumulative effects. Due to the inherent uncertainty regarding future developments and the efforts needed for the assessment and development of management plans, the Project will support a detailed cumulative and strategic environmental effects assessment during implementation.

67. **Natural Habitats (OP/BP 4.04).** As a low-head and run-off type of dam, the Yakou hydro-navigation complex has only daily regulation capacity that will not have unacceptable impacts on river hydrology and natural habitats. Neither endangered/ rare/protected species nor critical natural habitats are located within the project footprint. They will also not be affected by the Project during its construction and/or operation. Dam construction will cause permanent loss of 1152 mu (77 ha) aquatic, riparian and terrestrial habitats. Impoundment of the River will form a long narrow reservoir, leading to a permanent inundation area of 99,495 mu (6,633 ha, including 4,794 ha of water and 1,839 ha of land). Of particular concern is that the dam and river impoundment will further fragment the River, block fishes from migration, and disturb the spawning and hatching of fish species with floating eggs. The impacts on natural habitats and fishery resources were thoroughly assessed and will be mitigated through the establishment of natural-like fish passage and associated fish breeding facilities, as well as through the implementation of a fishery compensation program. A coordinated dam operation (i.e., ecological scheduling) program will be implemented annually to provide favorable hydrological conditions during the fish breeding season. In addition, aquatic and riparian habitats restoration programs have been developed, budgeted, and included in the Project ESMP.

68. Upstream of the Yakou Complex, a Wanyangzhou wetland park next to Yicheng City has been planned for recreational and educational purposes. The compliance review concluded that it is not a legally protected area and does not present distinctive biodiversity significance compared to other sections of the River. Hence the wetland park is not considered a critical natural habitat per OP4.04. A detailed wetland planning was prepared during Yakou project preparation and approved by responsible agencies and local government. The wetland park planning is compatible with the Yakou reservoir and includes significant riparian wetland restoration, environmental education as well as recreational and service functions.

69. **Physical Cultural Resources (OP/BP 4.11).** Twelve small and scattered ancient tombs were identified in the Project-affected area during Project preparation; one of the tombs has been identified as a county level Cultural Relic according to domestic law. The tombs are outside the Project construction footprint, but are subject to inundation or erosion due to future reservoir impoundment. Impact assessment and a physical cultural resources (PCR) management plan are included in the ESIA and ESMP. In addition, chance-find procedures are included in the ESMP.

70. **Public Consultation and Disclosure.** As required under OP4.01, several rounds of public consultation and information disclosure were conducted during EA preparation through questionnaire surveys, interviews, and public meetings. The public, pertinent government agencies, and an NGO were consulted during EA preparation. Public opinion has been incorporated in the project design and in the EA reports. The EA documents were disclosed at the Bank's external website on October 20, 2016 (EA), and October 21, 2016 (ESMP) which were updated and redisclosed on August 21 and 22, 2017.

71. **Safety of Dams (OP4.37).** The Bank safeguard policy on Safety of Dams (OP4.37) is triggered because the Project will finance the Yakou Dam. In addition, the existing upstream Cuijiaying Dam also triggers OP4.37. Four dam safety plans have been prepared for the Yakou Dam, including: (i) plan for construction supervision and quality assurance; (ii) instrumentation plan; (iii) operation and maintenance plan; and (iv) emergency preparedness plan. The latter three plans will be refined and finalized during project implementation based on the requirement of the OP4.37. An independent Panel of Experts, comprising twenty experts, has been established to assist the PMO to ensure compliance with OP4.37. The POE will review and comment on the investigation, design, and construction of the Project, the detailed dam safety plans, and the start of operations.

72. The PMO provided a Failure Analysis Report of the upstream Cuijiaying Dam. Based on the analysis report, the POE conducted an inspection and reviewed the safety of the Cuijiaying Dam. The POE review concluded that the Cuijiaying Dam is operationally safe. The POE will continue to monitor the safety of the Cuijiaying Dam, and the PMO and the Provincial government will take appropriate action to ensure its safety.

G. World Bank Grievance Redress

73. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1: Results Framework and Monitoring

Country: China

Project Name: China: Hubei Inland Waterway Improvement Project (P158717)

Results Framework

Project Development Objectives

PDO Statement

The Project Development Objective is to improve inland waterway transport capacity and reliability along the Han River in support of low carbon development.

These results are at | Project Level

Project Development Objective Indicators

Indicator Name	Baseline (2015)	Cumulative Target Values				
		YR1 (2018)	YR2 (2019)	YR3 (2020)	YR4 (2021)	YR5/Target (2022)
1.Traffic passing through the Yakou Complex (Million Tons/year)	3.51	3.70	3.80	3.90	5.57	6.90
2. Navigability of 1000 DWT vessels (days/year)	0	-	-	-	340	340
3. CO2 emission reduction (Tons/year)	0	0	0	1,614	13,689	13,689

Intermediate Results Indicators

Indicator Name	Baseline (2015)	Cumulative Target Values				
		YR1 (2018)	YR2 (2019)	YR3 (2020)	YR4 (2021)	YR5/Target (2022)
Component A. Yakou Navigation-Hydropower Complex						
4. Ship lock in operation (Yes/No)	No			Y	Y	Y
5. Powerhouse in operation (Number)	0			1	6	6
6. Fish pass in function (Yes/No)	No				Y	Y
7. Provision of renewable energy (kWh/year) (Number)	0	0	0	0.29*10 ⁸	2.46*10 ⁸	2.46*10 ⁸
8. Achievement of design water level of 55.22m (Yes/No)	No				Y	Y
Component B. Institutional Strengthening						
9. Digital waterway information system study completed and piloted (Yes/No)	No				Y	Y
10. IWT safety management study completed (Yes/No)	No				Y	Y
11. Accumulative Environmental Impact Analysis Study (Stage II) completed (Yes/No)	No			Y	Y	Y
12. Ecological scheduling (Yes/ No)	No				Y	Y
13. Staff trained (Person-days) (Accumulative Number)	0	60	130	200	280	340
of which, female staff trained (Accumulative Number - Sub-Type: Supplemental)	0	20	40	60	90	110

Citizen Engagement						
14. Grievances and suggestions responded (%)	0	100	100	100	100	100

Indicator Description

Project Development Objective Indicators				
Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
1. Traffic passing through the Yakou Complex (Tons/year)	Indicator measures the outcome of inland waterway transport capacity improvement aspect of the PDO. Traffic volume will be measured by total freight passing the Cuijiaying/Yakou in a year.	Annual	By the end of each calendar year, the PMO will collect and calculate the accumulative freight volumes (ton) based on the ship lock operation records at Cuijiaying Complex (prior to the operation of Yakou Complex) and at Yakou Complex (after the operation).	PMO
2. Navigability of 1,000 DWT vessels (days/year)	Indicator measures the outcome of waterway reliability improvement aspect of the PDO. Reliability will be measured by number of days that the water level of the waterway between Yakou and Cuijiaying could meet the navigation requirement for 1,000 DWT vessels.	Annual	The PMO will collect hydrological data from the Cuijiaying and Yakou Complexes and count the number of days that the depth of the navigation channel between Yakou and Cuijiaying reaches 2.4m or above, which is the minimum navigation requirement for 1,000 DWT vessels.	PMO
3. CO2 emission reduction (Tons/year)	Indicator measures the outcome of low carbon development aspect of the PDO. CO2 emission reduction is achieved by: (i) hydro power replacing coal power; (ii) increase in inland waterway transport shifting from higher-emission land transport; and (iii) larger vessels with higher fuel efficiency compared to small vessels.	Annual	The PMO will survey the records of hydropower sold by the Yakou Complex and calculate the CO2 emission without the Project by following method: (i) accumulative amount of electricity sold (KWh) x 0.00031(T/KWh) x 5.02 (GJ/T)/29.31(GJ/T) x 2.7725 (tCO2/TCE) x 40 percent *. The target values do not include CO2 emission reduction from (ii) modal	PMO

			shift and (iii) replacement of small vessels as these will only happen over time.	
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Intermediate Results Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Component A. Yakou Navigation-Hydropower Complex				
4. Ship lock in operation (Yes/No)	Indicator will measure the implementation progress of the ship lock. A ship lock of Grade III standard is built and is in operation.	Annual	The operation log of the Yakou Complex ship lock. The 'Y' rating will be assigned only when the ship lock meets the design standard and is opened to traffic.	PMO
5. Powerhouse in operation	Indicator will measure the implementation progress of the powerhouse and operation of generators.	Annual	The operation log of the Yakou Complex powerhouse.	PMO
6. Fish pass in function (Yes/No)	Indicator measures completion of fish pass. The fish pass is completed and is functional for fish migration.	Annual	Fish pass monitoring records at Yakou Complex. The 'Y' rating will be assigned only when the fish pass meets the design standard and allows fish to migrate upstream and downstream of the Yakou Complex.	PMO
7. Provision of renewable energy (kWh X 10 ⁸)	Indicator will measure renewable energy output. It is the net amount available for market sale, excluding consumption by the complex.	Annual	Sale records of Yakou Complex powerhouse, measuring the accumulative amount of electricity sold to power grid in a year.	PMO

8. Achievement of design water level, 55.22m (Yes/No)	Indicator will measure completion of the Yakou Complex and impoundment in reservoir area. The water level achieves the design level.	Annual	Water level record at Yakou Complex. The 'Y' rating will be assigned only when the water reaches the design level of 55.22 meters.	PMO
Component B. Institutional Strengthening				
9. Digital waterway information system study and pilot (Yes/No)	Indicator will measure completion of the technical assistance on WIS as well as pilot application. A study report is completed and recommendations are piloted on the Han River.	Annual	The 'Y' rating will be assigned only when the study report is issued and a pilot program is implemented.	PMO
10. IWT safety management study (Yes/No)	Indicator will measure completion of the technical assistance on IWT safety management. A study report is completed and recommendations are considered by IWT administration authorities in sectoral program.	Annual	The 'Y' rating will be assigned only when the study report is issued and findings are considered by relevant authorities or a workshop is held to disseminate study findings.	PMO
11. Accumulative Environmental Impact Analysis Study (Yes/No)	Indicator will measure completion of the technical assistance on cumulative environmental Effects analysis (Stage II).	Annual	The 'Y' rating will be assigned only when the study report is issued and recommendations are considered by relevant authorities or a workshop is held to disseminate study findings.	PMO
12. Ecological scheduling (Yes/ No)	Indicator will measure the implementation of an inter-agency coordinated operation to restore natural river flow pattern including flow rate and velocity and distance that are favorable for the successful spawning and hatching of fish species of floating eggs.	Annual	The 'Y' rating will be assigned when a coordinated dam or ecological scheduling operation is implemented.	PMO
13. Staff trained (Person-days)	Indicator will measure implementation of the training program under the project.	Annual	Training records relating to the cumulative number of person-days	PMO

			of training received by staff during project implementation.	
13. Of which, female staff trained	Indicator will measure the gender dimension of capacity building.	Annual	Training record on the cumulative number of person-days of training received by female staff during project implementation.	PMO
Citizen Engagement				
14. Grievances and suggestions responded to (%)	Indicator will measure the results of grievance redress mechanisms.	Annual	Hotline records. PMO will summarize the ratio of responded and/or resolved to the total number of complaints and suggestions received from citizens each year.	PMO

* Assumes that 40 percent of electricity sold by the Yakou Complex would be provided by coal power without the Project. The calculation of CO2 reduction is based on the following assumptions: (i) Calorific value of coal for power generation should be no less than 5.02 GJ/T; (ii) 1 ton of coal equivalent (TCE) corresponds to 29.31GJ (GB2589-1990); (iii) CO2 emission factor of TCE is about 2.62 tCO2; and (iv) 1 KWh electricity consumes on average less than 310 grams of coal by 2020 (Source: Action plan for upgrading and reforming coal electricity energy saving and emission reduction (2014-2020) jointly issued by NDRC, Ministry of Environment Protection, and National Energy Administration Bureau).

