



1. Project Data

Project ID P158717	Project Name China: Hubei Inland Waterway Improvement	
Country China	Practice Area(Lead) Transport	
L/C/TF Number(s) IBRD-88460	Closing Date (Original) 30-Jun-2023	Total Project Cost (USD) 149,945,253.71
Bank Approval Date 18-May-2018	Closing Date (Actual) 30-Dec-2023	
	IBRD/IDA (USD)	Grants (USD)
Original Commitment	150,000,000.00	0.00
Revised Commitment	149,945,253.71	0.00
Actual	149,945,253.71	0.00

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2. Project Objectives and Components

a. Objectives

The Project Development Objective (PDO) as stated in the Loan Agreement (Schedule 1, page 5) and in the Project Appraisal Document (PAD, page 7) is:

" To improve inland waterway transport capacity and reliability along the Han River in support of low carbon development ".



b. Were the project objectives/key associated outcome targets revised during implementation?

No

c. Will a split evaluation be undertaken?

No

d. Components

There were two components: (PAD, page 7).

A. Yakou Navigation-Hydropower Complex. The estimated cost at appraisal was US\$484.96 million. The actual cost was US\$476.41 million.

This component consisted of constructing the Yakou Infrastructure Complex comprising *inter alia*, the following structures: (i) A Grade III shiplock of up to 1,000 Dead Weight Tonnage (DWT) vessel capacity; (ii) dam sluice gates; (iii) a powerhouse of up to 75 Mega Watt (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 bridge in several sections along the ship lock, sluice gates and powerhouse.

B: Institutional Strengthening. The estimated cost at appraisal was US\$3.50 million. The actual cost was US\$2.40 million,

This component consisted of carrying out of (i) technical assistance (TA) activities and training to enhance the institutional capacity of the Inland Waterway Transport (IWT) management 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 for conservation of fisheries and habitats in the Han River.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project cost. The estimated cost at appraisal was US\$515.13 million. The actual cost was US\$492.72 million.

Financing. The project was financed by an International Bank for Reconstruction and Development (IBRD) loan of US\$150.00. The amount disbursed was US\$149.94 million.

Borrower contribution. Borrower contribution of US\$365.13 million was planned at appraisal. Their actual contribution was US\$342.78 million.

Dates. The project was approved on May 18, 2018, became effective on September 27, 2018 and was scheduled to close on June 30, 2023. The Mid-Term Review (MTR) was held on September 16, 2019. The project closed six months behind schedule on December 31, 2023.

Changes. These changes were made through a level 2 restructuring on June 29, 2023.

- The closing date was extended by six months to December 31, 2023, for completing the remaining civil works that were delays on account of factors like the COVID-19 restrictions, two major floods of



the Han River (in September 2017 and August 2021) and for complying with the Bank's safeguard policies.

- The loan proceeds were reallocated and expenditure percentage was retroactively increased for component one activities.

3. Relevance of Objectives

Rationale

County and Provincial Context. Despite impressive economic growth in China experienced over three decades, there were growing disparities between the prosperous eastern/coastal provinces and the less developed western and central regions. The project activities were in Hubei province in Central China. Wuhan, the capital city of Hubei, located on the Yangtze River, is the economic center in the central region and a national transport hub on the Yangtze River.

Sector context. The potential for Inland water transport (IWT), - a more cost-effective and environmentally more friendly transport mode for long-haul freight transport as compared to the road mode, has not been fully realized in China's freight market. In 2016, only seven percent of China's freight was transported by IWT. Two of the major constraints for IWT were: (i) a large proportion of the navigable waterways did not meet the higher navigation standards required by large vessels that can deliver lower unit costs than smaller vessels; and (ii) lack of integration of waterways, ports and intermodal logistics. Recognizing these constraints, the national and local governments planned to improve inland waterway infrastructure and connectivity between waterways and other transport modes to increase IWT capacity and utilization.

National strategy. China's 13th Five-Year Plan (FYP) for 2016 - 2020 aimed to achieve balanced economic growth through "green" development strategy. The FYP also called for accelerating the establishment of a modern multi-modal transportation and logistics system in Central China. In 2007, the Ministry of Transport (MOT) issued the National Inland Waterway and Port Plan that envisaged development of a high-class waterway network, with a total length of 19,100 kilometers (km) by 2020, that would connect 25% of cities with a population of over half a million.