Annex 2: Detailed Project Description

CHINA: HUBEI INLAND WATERWAY IMPROVEMENT PROJECT

A. Project Background

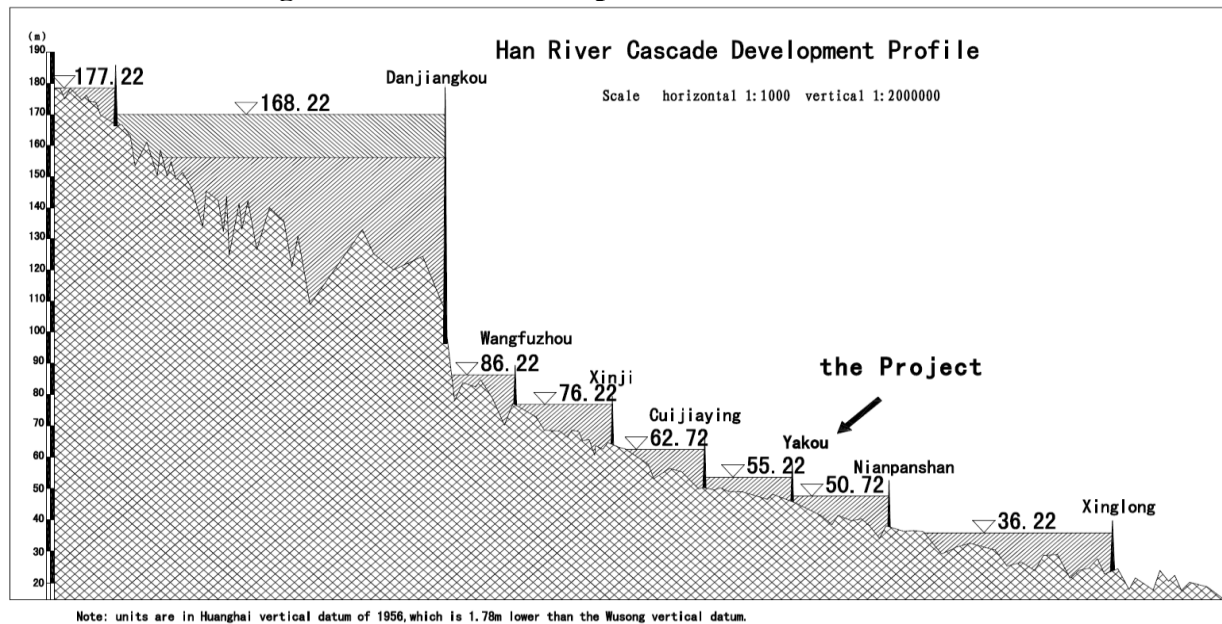
1. The Han River is the longest tributary in the middle reach of the Yangtze River. It originates in southwestern Shaanxi Province, crosses Hubei Province from the northwest to the southeast, and joins the Yangtze River at Wuhan. The Han River has 1,376 kilometers of navigable waterways, of which 867 kilometers are in Hubei Province.
2. The hinterland of the Han River is home to about 40 percent of Hubei's population and is a major producer of agricultural products, fertilizers, building materials and bulk minerals; these are most suitable for waterway transport in terms of capacity and cost efficiency. Significant industrial and agricultural developments have taken place in the past decade along the Han River corridor. Freight volume on the Han River increased about 8.8 percent annually during 2000-2013 and reached 21.3 million tons in 2013.
3. Future growth in freight volume on the Han River is currently severely constrained by the low standard of the navigation channel and low water level in the four-month dry season. Commercial vehicles, containers and other high value cargo that are ideal candidates for long distance waterway transport cannot be fully accommodated. In addition, inland waterway transport management is weak: no waterway information system is available to guide and monitor traffic along the Han River; emergency response and safety management systems are insufficient to meet the future demands of transporting bulk industrial products; and the ports' capacity for handling wastes from vessels is inadequate. The relatively low skilled IWT labor force further hinders Han River's development into a competitive freight transport mode.
4. According to relevant plans¹⁰ governing IWT development on the Han River, the waterway from Danjiangkou downstream will be upgraded to Class III standard by 2020, which will enable 1,000 DWT vessels to navigate year-round on the Han River. Above Danjiangkou, the waterway will be upgraded to Class IV and V standards. The waterway upgrade will be implemented through cascade development as the River travels from the higher elevation mountainous area to the lower elevation low hill plain area. In Hubei Province, from Danjiangkou downstream, six cascades¹¹ are planned. Of these, three (Wangfuzhou, Cuijiaying¹² and Xinglong) have been built, and the remaining three (Xinji, Yakou and Nianpanshan) are planned to be completed by 2020. The cascade development plan for the Han River is illustrated in Figure 1.

¹⁰ These plans include: *Yangtze River Basin Comprehensive Utilization Plan*, issued by the State Council in 1990; *Hubei Inland Waterway Development Plan (2002-2020)*, issued by the Hubei Provincial Government in 2005; and *Han River Comprehensive Utilization Plan (revision)*, issued by the Yangtze River Committee in 2011.

¹¹ There are a total of eight cascades in Hubei, including two upstream, Gushan and Danjiangkou, and six downstream.

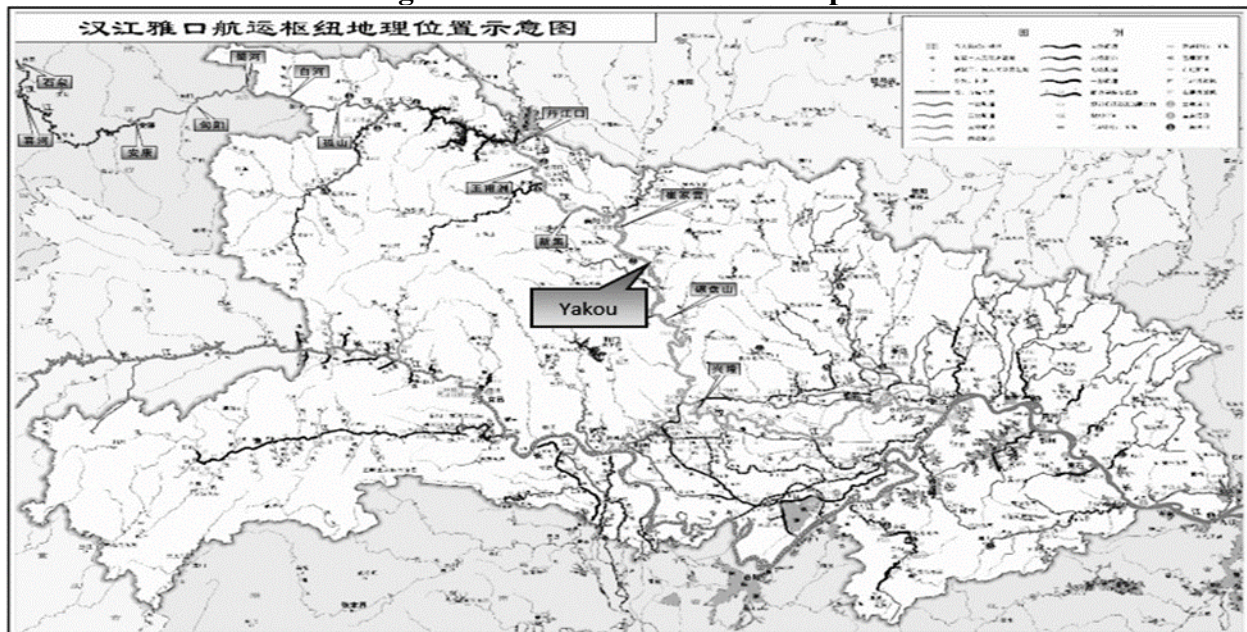
¹² Cuijiaying Navigation Complex was financed by the World Bank. It is also known as the Fifth IWT Project.

Figure 1. Cascade Development Plan of the Han River



5. The proposed Project at Yakou is in the middle reach of the Han River, about 203 kilometers downstream of Danjiangkou and 53 kilometers downstream from Cuijiaying. The completion of Yakou cascade development is one of the critical milestones for the Han River to reach the planned navigation standard by 2020; it is also a key bottleneck for the completed investments at the other cascades to realize their full navigation capacity and economic benefits. In addition, the proposed Project will also contribute to: achieving the objectives of YREB Strategy; enhancing Yangtze River's golden waterway function; and coordinated development to facilitate interaction and cooperation between eastern, central and western regions.

Figure 2. Location of Yakou Complex



6. The proposed Project at Yakou will include an integrated powerhouse – ship lock complex. It is expected to have significant environmental and climate change adaptation and mitigation benefits. It will not only promote IWT as a green freight mode compared to road transport and railways, but will also generate clean and renewable energy for Yicheng City, which is located 16 kilometers from Yakou. In addition, the proposed Project will provide gravity flow irrigation for over 5,300 ha of existing farmland and reduce lifting costs significantly, improve flood resilience, and create a better landscape for recreation.

B. Project Description

7. The Project consists of two components to achieve the overall objective: Component 1 supports the development of Yakou Navigation-Hydropower Complex, while Component 2 focuses on institutional capacity enhancement to support the safe, efficient, and sustainable operation and management of the Han River waterways.

8. **Component 1: Yakou Navigation-Hydropower Complex - US\$484.96 million (US\$148.455 million IBRD Loan).** The Yakou Complex is a 3,180-meter single integrated structure that consists of a Class III ship lock, a hydropower house that will serve as a baseload power generator to the local grid, 44 sluice gates, connecting earth-rock-fill dams, a fish pass and fish reproduction facilities, a connection bridge, and two anchorage areas. When completed, the new complex will create a Class III navigation channel between Yakou and Cuijiaying, supply approximately 246 GWh of electricity per annum to the local grid, provide gravity flow irrigation for over 5,300 ha of existing farmland and reduce lifting costs significantly, improve flood resilience, and create large recreational areas. Construction of the civil works is expected to take approximately 49 months.

9. The Yakou Complex will consist of the following main structures:

- (a) **Ship lock.** A Class III single ship lock, capable of accommodating vessels of up to 1,000 DWT, will be constructed. The chamber dimension of the ship lock will be about 180m x 23m x 3.5m.
- (b) **Sluice gates.** The dam sluice gates will be located beside the power station to regulate water flows. The discharge orifice of sluice gate will be about 14m x 11.22m, and there will be 44 sluice gates.
- (c) **Hydropower House.** A powerhouse with six bulb hydro turbines will be constructed with an installed capacity of 75 MW.
- (d) **Connection dam.** Three sections of earth-rock-fill dams, with a total length of about 2,150 meters, will connect the ship lock, the hydropower station, and the river banks.
- (e) **Fish pass and fish reproduction facilities.** About 961 meters of vertical-slot fish pass with two resting pools will be constructed. About 560 meters of the fish pass will imitate natural ecological conditions and facilitate fish migration.
- (f) **Dam crest access bridges.** Approximately 1,500 meters of bridge sections will be constructed crossing the ship lock, sluice gates and power station.

10. **Component B: Institutional Strengthening - US\$3.05 million (US\$1.17 million IBRD Loan).** This component will support technical assistance and training activities to enhance the institutional capacity of the IWT management authorities, particularly by taking a holistic

approach in support of operating the infrastructure and developing policies in the areas of IWT management, environment impact mitigation, and ecosystem protection. The Project will support five technical assistance activities: (i) waterway information system (WIS) study and pilot; (ii) IWT safety management, including risk analysis and emergency response system improvement; (iii) detailed cumulative impact assessment; (iv) evaluation of fish facilities; and (v) ecological scheduling along the Han River.

11. **WIS.** Navigation on the Han River currently relies on navigation buoys, which do not enable the waterway operator and users to obtain timely geographical, hydrological and administrative information of the waterway, exchange information, optimize traffic and transport processes, and support decision making and trip planning. To meet growing IWT demands, HPDT and HPSB aim to introduce a WIS system to improve IWT management along the Han River and pilot it on the waterway between the Yakou and Cuijiaying Complexes, scale it up to the entire Han River in the future, and integrate it with the WIS along the Yangtze River.

12. **IWT safety management.** Upon completion of all planned complexes along the Han River, 1000 DWT vessels will be able to navigate year-round from Danjiangkou complex downward and 500 DWT vessels will be able to navigate year-round from Danjiangkou complex upward to the border of Shaanxi Province. The Han River will become the second "golden waterway" in Hubei Province. IWT traffic on the Han River is expected to increase with the upgrade of navigation waterways and economic growth. More industrial and chemical products will be commercially viable for IWT along the Han River corridor, and water related recreation activities are expected to increase as well. The existing safety management system is unable to meet the growing demand for IWT safety management and emergency response. The Project will support a study to review existing IWT safety management and emergency response system along the Han River, identify potential risks and IWT black spots along the River, analyze key issues and actions to enhance risk management and emergency response capacities, develop an evaluation system and indicators for safety management and emergency response, and provide recommendations for improvement.

13. **Cumulative environmental effects analysis.** The PMO has completed a preliminary cumulative impact assessment associated with the cascade development of the middle and lower reaches of Han River. Given the uncertainty of future developments and the extensive efforts needed for the assessment and development of management plans, the Project will fund a more detailed cumulative effects study, which is expected to lead to a more concrete mitigation plan and an inter-agency coordination mechanism for addressing cumulative effects and achieving ecosystem sustainability for the Han River Basin.

14. **Evaluation of fishery facilities and program.** The Bank-financed Fifth Inland Waterway Project built a fish pass and fish breeding facilities in the Cuijiaying Complex, which was the first fish pass built on the Han River. Fish passes have since been included in all cascade development designs on the Han River. The proposed Yakou fish pass design is based on the Guideline for Fish Pass in Water Conservancy and Hydropower Project (SL 609-2013) issued by the Government in 2013. The Project will support technical assistance to evaluate the effectiveness and enhance performance of the fish passes, fish breeding facilities and fish release programs.

15. **Ecological scheduling.** An Ecological Scheduling Plan for the Coordinated Operation of the Cascade downstream of Danjiangkou was approved by Hubei Provincial Government in November 2015. The ecological scheduling addresses potential impacts of the cascade development on fish species with floating eggs (such as the Four Domesticated Fish) whose breeding life stage may be affected by dam fragmentation and unfavorable flow regimes. The ecological scheduling will be carried out on a yearly basis. Through coordinated dam/reservoir operation, the natural flooding process will be recovered to stimulate spawning and provide adequate floating distance during the spawning seasons of the target fish species. The provincial government has committed to coordinate pertinent government agencies and dam/reservoir management entities to ensure implementation of the ecological scheduling plan. Implementation of the plan has been budgeted and started in 2017.

16. **Project costs and financing.** The total cost of the Project is estimated at US\$515.133 million. The Bank will provide a loan of US\$150 million, while counterpart funds will provide the remaining US\$365.133 million. The details of costs and financing plan are provided in the Table 1-1 below.

Table 1-1: Detailed Project Costs and Financing Plan
(US\$ million)

Project Cost by Component	Total	Counterpart Funds	IBRD Financing	Percentage of Financing by IBRD
Component A: Yakou Navigation-Hydropower Complex	484.96	336.505	148.455	31
Civil Works and installation	239.06	130.315	108.745	
Equipment	101.72	62.01	39.71	
Construction Management and others	39.50	39.50	-	
Land Acquisition and Resettlement	104.68	104.68	-	
Component B: Institutional Strengthening	3.05	1.88	1.17	38
Technical Assistance	2.28	1.88	0.40	
Trainings	0.77	-	0.77	
Total Baseline Cost	488.01	338.385	149.625	31
Contingencies	18.65	18.65	-	
Total Project Cost	506.66	357.035	149.625	30
Interests, Commitment Fee, and during Construction	8.098	8.098	-	
Front-end Fee	0.375	-	0.375	
Total Financing Required	515.133	365.133	150.00	29

17. **GEF project.** A proposed “GEF China Efficient and Green Freight Transport Project”, aims to improve the efficiency of China's freight transport sector and reduce carbon emissions. The Ministry of Transport will be the implementing agency of the GEF efficient and green freight

project, and HPDT will be one of the sub-national implementing agencies. Under the framework of improving multimodal freight transport connectivity and efficiency, the proposed GEF efficient and green freight project will finance technical assistance for Han River IWT efficiency improvement. The technical assistance will focus on commodity flow data collection in the Han River corridor, analysis of freight movement on the transport network (highway, IWT, railway, and air), logistics service value chain stakeholder analysis, identification of bottlenecks in the transport network and the logistics service value chain (skilled labor force, vessel standardization, policy incentives), and plans to improve Han River IWT intermodal connectivity and efficiency.

18. **Readiness for implementation.** The PMO has set up an office on site, assigned staff familiar with Bank-financed projects, and has engaged experienced consultants to carry out detailed designs and prepare bid documents. The feasibility study report of the Project and the preliminary design of Component A have been approved by government. Detailed designs and bid documents for the first batch contracts have been prepared for advance procurement. The PMO has also developed TORs for the technical assistance packages under Component B and has allocated funds in the financing plan. HPTD had made counterpart funds of RMB512 million available for the Project in 2017. About RMB130 million of the counterpart funds has been used for land acquisition and resettlement.

C. Linked Activities

19. **Reservoir Bank Reinforcement Project.** Reinforcement work is currently underway on reservoir banks along the Han River to: (i) increase the height and width of some sections; (ii) conduct anti-seepage treatments; and (iii) install slope concrete panels on some sections to ensure slope stability. The dikes at a few sections in urban areas were strengthened on the same locations, via grouting or raising the dike within red line, which did not require land acquisition or resettlement.

20. HPWRD has divided the project into seven sub-projects and delegated each sub-project to local water resources agencies based on their jurisdiction. The local agencies are responsible for preliminary design, resettlement and land acquisition, and implementation. HPWRD will be responsible for overall project implementation coordination. Of the seven sub-projects, the Xiangyang sub-project covers the Yakou project area. Xiangyang Water Resources Department is the implementation agency.

21. Resettlement and land acquisition for the reservoir bank reinforcement will be based on MOWR guidelines. HPWRD anticipates minimal resettlement since the reinforcement works are mostly within the existing red line. The PMO will coordinate with the local government agency to ensure consistency between the MOWR guidelines and the provisions of the RPF.

22. HPTD is coordinating the implementation schedules, including incorporation of the Project into the on-going Xiangyang sub-project preliminary design, with HPWRD. It will ensure that the reservoir bank work is completed before reservoir water fill and first power generation.

23. **New power transmission line connecting with the powerhouse.** Hubei Provincial Power Company will build a 12 kilometers 110 kV power transmission cable to connect the Yakou

Complex powerhouse with the existing transformer sub-station at Zhengji in 2018 prior to the operation of the powerhouse and to transmit electricity generated by the powerhouse to local grid.

24. **Wanyangzhou Wetland Park.** Yicheng City has planned to build a wetland park at Wanyangzhou. The wetland park, located upstream of the Yakou Complex and next to the built-up area of Yicheng City, was approved by the National Forest Bureau in December 2013. The detailed development plan of the Park was approved by Yicheng City in October 2016. The objective of the park is to develop an urban Wetland Park with multiple functions of landscaping, education, recreation, and environment protection. The core area of the Park consists of a demonstration and education area of 190 ha, a development area of 76 ha, and an administration and service area of 0.3 ha. Mitigation measures have been included in the detailed plan of the Park, because the Yakou Complex will raise the water level of about three meters on average. The Wetland Protection Center of Hubei Provincial Forest Department has confirmed that the proposed Project would not have a significant impact on the planned Park. The PMO will coordinate with Yicheng City during project implementation to maximize the Project's benefits to the Park and to mitigate impacts on the Park.

Annex 3: Implementation Arrangements

CHINA: HUBEI INLAND WATERWAY IMPROVEMENT PROJECT

Project Institutional and Implementation Arrangements

1. HPTD, on behalf of Hubei Province to implement the proposed Project, has entrusted HPSB to manage the Project. HPSB will be responsible for routine coordination with other related government agencies, including HPWRD, Xiangyang Municipality, and Yicheng City, and management agencies of other complexes along the Han River, as well as supervising project implementation. The World Bank Project Office under HPTD will act as the liaison office with the Bank.
2. HPTD has established a dedicated PMO, the Yakou Complex Management Office, to prepare and implement the Project. The PMO is responsible for design preparation, safeguard document preparation and supervision, procurement and contract management, financial management, and monitoring and evaluation of the project. Hubei provincial government has also authorized HPTD to establish a permanent unit to operate the Yakou Complex.
3. The key PMO staff come from the Cuijiaying Complex Management Office. The staff is familiar with Bank policies and procedures. In addition, the PMO has engaged experienced design institutes, a procurement agency, supervision consultants, dam safety experts, and safeguard experts to provide technical support for the preparation and implementation of the Project.

Financial Management, Disbursements, and Procurement

Financial Management

4. Bank loan proceeds, including oversight of the designated account (DA), will be managed by HPFD. HPTD has managed several highway and inland projects financed by the Bank, where overall FM performance has been assessed as Satisfactory. The PMO has a financial management staff assigned from HPSB for project preparation. The staff participated in the 5th IWW project and has basic knowledge of managing Bank financed operations and recently attended training to update her knowledge.
5. The FM capacity assessment rated the overall FM risk as Moderate and identified the major FM risk to be multiple agencies being involved in project implementation and possible lack of coordination. To mitigate this risk, the following actions will be taken: (i) the PMO will have adequate qualified staff; (ii) disbursement arrangements will be streamlined to improve efficiency; (iii) a project Financial Management Manual (FMM) prepared by the PMO will standardize project FM and disbursement procedures; and (iv) the Bank will closely monitor project FM arrangements and their satisfactory implementation. With the implementation of the proposed actions, the project's FM arrangements satisfy the Bank's requirements under OP/BP 10.00.
6. Funding sources for the project include the Bank loan and counterpart funds. The Bank Loan Agreement will be signed by the Bank and the Ministry of Finance (MOF), and the

Subsidiary Loan Agreement will be entered into by MOF and Hubei Provincial Government, who will delegate HPFD to sign a subsidiary arrangement with HPTD. Counterpart funds will comprise MOT's subsidies and HPSB's own funds.

7. **Budgeting.** The PMO will prepare the annual construction and financing plan (showing the various sources of funds) based on the implementation plan. The plan will be reflected in the annual construction plan and budget allocation, and approved by HPSB and HPTD. Overall budget preparation and execution will be a part of the government system. Budget execution will be closely monitored throughout the year and necessary adjustments will be made to address any budget variances.

8. **Funds flow.** The DA for the Bank loan will be opened and managed by HPFD. Disbursement applications will be submitted from the PMO to HPFD through HPSB and HPTD. Bank loan proceeds will be paid from the DA to the contractors directly, while the related payment statements will be provided to the PMO for accounting and debt management. Arrangements for disbursement applications/requests and funds-flow are described in the FMM.

9. **Accounting and financial reporting.** The Project's administration, accounting and reporting will be established in accordance with Circular #13: "Accounting Regulations for World Bank-financed Projects" issued by MOF in January 2000. The PMO will manage, monitor and maintain project accounting records for project activities for which it is responsible. A commonly used computerized accounting system will be adopted to maintain the accounting system and to prepare project financial statements, as well as unaudited semi-annual project financial reports. The latter will be provided to the Bank as part of semi-annual progress reports, no later than 60 days following each semester.

10. **Internal controls.** MOF has issued the related accounting policy, procedures and regulations that govern project internal control. The FMM will align FM and disbursement requirements among implementing agencies.

11. **Audit.** Hubei Provincial Audit Office has been identified as the auditor for the Project. The annual audit report on project financial statements will be issued by this office and will be due to the Bank within six months after the end of each calendar year (that is, by June 30 of each year). The audit report and audited financial statements will be publicly available on the websites of the Bank and the Hubei Provincial Audit Office.

Disbursements

12. Four disbursement methods are available for the project: (i) advance; (ii) reimbursement; (iii) direct payment; and (iv) special commitment. The primary Bank disbursement method will be advances to a US dollar DA opened at a commercial bank acceptable to the Bank. Supporting documents required for Bank disbursement under different disbursement methods are specified in the Disbursement Letter issued by the Bank. The Bank loan will disburse against eligible expenditures (taxes inclusive), as indicated in Table A2-1.

Table A2-1: Eligible Expenditures

Category	Amount of the Loan Allocated (expressed in US\$)	Percentage of Expenditures to be financed (inclusive of Taxes)
(1) Works	108,745,000	70 %
(2) Goods, consulting services, non-consulting services, Incremental Operating Costs, and Training and Workshops	40,880,000	100 %
(3) Front-end Fee	375,000	Amount payable pursuant to Section 2.03 of Loan Agreement in accordance with Section 2.07 (b) of the General Conditions
(4) Interest Rate Cap or Interest Rate Collar premium	0	Amount due pursuant to Section 4.05 (c) of the General Conditions
TOTAL AMOUNT	150,000,000	

13. **Retroactive Financing.** Retroactive financing will be applied for this Project. Retroactive financing of up to US\$30 million of the Bank loan will be available for payments made by the PMO prior to the signing of the Loan Agreement but on or after July 1, 2017, for all eligible expenditures, according to the requirements specified in the Loan Agreement.