Current Government strategy. The PDO continued to be relevant to the priorities of China's 14th FYP for 2021 - 2025 of improving inland waterways and supporting the green development target of the plan. The project also contributes to achieving China's carbon goals by 2030 and 2060 respectively.

Hubei strategy. Hubei's 13th FYP (2016-2020) aimed to eliminate poverty and boost economic development by taking advantage of its strategic location. The Hubei IWT development plan for 2002 - 2020 prioritized development of "Three Trunk Waterways" (including the Yangtze River and the Hans River).

World Bank (WB) strategy at appraisal. The PDO was well-aligned with two strategic themes of the WB's Country Partnership Strategy (CPS) for 2015 - 2016: Theme One: Supporting Greener Growth; and theme two: Promoting more inclusive development.



WB current strategy. The PDO is well-aligned with the second engagement area of the WB's current Country Partnership Framework (CPF) for 2020 - 2025 - "*promoting greener development*". The PDO directly supported objective 2.5: "*Promoting Low-Carbon transport and cities*".

Previous WB experience. Beginning with the First IWP in 1995, the WB has supported seven IWT projects in China. Over the years, WB's engagement has evolved from removing transport bottlenecks by improving IWT infrastructure, to supporting power-generation facilities as part of integrated powerhouse - the lock complexes to improve the financial sustainability of IWT, and providing waterway management systems for coordinating multiple uses of water resources, including flood control, irrigation, power generation and navigation. The Fifth Bank-financed IWT supported the development of Cuijaying complex on the Han River in Hubei Province.

Current project. This project at Yakou was in the middle reach of the Han River. The completion of the Yakou cascade development was expected to be a critical milestone for the Han River to reach the planned navigation standard by 2020. The project would also address a key bottleneck for completed investments at other cascades to realize their full navigation capacity and economic benefits in terms of traffic flows through IWT. The project also aimed to promote IWT utilization through improved integration of waterways, ports and intermodal logistics with roads and railways.

Relevance of the PDO. The development objectives of improving IWT capacity and reliability along the Han river directly responded to the country context of linking China's coastal region with the relatively less developed China's central region. Given that IWT is more cost-effective, energy efficient and environmentally more-friendly than the road mode, the PDO directly responded to the current Bank strategy of promoting alternative greener transport modes. The PDO objective was pitched at the outcome level of the results chain and appropriately pitched to address the identified development problem. The overall relevance is rated as High.

Rating

High

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

To improve inland waterway transport capacity and reliability along the Han River in support of low carbon development .

Rationale

Theory of change. The project activities aimed at improving the IWT capacity and reliability of IWT services along the Han river. The outputs of activities such as constructing Grade III ship lock, dam sluice gates, powerhouses and fish pass, were likely to help the navigability of large ships which could deliver lower unit cost than smaller vessels through the Yakou Dam. The outputs of technical assistance (TA) such as financing



studies on water information, ICT safety management, a cumulative impact assessment, evaluation of fish facilities and ecological scheduling along the Han river were likely to help in institutional strengthening of the IWT authorities for providing reliable ICT services. These outcomes were likely to aid in realizing the intended outcomes of improving the capacity and reliability of ICT and promoting environmentally friendly IWT transport mode for long haul freight.

The outcomes were predicated on these assumptions: (i) The counterpart funding is provided in a timely manner; (ii) The upstream Xinji complex and the downstream Niangparshan Complex are operational no later than the Project's works as the project's desired outcome of increasing IWT traffic flows were contingent on the completion of these activities ; and (iii) there is sufficient budget for operations and maintenance beyond the project.

Outputs.