Procurement

14. **Capacity Assessment.** Procurement will be conducted by Hubei Port & Shipping Bureau (HPSB) under the supervision of Hubei Provincial Transport Department (HPTD), with assistance from a procurement agent company. An assessment of the capacity of HPSB to implement procurement under the supervision of HPTD identified the following key risks: (i) inappropriate qualification criteria may result in lack of competition; (ii) potential substantial variations in quantity and/or price due to changes between detail design (which is the basis for contracts) and preliminary design (which is the basis for bid documents); and (iii) costs overruns. Agreed mitigation measures include: (i) market analysis to inform appropriate qualification criteria for the bid documents; and (ii) provision of Bank support in contract management through (a) training, (b) sharing good practices of supervising the major work contracts, and (c) advising when necessary on the interpretation of contract clauses and on contract variations. The overall procurement risk is rated as “Moderate”.

15. **Applicable Guidelines.** Procurement will be carried out in accordance with: “Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits & 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 & Grants by World Bank Borrowers” dated January 2011 and revised in July 2014; and the provisions stipulated in the Loan Agreement and Project Agreement.

16. **Procurement of Works and Supply & Installation of Plant and Equipment.** Procurement of works and supply & installation of equipment will be conducted using the Bank's Standard Bidding Documents for all international competitive bidding (ICB) and model bidding documents for all national competitive bidding (NCB).

17. **Procurement of Goods.** Procurement of goods will be conducted using the Bank's Standard Bidding Documents for all ICB and model bidding documents for all NCB.

18. **Selection of Consultants.** The Bank's Standard Request for Proposals will be used for consultancy services costing more than US\$300,000 or equivalent. Simplified Requests for Proposals will be used for services costing less than US\$300,000.

19. **Procurement Plan.** A Procurement Plan has been prepared by the HPSB for the entire project and is available on the Bank's external website. The Procurement Plan sets forth the thresholds for procurement methods and prior review. The Procurement Plan will be updated annually or as required to reflect new project implementation needs and improvements in institutional capacity.

20. **Thresholds for Procurement Methods and Prior Review.** The maximum indicative thresholds which can be applied are shown in Table A2-2 below.

Table A2-2: Maximum Thresholds for Procurement Methods and Prior Review

Expenditure Category	Contract Value Threshold (US\$)	Procurement/Selection Method	Prior Review Threshold (US\$) ^{1/}
1. Works and Supply & Installation of Plant and Equipment	--	ICB	>=15,000,000
	<40,000,000	NCB	>=15,000,000
	<500,000	Shopping	
2. Goods and Non-Consulting Services	--	ICB	>=4,000,000
	<10,000,000	NCB	>=4,000,000
	<500,000	Shopping	

3. Consultants Services ^{2/}	--	QCBS/QBS/LCS/FBS	>=2,000,000
	<300,000	CQS	
	--	Individual Consultant	>=400,000
		Single-Source Selection	All SSS firms > 1,000,000

1/ A contract whose cost estimate is below the Bank prior review threshold is subject to prior review if the price of the lowest evaluated responsive bid (or, in the case of consulting services, the financial offer of the selected firm) exceeds such threshold at the bid/proposal evaluation stage. TORs for all firm and individual consultants and all technical specifications shall be prior reviewed by the Bank.

2/ The threshold for shortlisting comprising only national consultants: US\$500,000.

21. **Advance Contracting and Retroactive Financing.** The Procurement Plan sets forth those contracts which will be procured in advance together with the relevant Bank review procedures. Payments will be eligible only for contracts procured in accordance with applicable Bank procurement procedures.

Environmental and Social (including safeguards)

Environment

22. The project is assigned Category A due to the nature and magnitude of potential environmental and social impacts involved. Full environmental assessment was carried out during Project preparation. Based on environmental screening, four environmental safeguards policies are triggered: (i) OP4.01 Environmental Assessment; (ii) OP4.04 Natural Habitats; (iii) OP4.11 Physical Cultural Resources; and (iv) OP4.37 Safety of Dams.

23. During the project preparation, the project proponent engaged an experienced EIA consultant to carry out environmental and social assessment following domestic regulations and the Bank's safeguard policy requirements. EA instruments prepared include: (i) an Environmental Impact Assessment (EIA); (ii) a supplemental Environmental and Social Impact Assessment (ESIA), including a CIA report; (iii) an Environmental and Social Management Plan (ESMP) for the Yakou Complex and auxiliary works; (iv) an ESMP for reservoir embankment strengthening; and (v) an Environmental and Social Assessment Executive Summary. The original EIA was prepared following domestic regulations and approved by the Ministry of Environmental Protection (MEP) in February 2016, before the Bank started Project preparation. The supplemental ESIA and ESMPs build on the original EIA and address more extensive environmental and social issues following the World Bank safeguards policy requirements. The EA instruments have been reviewed by the Bank and are considered satisfactory.

24. **OP4.01 Environmental Assessment.** Per OP4.01, the Project area of influence covers the Han River main stem, tributaries, riparian areas and upland. The Project footprint of construction covers the Yakou hydro-navigation complex and associated temporary works such as materials sites, worker camps and access roads. In addition, it covers the reinforcement of existing upstream river banks, modifications of drainage system and other facilities that should be built or rehabilitated to accommodate future river impoundment, and a power transmission line that will need to be built to connect the powerhouse to existing grid. On the operational side, impoundment of the Yakou Reservoir and operation of the Complex will have impacts on the Han River segment immediately downstream of the Cuijiaying Dam to 10 kilometers downstream of Yakou Dam and pertinent tributaries. Where needed, the study scope has been adjusted as dictated by the characteristics of each environmental and social element. The Project ESIAs fully took into account these considerations in defining the Project area of influence.

25. *Environmental Baselines and Sensitive Receptors/Areas.* Comprehensive surveys on the baseline conditions in the Project area were conducted through literature review, field investigations and consultations. This baselines study was further extended spatially and temporally in the cumulative impact assessment to inform the historical conditions and trends of VECs. The proposed Project is located in the middle reach of Han River in Hubei Province in middle China. The Han River is the longest tributary of the Yangtze River, with a total length of 1,567 kilometers and a catchment area of 159,000 square kilometers. The upper reach of Han River runs through mountainous areas in Shaanxi Province and northwestern Hubei Province. The middle and lower river segments meander southeastwards through low hills and plains, constrained within the embankments on both sides, and the River finally empties into the Yangtze River in Hankou, Wuhan Municipality. The middle and lower Han River is 649 kilometers long and has a total catchment area of 63,800 square kilometers. The Project supported Yakou Dam is situated near Yakou Village, 16 kilometers downstream of the urban center of Yicheng City. The Yakou Dam is 203 kilometers downstream of Danjiangkou Dam, 53 kilometers downstream of Cuijiaying Dam (financed by the Bank-financed Fifth Inland Waterway Project), and 64 kilometers upstream of the planned Nianpanshan Dam.

26. Overall, the middle and lower Han River main stem is of good water quality, fully attaining designated Class II national standard for surface waters (*that is, suitable for centralized drinking water source area, habitats for rare aquatic life, spawning area for fish and shrimp, and feeding area for fry fish*), while the water quality of its tributaries ranges from clean to polluted status. The Project area has been highly modified by human activities. There is a little native vegetation in the Project area; secondary and cultivated vegetation are dominant. In general, the fishery resources present a declining trend over the past four decades; the abundance and diversity of traditionally dominant fish species with floating eggs (represented by the *Four Domesticated Fish*, namely *black, grass, bighead and silver carps*) have dwindled, their spawning grounds have reduced markedly, and the sizes of individual fish in the river have decreased. Various surveys indicated that fish species with sticky eggs, such as crucian carp and common carp, have become dominant in the river since the late 1990s.

27. Sensitive environmental and social receptors were given special attention during the Yakou project EA study. In terms of fauna and flora, five amphibians, two reptiles, eighteen birds and one mammal species that are under national (Class II) or Hubei provincial level of protection were

recorded. A Chinese Pistache tree (*Pistacia chinensis Bunge*) classified as ‘Old and Famous Tree’ was found 550 m away from the inundation boundary. These species of concern will not be located within the Project construction footprint or inundation area. The Project is not expected to adversely affect any species of international/regional importance or concern.

28. Standard methodologies have been consistently used by professionals for fish surveys, which include desktop review, market survey and interviews, and catching along the middle to lower Han River and tributaries. Five fish species under Hubei provincial level of protection were recorded, of which, two had disappeared long time ago; three were found in a comprehensive fish survey conducted in 2004, but none of them was reported in subsequent surveys, including the one for the Project EA in 2014. In addition, one migratory fish species (*Anguilla japonica*, an eel) was recorded, however, it has not been found in the Han River for decades.

29. In terms of fishing spawning grounds for fish species of flowing eggs, three spawning grounds for fish species with floating eggs were identified in the 2004 survey. The Yicheng spawning ground was the only one located within the project area of influence, which was also reported by survey in 2009. However, the resource abundance and quantity of eggs in 2009 was much less than that of 2004 survey, and no fries of the Four Chinese Carps were caught in the 2009 survey. Subsequent studies have not reported its existence beyond discussing its historical presence. Therefore, the likelihood of presence of the Yicheng spawning ground is very low.

30. The Project area has been subject to a long history of human activities. There are dense road network and transmission lines. Agricultural and urban settings are dominant along the river corridor. The Project involves Yicheng City, Xiangcheng District and Xiangzhou District that are all under the jurisdiction of Xiangyang Municipality. The three districts/city have a total population of 2.12 million, a total GDP of RMB76 billion, and per capita disposable income of RMB15, 100-18,885 for urban residents and RMB9, 639-10,100 for the rural population. Overall, economic development and income levels in the project area are low compared to the rest of China.

31. *Alternative Analysis.* During the development of the project feasibility study and the environmental assessment, a comprehensive alternative analysis was carried out, taking into account technical, economic, environmental and social considerations, with particular attention to:

- *With/without project scenario.* The project will bring about environmental and social benefits associated with inland waterway transport that reduces the environmental footprint and GHG emissions that would otherwise be produced by road-based freight transport and fossil-based power generation. The Project will also benefit local communities by enhancing irrigation guarantee, flood control capacity and recreational resources. The potential negative impacts can be effectively avoided, mitigated or compensated by measures included in the project design and the ESMPs. Hence the “With Project” scenario was preferred;
- *Dam location.* Three dam locations were compared. The Yakou option was selected due to anticipated lower environmental and social impacts and better navigation potential compared to the other two options;
- *Reservoir storage level.* Three options were compared and it was determined that as a low head and run-off type complex, differences in terms of environmental impacts are not

significant. A 55.22-meter option was selected taking into account the flooding area, navigation needs, and power generation;

- *Fish passage.* Several types of fish passage were considered. Since the Yakou Dam is a low-lift dam that allows a natural flow pattern, a nature-imitating fish passage combined with engineered fish passage was selected.

32. *Environmental and social impacts assessment.* The Project will improve inland waterway transport capacity and generate hydropower, bringing about environmental and social benefits through reducing GHGs, air emissions and environmental footprints as opposed to alternatives where such capacities are to be met by coal-based power generation or surface transportation. In addition, the Project will enhance irrigation safety, flooding control capacity and recreational opportunities that will benefit local communities. The Project is expected to significantly contribute to local social and economic development in the under-developed areas of Hubei Province.

33. Given the nature and scale of the Project, anticipated environmental and social issues include:

- *Construction impacts related to water and air pollution, noise, loss of aquatic, terrestrial and riparian habitats, soil erosion and solid wastes, social disturbance, labor influx, health and safety concerns.* There will be a permanent loss of 1152 mu (77 ha) of aquatic, riparian and terrestrial habitats and a temporary loss of 840 mu (56 ha) within the footprint of the project dam. Five materials borrowing sites and two disposals sites will be used; 10 kilometers of access roads will be built; and two worker camps will be installed. At peak time, 2,100 management staff and workers will be involved in the construction. If not well planned and managed, the construction activities, materials transport and disposal will pose major concerns to the local environment, occupational/community health and safety, and navigation;
- *Operational impacts on river hydrologic regimes, water quality, fishery resources, groundwater, and infrastructure facilities, as well as on aquatic, terrestrial and riparian habitats primarily due to impoundment of the river and navigation-related safety risks.* Impoundment of the River will form a long narrow reservoir, leading to a permanent inundation area of 99,495 mu (6,633 ha, including 4,794 ha of water and 1,839 of ha land). The Dam will further fragment the river and block fishes from migration. Reduced flow velocity will cause loss of water environmental carrying capacity, and deterioration of water quality. Spawning and hatching of fish species with floating eggs will be disturbed by the Dam and the changed hydrologic regime. River impoundment will also cause elevated groundwater levels that will affect local drainage and farmland, and will affect existing pumping and irrigation facilities, water intake and ferries. Increased water transport may lead to increased safety concerns and risks. In addition, 12 ancient tombs identified in the vicinity of the impounded area will be subject to inundation or erosion impacts.