- The Yakou navigation hydropower complex was constructed and put into operation as targeted. With this, navigation of the Han River section through the complex improved as 1000 Dead Weight Tonnage (DWT) vessels could pass through it throughout the year.
- These activities were completed as targeted: (i) The ship lock and the powerhouse were in operation; (ii) The fish pass was functional.
- The provision of renewable energy increased to 423,000,000 kilowatts (kWh/year), exceeding the target of 246,000,000 kwh/year.
- The design water level of 55.22 m was achieved as targeted.
- The project aided in delivering five studies as targeted: (i) Evaluation of Fish Pass Facilities; (ii) The Ecological Scheduling Operation; (iii) The Cumulative Environmental Effect Assessment (CEA) Study (Phase II); (iv) IWT safety management study; (iii) The Water Information System. The final reports of the studies were accepted, and their recommendations are expected to impact inland waterway technical standards or similar projects in the future.
- 340 staff members were trained as targeted (of this, 110 were women).

Outcomes.

The outputs described above were expected to aid in contributing to the following desired outcomes: (i) increase traffic passing the Yakou complex (a proxy for measuring improvements in IWT capacity); (ii) navigability of 1,000 DWT vessels (a proxy for measuring reliability of the waterways: and (iii) reduce carbon dioxide emissions (a measure climate change impacts).

- The traffic passing through the Yakou complex was 0.82 Million Tons/year, far short of the target of 6.9 Million Tons/ years. The goal of volume of traffic passing through the complex was not achieved because of the delays in completing the two cascades (Xinji complex upstream and the Nianpanshan complex downstream). The ICR notes that both traffic volume and number of ships of passing through the Yakou Complex increased rapidly from 26,673 tons and 90 ships in June 2023 to 190,054 tons and 305 ships in June 2024. This growth rate shows that the traffic volume of the Yakou Complex will reach 6.9 million tons by 2028 and 11 million tons in 2035.
- The navigability of 1,000 DWT vessels increased to 350 days a year, exceeding the target of 340 days a year.
- At project closure the carbon dioxide emissions reduced to 24,907 tons a year, exceeding the target of 13,689 tons a year. The ICR notes that the project's hydropower turbines generated an amount of



renewable energy of 423 million kWh a year which were equivalent to a consumption of 76,260 tons of coal in a thermal powerplant and 13,689 tons of CO₂ in the year. The CO₂ reduction was also gained through reduced fuel consumption as goods transportation by road transport was shifted to by IWT, and through fuel efficiency gain as larger shift could navigate along the Han River as the navigability has been improved though this was not quantified.

Efficacy of the PDO is rated as substantial with moderate shortcomings, as two of the three intended outcomes were fully realized.

Rating
Substantial

OVERALL EFFICACY

Rationale

Two of the three intended outcomes were realized. Overall efficacy is hence rated as substantial, with moderate shortcomings.

Overall Efficacy Rating

Substantial

5. Efficiency

Economic analysis. A cost-benefit analysis was conducted for component one activities at appraisal and at closure. These activities accounted for 94% and 96% of the appraisal estimate and actual cost respectively. The economic benefits were assumed to come: (i) savings in transport costs; (ii) increased use of renewable energy; (iii) reduction in operation and maintenance (O&M) costs of the navigation channel; (iv) increased agricultural production and reduced O&M costs owing to improved irrigation systems; and (v) local and global environmental benefits due to reduced Green House Gas (GHG) emissions.

The Net Present Value (NPV) at 6% discount rate (as recommended in the WB guidance note) at appraisal was Chinese Yuan (CNY) 2,995 and the NPV when the project closed was 1,109 CNY. The ex-post Economic Internal Rate of Return (EIRR) was 8.74%, as compared to the ex-ante EIRR of 13.02%. The Benefit-Cost Ratio when the project closed was 1.26 as compared to the Benefit - Cost Ratio of 1.56 at appraisal. The lower ex-post EIRR was mainly owing to the lower traffic volume, due to the delays in completion of the upstream/downstream activities.



Operational efficiency. The project was efficiently implemented. The project substantially achieved its PDO with a mere six month extension of the closing data, which were largely outside the project's control (physical restrictions in the wake of the COVID-19 pandemic and two major floods of the Han river).

Overall efficiency is rated as modest given the low ex-post EIRR.