These impacts have been thoroughly assessed and mitigation measures are included in the ESMPs to avoid, mitigate or compensate for these impacts and risks. The assessments concluded that as a low-head and -of-river type of navigation-oriented complex, the Project will not have unacceptable environmental and social impacts. Construction impacts will be temporary and manageable

provided that the project ESMPs are strictly adhered to. The inundation area due to reservoir formation will be limited. Yakou Reservoir is only capable of daily regulation capacity that will neither affect the river hydrology regime nor significantly weaken the river's carrying capacity and ecosystems.

34. **OP4.04 Natural Habitats.** The Project area has been subject to human activities for a long history. Surveys and an impact assessment on aquatic, riparian and terrestrial habitats were conducted during Project preparation; mitigation hierarchies have been applied and are included in the Project ESMPs.

35. The flooded area will be a 53-kilometer long river-like reservoir within the existing river embankments. The affected habitats will include wetlands, riparian vegetation, shoals, and the river itself. The dam will further fragment the river and block fish migration. The current flow-water condition in the Project river segment will be turned into a lake. Specific concerns and measures with respect to the natural habitats policy are highlighted below.

36. *Protection of fishery resources and habitats.* Yakou Dam and the formation of reservoir will affect fish migration, inundate certain riparian habitats, modify natural flow patterns (which will be detrimental to fish species whose breeding life stage depends on rapid currents, notably the *Four Domesticated Fish: black, grass, silver, and bighead carp*). These impacts on natural habitats and fishery resources were thoroughly assessed and will be mitigated through the establishment of a fish passage and fish breeding facilities associated with Yakou Complex, and implementation of a fishery compensation program. The cost of the fish program is included in the Project operational cost. A coordinated dam operation (that is, ecological scheduling) program will be implemented annually to mimic natural flow patterns and provide favorable hydrological conditions during the fish breeding seasons. In addition, aquatic and riparian habitat restoration programs have been developed, budgeted, and are included in the Project ESMP.

37. *Wanyangzhou Wetland Park.* Yicheng City has planned to establish a Wanyangzhou wetland park in the center of the city. The main body of the Wanyangzhou wetland park consists of the Han River main stem segment and riparian wetlands, and is located within the Yakou reservoir flooded area. The wetland park was proposed with the intention of protecting the highly-disturbed river segment and riparian wetlands from further degradation and to provide local communities with opportunities for nature education and recreation. The wetland park proposal was approved by the National Forest Bureau in December 2013, but has not been implemented except for some embankment rehabilitation and landscaping works near the urban center.

38. A compliance review concluded that a wetland park is not considered a legally protected area (such as *Important International Wetland, Important National Wetland or Wetland Nature Reserve*) as defined by domestic regulations. Hence the Ministry of Environmental Protection (MEP) and the forestry agency approved the Yakou project. The baseline survey of the wetland park area indicates that it does not show a distinctive significance from a biodiversity perspective, when compared to other Han river sections. The wetland park is thus not considered a critical natural habitat under OP4.04. The proposed Project works is far away from the Wanyangzhou wetland park and its construction footprint will not affect the wetland park. Nonetheless, the forthcoming Yakou reservoir will flood current riparian areas and shoals in the wetland park area.

With mitigation measures, the intention to protect the disturbed river segment and riparian wetland from further degradation is expected to be accomplished because the proposed regulations regarding to the establishment of the wetland park will be implemented without compromise and existing activities such as in-stream sand mining will be curtailed. As agreed with the Bank, detailed plans for the wetland park were developed during Project preparation. The plans are compatible with the Yakou reservoir and include significant riparian wetland restoration, environmental education as well as recreational and service functions. The current detailed wetland park planning maximizes ecosystem restoration opportunities, in addition to recreational activities. The detailed plans were approved by the responsible governmental and administrative authorities during the Project preparation.

39. **OP4.12 Physical Cultural Resources (PCR).** Twelve ancient tombs were identified in the Project-affected area during the Project preparation. These tombs are small in scale and are scattered in the vicinity of the shoreline of the Han River; one tomb is identified as a county level Cultural Relic, according to domestic law. The tombs are outside the Project construction footprint, but are subject to inundation or erosion due to future reservoir impoundment. An impact assessment and a physical cultural resources (PCR) management plan have been included in the ESIA and ESMP. Chance-find procedures are also included in the ESMP.

40. **Cumulative Impact Assessment (CIA).** Cascade development plans for the Han River main stem have been developed and updated since the 1950s; the first dam at Danjiangkou was built in 1973. The *Comprehensive Plan for the Trunk Han River* (2012) proposed a 15-stage cascade development along the 1500 kilometers long Han River main stem. Implementation was accelerated after 2000, and it is expected that the cascade development will be completed in the next three to five years. In addition to project-specific impacts, a system-wide study is needed to assess the indirect and long-term impacts associated with the cascade development. Therefore, a CIA was prepared during Project preparation.

41. The CIA was prepared based on internationally acknowledged guidance and good practices. The 15-stage cascade development on the Han River main stem was initially reviewed. It was recognized that putting the emphasis on the middle and lower Han River (Danjiangkou reservoir and its downstream) would be meaningful and practical for the following key reasons: (i) a major assessment objective, agreed among various stakeholders, was that a workable inter-agency coordination mechanism and implementable action plans are essential to address cumulative effects and hence the study scope should be on the middle and lower Han River (which is under the jurisdiction of Hubei Province); and (ii) the hydrologic regimes (hence water availability, various ecosystems and socio-economic aspects) in the middle and lower Han River are largely controlled by releases from Danjiangkou reservoir. The middle and lower Han River can thus be treated as a relatively independent system for study.

42. Of the seven dams/reservoirs along the length of the middle and lower Han River mainstem, four have been built and are operational (that is, Stage 1 Danjiangkou, Stage 2 Wangfuzhou, Stage 4 Cuijiaying, and Stage 7 Xinglong); the remaining three stages (that is, Stage 3 Xinji, Stage 5 Yakou, and Stage 6 Nianpanshan) are expected to be completed in next three to five years. Several VECs were identified through comprehensive desk review and public consultations with pertinent agencies, technical experts and other stakeholders; hydrologic regime,

water quality, fish and riparian areas were considered as the high priority among the identified VECs.

43. Review of historical conditions, trends and inter-dependency of the VECs leads to the following findings: (i) Hydrologic regimes - Flow measurement results at each fixed cross-section on the middle and lower Han River main stem since 1956 suggest that annual average runoff ranged from 1,100-1,500 m³/s. The Danjiangkou reservoir (built in 1973) increased human uses and reduced the overall flow rate moderately compared to the natural conditions. Combined with subsequent dams/reservoirs, the spatial and temporal distribution of the runoff varied markedly, as demonstrated by reduced annual variations, elevated levels, expanded areas, reduced flow velocity and decreased solid contents; (ii) Water quality - Water quality in the main stem and major tributaries has seen continuous improvement in the past 15 years. In recent years, the designated Class II standard has been fully attained in the main stem, while the tributaries' water quality ranged from clean to polluted status; (iii) Fishery resources present a declining trend over the past 4 decades, as evidenced by the reduced abundance and diversity of traditionally dominant fish species with floating eggs (represented by the *Four Domesticated Fish*, namely *black, grass, bighead and silver carps*) as well as their spawning grounds; fish species favoring stagnant waters, such as common and crucian carps, have become dominant; the sizes of individual fishes have decreased. Overfishing, water pollution, dam/reservoir development and other activities such as in-stream sand mining, have cumulatively contributed to these changes. Meanwhile, the government has made extensive protection and restoration efforts, such as water pollution control and no-fishing regulation to help mitigate the negative effects, which have improved water quality; and (iv) Riparian habitats and wildlife - Terrestrial ecology was examined routinely in traditional Han River EA studies. Drawing on international advancements in research and EA practices, this CIA study also examined the riparian areas, where are transitional between terrestrial and aquatic ecosystems, present distinguished ecological functions, and are higher relevance to the proposed developments than the general terrestrial ecosystem. Apparently, many riparian areas along the Han River have been lost due to intensified human activities (for example, farming and urban development) and inundation resulting from the formation of reservoirs. Currently the riparian corridor is dominated by secondary vegetation (such as poplar and willow), shrubs, grass, and crops. Wetland and adjacent emergent/submerged plants provide habitats for fish, birds, and other wildlife. Forty-four waterfowls (13 swimming birds and 31 wading birds) were recorded, including two national Class I protected wading bird species, namely Oriental White Stork (*Ciconia boyciana*) and Black Stork (*Ciconia nigra*); and four national class II protected waterfowls. Following the formation of the Wangfuzhou and Cuijiaying reservoirs, local governments established a wetland nature reserve and a wetland park in each reservoir area; two other wetland parks have been proposed. These actions result in ecological and recreational benefits as well.

44. Based on the deepened understanding of past activities and their cumulative effects on the key VECs, major future development activities were identified: (i) Completion of the 7-stage cascade development on the middle and lower Han River in the next 3-5 years very likely; and (ii) the South-to-North Water Diversion (SN Diversion) project that was put into operation in December 2014 and transfers water from Danjiangkou reservoir to north China. Other present and future activities that may have cumulative effects on the VECs were also considered, though quantitative evaluations were not possible. Specifically, cumulative effects and mitigation measures include the following:

- *Hydrologic regimes.* The SN Diversion currently transfers 2-3 billion m³/year of water from Danjiangkou reservoir annually, compared to the 40 billion m³/year annual inflow into the reservoir. Flow reduction in the middle and lower reaches of the Han River is moderate. In future, combined with the full cascade development, the cumulative effects on flow rate and flow velocity will be significant. The formation of reservoirs in the middle and lower Han River will to a certain extent compensate the river width and depth reduction from the flow reduction, but will turn the River into connected lakes. To mitigate the cumulative effects, a regulation has been enacted to ensure that the minimum releases from each dam must meet the downstream needs for environmental flow, navigation and water supply. Further, an ecological scheduling program has been developed, which stipulates coordinated dam operation throughout the middle and lower Han River to create seasonal flooding that provides favorable flow rate and velocity for the spawning and breeding of fish species of floating eggs. The requirements have become regulations enacted by the Hubei provincial government and will be enforced;
- *Water quality.* Initial mathematical modelling suggests that cumulatively the SN Diversion and full cascade development may result in significant loss of water environmental carrying capacity and non-compliance with Class II surface water standards. More aggressive domestic/industrial wastewater pollution and agricultural non-point source pollution control plans as well as more stringent pollution discharge standards are being implemented to mitigate these impacts;
- *Fish.* Changes of flow regimes and fragmentation caused by the dams have and will further negatively impact on fish species with floating eggs (such as the Four Domesticated Fish) through disturbing their breeding and hatching life stages and spawning grounds, while fish species favoring lake-like conditions will become more dominant. Mitigation measures include fish breeding facilities and fish reproduction programs that are implemented and financed by each dam operator; fish passages in the five dams downstream of Wangfuzhou (Stage 2), coordinated dam operation (that is, ecological scheduling) to provide needed water rise, flow velocity and floating distance for the successful reproduction of fish species with floating eggs; fish habitat protection and restoration in the mainstem tail waters and tributaries; fishery administrative measures such as no-fishing zones and seasons, and educational activities;
- *Riparian areas.* Riparian/floodplain areas along the middle and lower Han River will be further impacted due to the changes of hydrologic regimes (for example, changes in seasonal flooding) and inundation. Since riparian ecology is a relatively new area of study internationally and in China, a general mitigation strategy was proposed, including expanding the existing ecological scheduling program and create a flooding process that is essential to riparian wetland (current ecological scheduling is designed primarily for fish needs), riparian vegetation restoration and other good management practices addressing over-farming, grazing and other development activities. The proposed Wangyangzhou wetland park (linked to the Yakou project) has the potential to demonstrate riparian ecosystem restoration as well.

45. The CIA also carefully examined the inter-agency coordination mechanism that is essential to address cumulative effects. The existing coordination mechanism, as exemplified by the coordinated dam operation program (that is, ecological scheduling), is overseen by the provincial government and involves pertinent provincial departments and dam operators. The proposed

habitat restoration, fishery administration (for example, no-fishing zone), and wetland park development will require close engagement with local governments and agriculture and fisheries departments. In addition, the uncertainty associated with future actions requires an adaptive monitoring and management approach to incorporate scientific, technical, and institutional uncertainties into the implementation and further development of cumulative effects action plans. To this end, a more detailed cumulative effect assessment will be carried out during Yakou project implementation, building on the preliminary CIA prepared during project preparation. The primary objectives of the detailed CIA include: (i) expanding the VECs and deepening the understanding of the cumulative effects; (ii) maintain and enhance the inter-agency coordination mechanism; and (iii) develop a long-term adaptive monitoring and management plan.

46. **Institutional Capacity.** The HPTD has gained safeguard management experience through completing six Bank-financed large-scale transport projects. During the implementation of the Fifth Inland Waterway Project (that is, Cuijiaying complex), the Bank supported HPTD in implementing a HIV/AIDS prevention program that helped it gain valuable experience in managing health and safety issues associated with the labor influx of a large-scale infrastructure project. Throughout Yakou Project implementation, the PMO will maintain an adequate institutional arrangement, with dedicated staff to manage the implementation of ESMPs. An independent environmental monitoring consultant will be hired to guide and support the PMO. The PMO will also, through HPTD, to build and maintain an inter-agency coordination and stakeholder dialogue mechanism in dealing with cross-cutting issues, for example, the implementation of ecological scheduling and various habitat restoration programs. The existing capacity to ensure fishing regulation has been proved effective. The project EMP includes strengthened fishing administration measures. The project cumulative impact assessment has proposed inter-agency coordination enhancement. These capacity building efforts are expected to ensure fishing regulations are upheld throughout the operation of the Project.

47. **Environmental Management.** A mitigation hierarchy of avoidance, minimization, and compensation has been included and budgeted in the project design and in the ESMPs. The project operation will not lead to the disappearance of any species in the River. The mainly affected species would be those fish species of floating eggs, represented by the Four Chinese Carps (black, grass, silver, and bighead carps). As the project EMP is designed, residual impacts will be offset by habitat restoration program, fish pass, fish breeding and release program, and an “ecological scheduling” program. Further, the project CIA proposed a follow-up study and development of a long-term ecosystem restoration program to address historical impacts resulting from various development activities. Main environment management measures at different stages are summarized below:

- *Design.* Through alternative analysis and design optimization, the inundation area has been minimized. To address long-term impacts on fish and natural habitats, fish passage and fish breeding facilities have been designed as part of the Complex. Local roads are used to the extent possible and most access roads are located within the dam construction site. Worker camps, mixing plants, and disposal sites will be located within the construction area and restored after project completion;
- *Construction.* Comprehensive construction impacts mitigation plans have been prepared to cover the dam construction site, reservoir embankment rehabilitation works, and transmission line works. Specific plans include soil erosion control (including site

restoration), contractor environmental, health and safety specifications and code of practices, solid waste and hazardous waste management, reservoir preparation, and physical cultural resources management plans. A two-stage diversion scheme is considered to ensure navigation continuity during construction. Construction materials will be either from the dam site or commercial materials sites approved by government. Facility restoration and land elevation will be conducted to address impoundment impacts on drainage, groundwater levels, and farmlands;

- *Operation.* A fish reproduction and release program will be implemented and funded by the Yakou Complex operator, which includes indefinitely breeding and releasing 4 million fish per year in compliance with Ministry of Environmental Protection's requirement; main stem and tributary (Ying River) fish habitat restoration will be carried out; and fish administration protocols (for example, no-fishing zones and seasons) will be enacted. An "ecological scheduling" program will be implemented to achieve coordinated dam operation to create seasonal flooding that is favorable for the spawning and breeding of fish species of floating eggs.

These mitigation measures, where applicable, will be included in the bidding and contract documents. The ESMPs also include the institutional setup, monitoring, training arrangements and the EMP budget.

48. **Public Consultation and Information Disclosure.** Several rounds of public consultations were conducted during EA preparation. During the preparation of domestic EIA, public consultation was carried out from August 2012 to December 2015 through a questionnaire survey, interviews, and public meetings in the area directly affected by the project. Information was disclosed in August 2012 on the website of Yicheng City Government, in August 2014 and January 2015 on the websites of Hubei Provincial Transport Department, Yicheng News and Xiangyang Environmental Protection Bureau. The full original EIA report was locally disclosed to the public on January 26, 2016 before the Ministry of Environmental Protection approved the domestic EIA.

49. During the preparation of supplemental EAs, additional public consultations were conducted with the public, NGOs (for example, Green Han River), local government and agencies. The main concerns expressed were about water quality issues, Han River pollution, implementation of environmental measures, impacts on fish species, feasibility and effectiveness of the measures for restoring fish resources, potential impacts on cultural relics, wetland park, local livelihoods, and land acquisition and compensation. Special consultations on cumulative effects were also carried out in May and June 2016 through field visits and interviews to completed complexes, and two stakeholder meetings were carried out in Xiangyang and Zhongxiang cities. The concerns and opinions expressed were responded to during the consultation and were taken into account in the project design and the development of EIAs, ESMPs and RAP. The full supplemental EIA and CIA were locally disclosed on June 20, 2016. The full EMPs were locally disclosed on June 22, 2016. The EA documents were disclosed at the Bank's external website on October 20, 2016 (EA), and October 21, 2016 (ESMP), which were updated and redisclosed on August 21 and 22, 2017.

50. **OP4.37 Safety of Dams.** The Project will finance the construction of the Yakou Complex, a run-off dam with an earth dam and ship-lock sections on the Han River. The Cuijiaying Complex,

about 53 kilometers upstream of the proposed Yakou Dam site, was completed in 2010 under the 5th IWW Project. The Cuijiaying Dam is a 16-meter-high gravel dam with ship-lock sections, and has a reservoir of 245 million m³ capacity. The PMO has assigned staff specifically for dam safety. An independent Panel of Experts has been engaged to assist the PMO in ensuring that the Bank's Safeguards Policy on Safety of Dams is complied with.

51. The PMO prepared four dam safety plans based on guidance from the Bank: (i) plan for construction supervision and quality assurance; (ii) instrumentation plan; (iii) operation and maintenance plan; and (iv) emergency preparedness plan. The latter three dam safety plans will be refined and finalized during project implementation based on the requirements of OP4.37. The POE will: review and comment on the investigation, design, and construction of the Project and the start of operations; review and comment on the PMO's detailed dam safety plans; and comment on the qualification criteria of bidders during procurement and tendering.

52. Cuijiaying Dam triggers OP4.37 because the safety and proper operation of the Cuijiaying Dam will directly impact the safety and proper operation of the proposed Yakou Dam. The PMO has prepared a Failure Analysis Report of the Cuijiaying Dam, which has been reviewed by the POE. The POE has also inspected the Dam. The POE review and inspection concluded that the Cuijiaying Dam is operationally safe. The POE will continue to monitor the safety of the Cuijiaying Dam and propose any remedial work needed. The PMO and the Provincial government will take appropriate action to ensure the safety of the Cuijiaying Dam.

Social

53. The Project will require the relocation of 35 households (152 people), and will require the acquisition of 183.2 ha (2,748 mu) of farmland in 60 villages, resulting in about 2 percent decrease in land holdings in the affected villages. Two small enterprises will be partially affected, but will not need to relocate and their operations will not be impacted. The project will also inundate some local infrastructure and public facilities, including ferries/ports, pump stations, and sand collection points in the reservoir area. The Project has prepared a Resettlement Action Plan (RAP), a Resettlement Policy Framework (RPF), and a social assessment (SA), which are in compliance with OP 4.12 and the social requirements of OP 4.01. The draft reports were locally disclosed on June 1, 2016 and disclosed in the Bank's external website on August 21, 2016 (SA), and October 21, 2016 (RPF), the RPF was updated and redisclosed on August 22, 2017.

54. Resettlement has recently commenced at the dam site. The RAP has been updated to reflect the implementation status, and a resettlement monitoring report has been prepared, which concludes that resettlement implemented so far adheres to the RAP and complies with OP 4.12.

55. **Gender.** Gender considerations have been integrated in project design through the SA that found most of the 713 women interviewed had concerns on losing land and on house demolition. They prioritized cash compensation and job creation as restoration measures. 92.3 percent of the women consulted support resettlement activities, while 64 percent would like to receive cash compensation; most of them prefer to build their own houses. The Project will monitor the provision of training to women, as well as the quality of resettlement measures for women. Women's opinions and participation will be encouraged further during project implementation to

increase their awareness of the Project. Gender is embedded in the project Results Framework and gender disaggregated information will be included in semi-annual progress reports.

56. **Poverty.** The SA found that 29 villages had 20,880 people under the poverty line (3.6 percent of population). Of those affected by resettlement, five households (10 persons) are below the poverty line; they will be provided special assistance. The Project will monitor and report on the resettlement of poor households to ensure timely restoration of their housing and livelihoods.

57. **Linked Activities.** Three activities are linked to the Project: strengthening of Han River Dike (to be carried out by the provincial water authority); power transmission line for the project powerhouse; and Wanyang Wetland Park within the reservoir. The PMO will coordinate with the relevant entities on the potential resettlement impact to ensure that the resettlement plans for these activities are prepared in line with the RPF and are implemented properly. The Bank task team will engage with the local governments closely for smooth coordination of implementation schedule of the linked activities with the Bank's Project, and ensure mitigate the risk of implementation delay caused by the linked activities to the minimum.

58. **Resettlement Budget.** The RAP contains a resettlement budget (estimated at about RMB500 million) and a funding plan that was developed based on the inventory and compensation rates. It includes compensation for land acquisition, houses/structures, enterprises, and restoration of livelihoods and infrastructure, as well as the fee for management and monitoring, and price and physical contingencies. Resettlement costs will be financed by counterpart funds.

59. **Organizational Arrangements.** The PMO and the local governments will set up resettlement offices as specified in the RAP, with adequate trained staff. A panel comprising resettlement experts will be established to provide advice on resettlement implementation.

60. **Citizen Engagement.** The RAP and the RPF were prepared based on extensive consultations with stakeholders, including various levels of government, village leaders and affected individuals. Affected households, enterprises and others were identified through the census and inventory. A socio-economic survey covered a sample of 431 households. Two rounds of impact investigation established the basis for resettlement planning. Project information was provided through various channels, including newspapers, TV stations, posters and public meetings. Meetings were held with involved local authorities and PMO staff on resettlement policies and mitigation of negative impacts. Focus group discussions and extensive key informant interviews were conducted with local government officials and the affected villages to finalize compensation rates, relocation arrangements and livelihood restoration measures. The results of these consultations, especially on people's needs and concerns, have been reflected in the RAP, which has been disclosed locally.

61. **Grievance Redress Mechanism.** A grievance redress mechanism is included in the RAP/RPF. Villages, individuals, and others who believe that they are adversely affected by the project may submit complaints, via three channels: project management system, external monitoring, and the court system. Complaints may also be sent to the Bank's Grievance Redress Service (GRS).

62. **Monitoring and Evaluation.** The RAP defines the purposes of monitoring, responsibilities, indicators, methodology, procedures and reporting requirements. Internal and external monitoring mechanisms have been designed for RAP implementation. Internal monitoring, to be conducted by the PMO resettlement office and county resettlement offices, will focus primarily on physical progress. An external monitoring agency will be engaged to monitor and report progress of resettlement implementation every six months. Apart from physical progress, the external monitor will also assess land raising, household relocation, livelihood restoration, and restoration of other facilities.

Annex 4: Implementation Support Plan
CHINA: HUBEI INLAND WATERWAY IMPROVEMENT PROJECT

Strategy and Approach for Implementation Support

1. The overall risk to achieving the PDO is rated moderate; however, risks relating to environmental and social aspects are rated substantial. The Implementation Support Plan (ISP) has been developed to ensure that adequate support is provided by the Bank to enable the project agencies to adequately address the key risks identified, monitor implementation of agreed risk mitigation measures, and ensure compliance with the Bank's safeguard and fiduciary Policies.
2. **Environmental and Social Safeguards.** The Project triggers five Bank safeguard policies and project implementation will need to be in compliance with the agreed safeguard documents and procedures (See Section VI E and F of the Main Text and Annex 3). Bank environmental and social specialists will visit project sites to review implementation of the safeguard action plans, provide guidance on the development and implementation of further safeguard studies supported by the Project, provide training to PMO staff, contractors and supervision engineers, review internal and external monitoring reports, and address specific safeguard compliance issues.
3. **Dam Safety.** The Bank dam specialist will hold periodic discussions with the Panel of Experts on matters relating to engineering design, construction and operational issues of the Dam, and on compliance with the Bank's dam safety requirements, undertake site visits, review reports on the implementation of agreed dam safety measures, and agree with the implementing agency on any remedial measures that may be required to ensure compliance.
4. **Procurement.** The Bank procurement specialist will review the procurement plan and procurement documents, provide training on Bank Procurement Guidelines, share experience and lessons of similar projects, and provide guidance to the PMO as required in the procurement of works, goods and consulting services. The Bank procurement specialist will also address non-compliance with Bank procurement guidelines and assist in responding, when applicable, to procurement related complaints.
5. **Financial Management.** The Bank financial management specialist will provide guidance to the PMO on the FM aspects of project implementation, identify financial management risks and mitigation measures, monitor the use and flow of the Bank Loan, and review audit reports.
6. **Inland Waterway Transport management.** A senior international expert has been engaged to share international good practices with the PMO, identify technical assistance needs for improving inland waterway transport efficiency along the Han River, and provide training on inland waterway transport management, for example, port planning, intermodal connections, safety management, low CO₂ emissions, and crew training.
7. **Engineering.** A senior geotechnical specialist will review the engineering design documents, share the lessons and experience of similar projects, and ensure that the technical designs comply with national codes and standards.