Efficiency Rating

Modest

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal	✓	13.02	94.00 <input type="checkbox"/> Not Applicable
ICR Estimate	✓	8.74	96.00 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The relevance of the PDO to the national strategy, the provincial strategy and the Bank strategy for China is High. Overall efficacy is rated as substantial, with moderate shortcomings. Efficiency is rated as Modest. Taking these ratings into account, overall outcome is rated as moderately satisfactory.

a. Outcome Rating

Moderately Satisfactory

7. Risk to Development Outcome

Government commitment/Ownership. The risk to sustainability of development is rated as low (ICR, para 65). By the time the project closed, the project complex was operational for six months under the management of the Yakou Complex with sufficient and operation and maintenance funds allocated annually.

Technical risk. There is moderate risk associated with the traffic volume, as the activities with upstream and downstream activities were yet to be completed when the project closed.



8. Assessment of Bank Performance

a. Quality-at-Entry

The Bank prepared this project based on the lessons from IWT projects in China, Bosnia and Herzegovina and Georgia. Lessons incorporated included: (i) focus on long-term development of river information services; (ii) As Bank's experience with similar projects had shown that sustainability of IWT depends on connectivity to the overall intermodal transport network focusing on technical assistance (TA) to study the logistics service value chain; (iii) promoting environmental sustainability through best practices in water resources and environmental management; and (iv) focusing on dam safety (PAD, pages 9 - 10). The project design supported the country and province's cascade development plans to promote IWT, and the project components were designed in a balanced manner, focusing equally on both infrastructure and technical assistance.

The implementation arrangements made at appraisal were appropriate for managing the project. The arrangements were: (i) The Hubei Port and Shipping Bureau (HPSU), under the Hubei Provincial Transport Department (HPTD) was responsible for overall administration and coordinating with related government agencies; and (ii) A dedicated Project Management Office (PMO) was responsible for implementation (PAD, paras 37 and 38).

The Bank identified several risks at appraisal including substantial risk with environmental and social safeguards and risks with reliable traffic forecasts. Mitigation measures were incorporated at appraisal. With these measures, overall project risk was rated as moderate at appraisal (PAD, para 42). The arrangements made at appraisal for safeguards and fiduciary compliance were appropriate (discussed in section 10).

There was one shortcoming. The design underestimated the risk of reduced traffic passing through the Project's complex due to the delays in the completion of the upstream Xinji and downstream Nianpanshan complexes that resulted in the partial achievement of the water transport volume.

Quality-at-Entry Rating

Moderately Satisfactory

b. Quality of supervision

Supervision missions were conducted twice a year, even during the COVID-19 pandemic, The continuity of leadership was maintained with only one Task Team Leader (TTL) throughout the project and the supervision team included safeguard and fiduciary specialists. At the early stage of project implementation, in late 2018 and 2019, successive WB missions identified the delays in land acquisition and compensation for the reservoir area and actively followed up until the issue was resolved. The support provided by the team aided in safeguards and fiduciary compliance. According to the Annex 5 incorporating Borrower's comments, the Bank provided strong support and close oversight and allocated project funds efficiently and quickly.



Overall Bank performance is rated as moderately satisfactory, due to the shortcoming at the quality-at-entry.

Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Moderately Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

The results framework was clear and the three key outcome indicators were in general appropriate for monitoring project performance. The data sources and the methodology for collecting data, the baseline and end targets were clearly specified at appraisal.

There was one shortcoming. The indicator pertaining to traffic flows along the Han River could not be only attributed to the project, as these were dependent on the completion of the Xinji upstream and Nianpanshan downstream activities which was to be financed by the Government. Delays in completion of the activities contributed to the nonachievement of a key outcome indicator.

b. M&E Implementation

The ICR (para 50) notes that M&E implementation was handled by the PMO from the beginning until the end of the project. Data provided by the PMO was shared with the relevant government agencies and the WB team for taking necessary actions.

c. M&E Utilization

Data collected during implementation was utilized for informing decision-making and management decisions. It was used for routinely monitoring implementation progress, alerting implementation risks and issues and providing evidence to achieve the PDO indicators.

Overall M&E is rated as substantial, with some shortcomings of design.

M&E Quality Rating

Substantial

10. Other Issues



a. Safeguards

The project was classified as a Category A (Full Assessment project) under the WB safeguard policies. Five safeguard policies were triggered at appraisal: Environmental Assessment (OP/BP 4.01); Natural Habitats (OP/BP 4.04); Physical Cultural Resources (OP/BP 4.11); Involuntary Resettlement (OP 4.12) and Safety of Dams (OP/BP 4.37). (PAD, page iii).