Implementation Support Plan

8. The Bank implementation support team will comprise international and domestic experts. The task team leader, fiduciary and safeguards specialists will be based in the Beijing Office and will ensure timely, efficient and effective training and implementation support to the project agencies. The Bank will carry out full implementation support missions on a semi-annual basis to review overall implementation status, identify potential issues and agree with the PMO on actions to resolve the identified problems at an early stage. The mid-term review of the project will be carried out in 2019 to assess progress in project implementation and the likelihood of achieving the PDO, as well as to identify remedial actions (including possible restructuring of the project) needed and reach agreement with the project agencies and the government on implementing the agreed actions.

9. The tables below summarize the skills needed for implementation support during the various stages of project implementation.

Time	Focus	Skills Needed	Resource Estimate (staff weeks)
First 12 months	Procurement supervision and training	Procurement	3
	FM supervision and training	FM	2
	Social safeguards/Resettlement supervision	Social development	4
	Environmental safeguards supervision	Environment	6
	Technical supervision and support	Technical	6
	Project management	Task Team Leadership	5
12-48 months	Procurement review, supervision and training	Procurement	6
	FM supervision and training	FM	4
	Social safeguards/Resettlement supervision	Social development	6
	Environmental safeguards supervision	Environment	10
	Technical supervision and support	Technical	8
	Project management	Task Team Leadership	12
48-60 months	Procurement review, supervision and training	Procurement	1
	FM supervision and training	FM	0.5
	Social safeguards/Resettlement supervision	Social development	1
	Environmental safeguards supervision	Environment	1
	Technical supervision and support	Technical	2
	Project management	Task Team Leadership	3

Skills Mix Required

<i>Skills Needed</i>	<i>Number of Staff Weeks</i>	<i>Number of Trips</i>	<i>Comments</i>
Procurement Specialist	9.5	10	Procurement review, contract management advise, training
Social Safeguards Specialist	10	10	Social safeguards review and support
Financial Management Specialist	6.5	10	FM review and supports
Environmental Safeguards Specialist	15	16	Environment safeguards review and support
Task Team Leader	18	10	Overall project implementation support
Technical specialist	14	16	Engineering design review, construction monitoring, support on sectoral strategy and policy development
Administrative client support	3	1	General support from Beijing Office

Annex 5: Economic Analysis

CHINA: HUBEI INLAND WATERWAY IMPROVEMENT PROJECT

1. The proposed Project aims to improve the capacity of IWT along the Han River to serve local communities, business, and industries in the northern part of Hubei Province better. The Project's identified economic benefits include: transport cost savings; increased utility of electricity consumption; reduced O&M costs of the navigation channel; increased agricultural production and reduced O&M costs as a result of improved irrigation systems; and local and global environmental benefits through avoided carbon dioxide emissions. These benefits will, in the medium and long term, boost local and regional economic development in the affected hinterlands of the Han River by facilitating the economical transport of coal, construction materials, and other bulk goods to areas of demand in Wuhan and other cities along the Han River and the Yangtze River.
2. The economic costs are identified as capital investment costs, including associated resettlement and environmental mitigation costs, and O&M costs (including required environmental management costs).
3. The economic analysis assumes that market prices for most elements of costs and benefits do not vary much from their economic value (that is, shadow price); therefore, in most cases market prices were applied directly without conversion. Economic benefits and costs are valued at base year 2015 prices, net of inflation, duties, and taxes. The Project is assumed to have a 5-year construction period (2017-2021) plus an operational period of 30 years (2022-2052). A discount rate of 6 percent was adopted in the analysis, as recommended in the World Bank guidance note.

Baseline and Alternatives

4. The baseline is the “non-project scenario”, in which the transport capacity of inland waterways along the Han River would remain low, allowing only vessels up to 500-dwt to navigate along most sections of the Han River. Most goods would continue to be transported by railway or road. No additional electricity will be generated from the Han River hydropower, and there would be no improvement to the irrigation system in the project area. The river channel's operation and maintenance costs would be high and unavoidable, if the navigation level was not raised and maintained at Class III level. There would be higher emissions of GHGs and local air pollution due to the use of fuel-intensive transport modes and electricity generation.

Cost-benefit Analysis

5. **Savings in Transport Costs.** The completion of the Yakou Complex will help increase the volume of waterway traffic, mostly bulk goods and both local and longer distance, along a 53-kilometer section of the Han River above the complex site. Because all other remaining ship locks on the Han River are scheduled to be fully operated by 2021, the volume of traffic at the Yakou Complex is projected to increase to 5.57 million tons in 2021, 9.43 million tons in 2026, 12.04 million tons in 2031, 15.41 million tons in 2041, and 18.79 million tons in 2051. This increased traffic volume includes both locally induced increase as a result of the improved navigation capacity and increased IWT transport due to a shift from road and railway transport. Increased

bulk goods to be transported via IWT include coal, construction materials, minerals, grains, fuels, and chemicals, as well as containers.

6. With the completion of the Complex, the unit cost of IWT is expected to drop from RMB85.7 to RMB48.2 per thousand tons per kilometer. If goods continue to be transported by road, the unit cost would be RMB1,038 per thousand tons per kilometer. IWT above the Yakou Complex in particular would substitute for road transport over 66 kilometers in the non-project scenario. Therefore, this project will bring about a significant reduction in transport costs.

7. It is estimated that road transport cost savings in 2026, 2031, 2041 and 2051 would be RMB217.2 million, RMB277.2 million, RMB354.7 and RMB432.4 million respectively. The estimated transport cost savings capture only a part of the benefits to local economic development, and is therefore considered a conservative estimate.

8. **Electricity Consumption.** Hubei is short of electricity as hydropower generated by the main rivers is being exported to the coastal provinces. The additional hydropower generated by the project will be consumed locally, and its economic benefit is estimated by the amount consumers are willing to pay for electricity.

9. The Complex will install 75 MW capacity turbines and will be able to generate 250 million kWh of electricity each year. It is projected that end-users will consume 246 million kWh. At the tariff of RMB0.458 per kWh (which the consumers currently pay for electricity) the economic benefit of electricity consumption is estimated at RMB112.7 million per year.

10. **O&M Cost Savings.** Without the project, there would be a need for much higher operation and maintenance costs to maintain a navigation capacity of Class III. A cost analysis for a similar river section downstream between Panshan and Xinglong indicates that RMB7.09 million per kilometer is required to develop and maintain navigation capacity at Class III level. The Project, once completed, will help avoid an investment of RMB373.7 million in the first two years and will result in annual O&M cost savings of RMB21.1 million in 2022.

11. **Benefits from Improved Irrigation.** Once the Complex is completed, the water level behind the Dam will be raised to 55.22 meters above sea level, which will allow gravity flow irrigation of up to 80,000 mu (about 5,300 ha) of farmland along the River. Pumping costs for irrigation and the O&M costs of existing pumping stations would be saved, with savings of RMB5 million per year. The Complex will further turn 300,500 mu (about 20,000 ha) of rain-fed farmland into irrigated land by 2027, which would increase the yield of agricultural products from RMB1,100 to RMB1,350 per mu per year. The net annual benefit of improved irrigation from 2027 is expected to be RMB83.5 million.

12. **Benefits from CO₂ Emission Reduction.** The Project will reduce GHG emissions through avoided coal consumption in thermal power production, reduced fuel consumption of road transport as a result of IWT, and IWT fuel savings due to improved IWT efficiency of Class III level navigation.

13. Electricity generated by hydropower through the Complex is estimated to be equivalent to a consumption of 76,260 tons of coal in a thermal power plant each year. In Hubei province, thermal power contributes to 40 percent of total electricity generation. As a result, the Complex will help avoid 13,689 tons of CO₂ emissions annually.

14. IWT will reduce fuel consumption and CO₂ emissions by road transport: 19,966 tons in 2026; 25,482 tons in 2031; 32,864 tons in 2041; and 40,059 tons in 2051. Improvements in IWT fuel economy due to the project's higher navigation capacity will further reduce CO₂ emissions by: 5,041 tons in 2026; 6,434 tons in 2031; 8,848 tons in 2041; and 10,786 tons in 2051.

15. Assuming the average environmental cost (or shadow price) per ton of CO₂ emitted is UD\$40 (RMB264) per ton, the global environmental benefit of the Project is summarized in the table below.. The Project will also reduce local air pollutants (for example, SO₂ and NO_x) from thermal power generation and transport fuel consumption; these benefits were not quantified in the analysis.

16. **Other Benefits.** The development of the Complex for IWT will avoid the use of scarce land to build roads and railways. Avoided land use costs, as well as resettlement costs, as observed in transport projects in many provinces in China can be substantial. In addition, increased IWT activities will boost local economies, including tourism development, along the River and will have positive spill-over effects on the life of local people. However, it is hard to quantify these benefits, and they are not included in the analysis.

17. **Residual of Capital Investment.** The multi-purpose complex normally has a life of 45 to 55 years. Taking the middle point of 50 years, the residual value of the capital investment at the end of 50 years is estimated at RMB1.68 billion.

18. **Results of the Cost-Benefit Analysis.** It is estimated that the net present value of the Project is RMB2.995 billion. The project's economic internal rate of return (EIRR) is 13.02 percent. The benefit-cost ratio (BCR) is 1.56. The results of the analysis are presented in the table below:

Results of the Cost Benefit Analysis

	Construction period					Operation period				
Year	2017	2018	2019	2020	2021	2022	2026	2031	2041	2051
Economic benefits				239.9	375.8	322.8	471.2	611.4	698.1	2473.7
Saving in transport costs						159.6	217.2	277.1	354.7	432.4
Saving in navigation channel maintenance costs						21.1	105.3	108.5	115.1	122.1
Electricity consumption benefits				13.3	112.7	112.7	112.7	112.7	112.7	112.7
Irrigation benefits					5.0	8.3	8.3	83.5	83.5	83.5
CO2 emission reduction				2.5	21.1	21.1	27.7	29.6	32.1	34.5
Capital investment residual										1687.8
Economic costs	299.6	749.1	749.1	749.1	475.2	40.4	40.4	45.8	45.8	45.8
Capital investment	299.6	749.1	749.1	749.1	449.5					
O&M					24.9	40.4	40.4	45.8	45.8	45.8
Net benefits	-299.6	-749.1	-749.1	-509.3	-99.3	282.4	430.8	565.6	652.3	2428.0
EIRR=	13.02%									
NPV=	2995.0									

19. Sensitivity analysis was carried out assuming a 10 percent increase in total costs and a 10 percent decrease in total benefits. Under these assumptions, the proposed project still yields an acceptable EIRR of 8.59 percent.

Impact on the Poor

20. The Project will provide greater economic development opportunities for local people, which will have a positive effect on the poor in the project area. Local governments have no plans to charge fees for use of the river channel for transportation, or to increase the electricity tariff. Accordingly, no negative impacts are anticipated on the poor.

Annex 6: Fiscal and Financial Analysis

CHINA: HUBEI INLAND WATERWAY IMPROVEMENT PROJECT

Fiscal Analysis

1. The fiscal analysis of the proposed Project focused on the financial capacity of HPTD, the final borrower, including: (i) revenue and expenditure status; (ii) inland waterway investments and plans; (iii) project counterpart fund requirements and availability; (iv) debt status; and (v) financial sustainability.