Environmental Assessment, Natural Habitats and Physical Cultural Resources. The anticipated adverse environmental impacts included: (i) construction impacts related to water and air pollution, loss of aquatic, terrestrial and riparian habitats, soil erosion, health and safety concerns; and (ii) operational impacts on river hydrology, water quality, fishery resources, groundwater and infrastructure facilities. The natural habitats safeguards was triggered due to the possibility that dam and river impoundment will further fragment the river, block fishes from migration and disturb the spawning and hatching of fish species. The safeguards on physical cultural resources was triggered as twelve small and scattered tombs were identified in the project areas. An Environmental and Social Impact Assessment (ESIA) was conducted at appraisal and an Environmental and Social Management Plan (ESMP) was prepared and publicly-disclosed at appraisal (PAD, pages 16 - 17).

The environmental safeguards performance was rated as satisfactory throughout implementation (ICR, para 54). There were no issues with natural habitats and project activities were not implemented in areas with important cultural sites. Given that the project was part of the cascade development on the Han River, a two-phased cumulative impact assessment was conducted to evaluate and address the potential cumulative environmental and social impacts associated with the project.

Involuntary Settlement and Safety of Dams. The safeguards on involuntary resettlement were triggered due to the possible adverse on local communities, such as land loss, house and structure damage, and social disturbance. The safeguards on the safety of dams were triggered as the project financed the Yakou Dam. A standalone social assessment was conducted at appraisal to establish the social baselines and a Resettlement Action Plan (RAP) and Resettlement Policy Framework (RPF) were prepared and publicly disclosed at appraisal to address these safeguards (PAD, para 56).

The ICR (para 57) noted that social safeguard performance during implementation varied between satisfactory and moderately satisfactory (ICR, para 57). Land acquisition, resettlement, and grievance redressing mechanisms were implemented adequately. Issues encountered such as those at the end of the implementation period namely demolishing a shipyard and relocation of the shipyard were resolved. There were no issues with the safety of dams.

b. Fiduciary Compliance

Financial Management (FM). The Bank conducted an FM assessment at appraisal. The assessment concluded that the main financial risk was coordination between the multiple agencies involved in project activities. With mitigation measures, FM risk was rated as moderate at appraisal (PAD, page 33).



The project's FM was consistently rated as satisfactory throughout the implementation period (ICR, para 58). Financial reports were submitted in a timely fashion and with adequate information on contract implementation and disbursement. The financial audits were unqualified.

Procurement Management. The Bank conducted an assessment of the PMO's capacity to manage procurement. With mitigation measures, procurement risk was rated as moderate at appraisal (PAD, page 35).

The project's procurement performance was rated as satisfactory (ICR, para 59). There was no mis procurement declared during implementation.

c. Unintended impacts (Positive or Negative)

There were no unintended impacts.

d. Other

Not applicable.

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Moderately Satisfactory	Moderately Satisfactory	
Bank Performance	Moderately Satisfactory	Moderately Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	High	

12. Lessons

The ICR draws the following main lessons from the experience of implementing this project, with some adaptation of language.

1. Capturing outcomes that are within the control of the project raises the potential for achieving the intended outcomes. In this project, the expected outcome of one results indicator was forecasted on assumed completion of all three remaining complexes. Given that two complexes were not directly under the control of this project as these activities were not financed by the project, the expected outcome could not be achieved.



2. A holistic approach may be raise the potential for promoting IWT projects. This project addressed the constraint of low standard of the navigation channel and the low water level in the four month dry season, but there are still a number of challenges in promoting IWT along the Han River, such as development of ports along the Han River with good hinterland connectivity.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR is concise, well-written and adheres to the recommended page length. The theory of change provided in the text clearly articulates the clear causal links between the project activities (inputs), outcomes and the desired outcomes. The theory of change clearly states the assumptions under which the intended outcomes are likely to be realized. The text provides adequate evidence for assessing project performance. The photographs provided in the text enable the reader to visualize the changes made under the project. The lessons learned are relevant and drawn from the project experience. Overall, the ICR quality is rated as High.

a. Quality of ICR Rating

High