2. **Revenue and Fund Sources.** Most of HPTD's funds are from government fiscal allocations. During 2011–2015, HPTD's revenues totaled RMB127.49 billion, of which, 70.4 percent was from government fiscal allocations, as summarized below:

- **Fuel tax allocations.** During 2011–2015, the total fuel tax allocation to HPTD was RMB38.16 billion, which was about 29.9 percent of HPTD's revenues¹³. Compared to 2011, the allocation in 2015 was more than double, with an average annual increase of 20 percent.
- **Provincial government subsidies.** During 2011–2015, the provincial government provided a subsidy of RMB846 million, which was about 0.9 percent of the total revenue. Compared to 2011, the provincial government subsidy in 2015 increased by 28 percent.
- **Vehicle purchase tax allocation.** In the past five years, vehicle purchase tax allocations to HPTD were RMB50.11 billion, that is, about 39.3 percent of total revenue and 55.9 percent of total fiscal allocations¹⁴. Compared to the previous five-year plan period (2006–2010), such fund allocation increased about 100 percent.
- **Punishment fee allocation.** Punishment fees from overloaded, traffic law violations, and road property damage are collected by governments and allocated to related transport agencies. In 2011–2015, HPTD received an allocation of RMB605 million, that is, about 0.4 percent of total revenue. The punishment fee allocation has shown a declining trend in the past five years.
- **Operational revenue.** Operational revenue is mainly from highway tolls and business operations. In 2011–2015, the total operational revenue was RMB35.00 billion, which was about 27.5 percent of total revenue. Compared to 2011, such revenue doubled in 2015 doubled as a result of the growth in traffic.
- **Other revenues.** HPTD also generates other revenues, for example, treatment of transport property and rights. Other revenues comprised only 2.1 percent of total revenues in the past five years.

¹³ Since 2009, China has introduced a fuel tax and no longer collects “road maintenance fee”. The tax is collected by the central government and is then allocated to each province.

¹⁴ In China, the vehicle purchase tax goes to the Ministry of Transport and is then allocated to each province.

Table 1. Financial Revenue and Fund Sources of HPTD
(RMB million)

Source	2011	2012	2013	2014	2015
1. Fiscal Allocation	12,826	14,545	17,415	23,768	21,168
1.1 Fuel tax allocation	4,015	6,992	9,185	9,649	8,320
1.2 Provincial government subsidy	156	154	167	169	200
1.3 MOC project funds	8,530	7,260	7,890	13,870	12,560
1.4 Punishment fee allocation	125	139	173	80	88
2. Operation Revenue	4,598	5,482	6,613	8,205	10,099
3. Other revenue	1,006	182	157	589	836
Total	18,430	20,209	24,185	32,562	32,103

Source: Hubei Provincial Transport Department

3. **Expenditures of HPTD.** Revenues of HPTD are generally used for: (i) daily operation and capacity development; (ii) transport infrastructure construction and rehabilitation; and (iii) infrastructure maintenance.

- **Daily operation.** HPTD is responsible for network planning, infrastructure maintenance and construction, and administration of highways and inland waterways in Hubei Province. Daily operation costs were about RMB132.28 billion during 2011-2015, i.e., about 19 percent of HPTD's total expenditures. Operation costs comprised mainly staff salaries and management, and the development of HPTD.
- **Infrastructure construction and rehabilitation.** In the past five years, total expenditures for infrastructure construction and rehabilitation were RMB97.23 billion, i.e., about 73.5 percent of total expenditures. Compared to 2011, expenditures for infrastructure construction and rehabilitation had increased by about 49 percent in 2015. Expenditures on inland waterways were only 5.9 percent¹⁵.
- **Infrastructure maintenance.** Such expenditures include the costs of routine maintenance, medium and large maintenance, and emergency response and disaster recovery. In the past five years, expenditures for transport infrastructure maintenance were RMB9.88 billion, i.e., about 7.5 percent of HPTD's financial expenditures. Expenditures on inland waterway infrastructure maintenance comprised only 1.4 percent.

¹⁵ In China, the provincial level transport infrastructure investments in the last 20 years were mainly on expressways and highways.

Table 2. Financial Expenditures of HPTD
(RMB million)

Items	2011	2012	2013	2014	2015
1. Operation and administration	4,480	4,390	4,475	6,644	5,176
2. Construction and rehabilitation	15,436	14,234	18,835	25,805	22,923
2.1 Inland waterway	1,214	1,163	1,132	1,047	1,178
3. Infrastructure maintenance	1,722	1,755	1,825	2,423	2,153
3.1 Inland waterway	20	19	27	36	35
Total	21,638	20,379	25,135	34,872	30,252

Source: Hubei Provincial Transport Department

4. **Inland Waterway Investments and Plans.** During 2011-2015, Hubei Province had enhanced inland waterway development, with total investment reaching RMB33.5 billion; this was about 3.2 times the amount in the previous five-year period. About 17.1 percent of the total investment was from government funds. Class III waterways increased by 614 kilometers and reached 1,738 kilometers¹⁶, i.e., to about 21 percent of inland waterways in Hubei Province. More than 70 inland waterway port projects were implemented to provide additional capacity for cargo and container transportation, and inland waterway transportation volume increased at an average of 18 percent per year. In the last five years HPTD had implemented four major inland waterway projects. Of these, the Cuijiaying Complex was financed by a World Bank loan.

Table 3. Major Inland Waterway Projects in Hubei Province

No	Projects	Investment (RMB million)	Status	Remark
1	Han River Cuijiaying Navigation and Hydropower Complex Project	2,061.00	Completed	World Bank Financed
2	Han River Panshan-Xinglong Waterway Rehabilitation Project	780.87	On-going	
3	Han River Xinglong-Hanchuan Waterway Rehabilitation Project	926.27	On-going	
4	Yin River Waterway Development Project	1,707.42	On-going	
Total		5,475.56		

Source: Hubei Provincial Port and Shipping Bureau

5. HPTD has prepared a preliminary inland waterways development plan for 2016-2020. The plan indicates that inland waterway development will be accelerated, with investments totaling RMB40 billion, comprising RMB30 billion for waterway infrastructure development and RMB10 billion for logistics park development. The fund sources mainly include fiscal allocations from governments, bank loans, and private investments. The proposed Project will be one of the major infrastructure development projects on the Han River in the next five years.

6. **Counterpart Fund Requirements and Availability.** According to the latest Feasibility Study Report (FSR), the total investment of the proposed Project would be RMB3.35 billion, of

¹⁶ Class-III inland waterway in China is classified as navigable for 1,000 ton vessels.

which, about 29.6 percent would be financed by the World Bank loan (\$150 million) and the remainder would be financed by counterpart funds. MOT has approved a subsidy of RMB405 million to support project implementation, and the balance of RMB1.95 billion would be provided by HPTD from government fiscal allocations.

7. HPTD's financial status in the next four years (2018-2021) and counterpart fund availability for the proposed Project are projected based on conservative assumptions, including:

- Fuel tax allocation would increase by 8 percent each year (it averaged 20.0 percent each year in 2011 - 2015); provincial fiscal allocation would increase by 5 percent each year (it averaged 6.4 percent each year in 2011 - 2015); MOT subsidy would remain the same as in 2015; and the punishment fee allocation would decrease by 2 percent each year.
- About 7.7 percent of the total revenue (10 percent of the fuel tax allocation, 50 percent of the provincial fiscal allocation, 5 percent of the MOT subsidy, and 10 percent of the punishment fee allocation) could be used for the proposed Project and is considered a discretionary funding source for the Project.
- Based on the latest project implementation schedule, counterpart funds of RMB2.36 billion (including the MOT subsidy) would be required for the Project during 2018 - 2021.

8. The results of the analysis reveal that total counterpart fund requirements would be: (i) about 2.0 percent of total fiscal allocations of HPTD in 2018 - 2021; (ii) about 26.1 percent of the discretionary funding sources for the Project; and (iii) the peak in 2019 would constitute about 46.0 percent of the discretionary funding sources. Table 4 below presents the analysis.

Table 4. Analysis on Counterpart Fund Availability
(RMB million)

	2018	2019	2000	2021	2018-21
Total Government Fiscal Allocations	23,355	24,204	25,120	26,109	117,090
Fuel tax allocation	10,481	11,319	12,225	13,203	52,715
Provincial government subsidy	232	243	255	268	1,160
MOC project funds	12,560	12,560	12,560	12,560	62,800
Punishment fee allocation	83	81	80	78	414
Discretionary Fund Sources for the Project	1,800	1,890	1,986	2,090	9,033
Fuel tax allocation	1,048	1,132	1,222	1,320	5,271
Provincial government subsidy	116	122	128	134	580
MOC project funds	628	628	628	628	3,140
Punishment fee allocation	8	8	8	8	41
Counterpart Fund Requirement	677	869	470	342	2,358
in Total fiscal allocations (%)	2.9	3.6	1.9	1.3	2.0
in Discretionary Fund Sources for the Project (%)	37.6	46.0	23.7	16.4	26.1

Source: World Bank analysis

9. As one of the key inland waterway projects of Hubei Province along the Han River in the next four years, both central and provincial governments have shown strong support for the Project.

About RMB512 millions of government funds had been made available for the Project in 2017. The remaining funds will be budgeted annually by HPTD based on project implementation demands. Counterpart funds requirements are expected to be met.

10. **HPTD Debt.** HPTD had an accumulated debt balance of RMB12.07 billion at the end of 2015. Of which, about 90 percent was for highway development projects. Debts for inland waterway infrastructure development comprised only 8.1 percent. HPTD's debt balance at the end of 2015 was about 65.5 percent of major discretionary revenues (fuel tax allocation and operations revenue). Debt repayment requirement was about 4.4 percent of discretionary revenue, which did not result in much financial pressure on HPTD.

Table 5: Debt Balance of HPTD
(RMB million)

	2011	2012	2013	2014	2015
New debt	709.00	400.00	430.00	100.00	-
Repayment	31.80	1,377.70	886.90	551.30	812.00
Balance	14,767.20	13,789.50	13,332.60	12,881.30	12,069.30
Balance in Discretionary Revenue*(%)	171.5	110.5	84.4	72.1	65.5
Repayment in Discretion Revenue (%)	0.4	11.0	5.6	3.1	4.4

* Discretionary revenues include the government fuel tax allocation and operation revenues.

Source: financial division, HPTD

11. HPTD has established a debt repayment fund, which is included in its annual budgetary plans. Debt repayment was about RMB812 million in 2015 and RMB1,100 million in 2016. HPTD plans to enhance its debt repayments and pay back all existing loans by 2022. Comparing with discretionary revenue, HPTD's debt ratio will be about 32.1 percent in 2021 and 12.9 percent in 2025.

12. HPTD will be responsible for the repayment of the World Bank loan of US\$150 million for the proposed Project, with repayments (including both principal and interest) starting in 2023. The peak year of repayment for all World Bank loans will be in 2023-2024 with a total repayment of about RMB100-150 million each year. These repayments would be less than 1 percent of the fuel tax allocation in those years. Nevertheless, HPTD should reserve adequate funds in its budget for loan repayments.

13. **Conclusions.** Based on the statistical data provided by HPTD and the analysis above, it can be concluded that:

- HPTD's revenue increased substantially in the past few years, which facilitated transport development and supported key infrastructure projects in Hubei Province. The revenue was mainly from government fiscal allocations and expressway operations. It is likely that government allocations to HPTD will continue to increase as revenues from transport related charges (such as vehicle purchase tax and fuel tax allocations) are increasing in line with the rapid motorization in the Province and in China.

- HPTD's discretionary fund sources for the proposed Project will be adequate to provide the required counterpart funds for project implementation. Counterpart fund requirements for this Project will not significantly impact HPTD's normal operation and maintenance budget. Counterpart fund requirements for the Project will peak in 2019, which will be about 46.0 percent of the total discretionary fund sources for the Project. Therefore, HPTD should budget its expenditures carefully and allocate adequate funds for project implementation.
- HPTD's debts have not brought too much pressure on its financial status. HPTD has established a debt repayment fund, which is included in the annual budgetary plans. HPTD plans to increase repayment of existing loans and repay all existing domestic loans by 2022. HPTD's indebtedness is expected to reduce from 49.2 percent in 2018 to 32.1 percent in 2021. Servicing the World Bank loan is not expected to stress HPTD's financial status significantly, in part due to increased revenues.
- To accelerate transport infrastructure development, especially inland waterways, HPTD should improve the efficiency of public funds and explore additional funding sources, including issuing government bonds, obtaining low interest commercial loans and improving regulation and policies to facilitate private investments. HPTD should also optimize the debt structure and maintain adequate funds for debt repayment.