



1. Project Data

Project ID P159883	Project Name Efficient and Green Freight Transport	
Country China	Practice Area(Lead) Transport	
L/C/TF Number(s) TF-A9121	Closing Date (Original) 31-Dec-2022	Total Project Cost (USD) 7,580,597.14
Bank Approval Date 18-Dec-2018	Closing Date (Actual) 31-Dec-2023	
	IBRD/IDA (USD)	Grants (USD)
Original Commitment	8,246,095.00	8,246,095.00
Revised Commitment	7,580,597.14	7,580,597.14
Actual	7,580,597.14	7,580,597.14

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2. Project Objectives and Components

a. Objectives

The project development objective (PDO), as stated in the grant agreement, is to (i) improve the recipient's institutional capacity to formulate and evaluate policies and strategies to promote green freight transport systems, and (ii) pilot innovative carbon emission reduction measures in the freight transport sector in selected provinces. In this validation, in the same way as in the implementation completion and results report (ICR), the PDO is parsed as follows:



(i) to improve the recipient's institutional capacity to formulate and evaluate policies and strategies to promote green freight transport systems, and

(ii) to pilot innovative carbon emission reduction measures in the freight transport sector in selected provinces.

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

Yes

Did the Board approve the revised objectives/key associated outcome targets?

No

c. Will a split evaluation be undertaken?

No

d. Components

Component 1: National Technical Assistance and Policy Development (cost at appraisal US\$4.85 million; cost at restructuring US\$5.35 million; actual cost: US\$11.94 million)

Component 1A: Development of Policy and Strategy for Low Carbon Multimodal Freight Transport, to finance technical and analytical support for the development of national policies, plans, strategies and standards for a low carbon multimodal freight transport system, including, inter alia (i) a structural carbon emission reduction strategy of China's freight transport sector, including a national freight flow model, (ii) an action plan for efficient and green freight corridors, and (iii) guidelines on multimodal freight development for the Yangtze River Economic Belt.

Component 1B: Development of National Policies and Guidelines for Green Urban Freight Distribution, to finance, inter alia: (i) guidelines for green and efficient urban freight transport development and (ii) guidelines and solutions for an e-commerce based urban freight distribution system.

Component 1C: Development of an Abatement Cost Analytical Tool for Freight Transport Emission Reduction, to finance a tool to analyze the emission reduction potential and abatement cost of different physical, operational, and policy interventions in the freight transport sector, including to (i) review and summarize various "avoid/shift/improve" interventions for freight transport emission reduction; (ii) develop the marginal abatement cost (MAC) curve for various interventions; and (iii) apply the MAC curve to develop the roadmap for emission reduction in key regions (e.g., Jing-Jin-Ji, Pearl River Delta).

During the 2022 restructuring, the following three new activities were added to this component: (i) study on modern logistics system including infrastructure, operations, equipment and business environment that support the green transition of China's economy, (ii) study on the impact of new international and domestic circumstances on freight transport and way forward for a low-carbon freight transport system, and (iii) study on the freight hubs and last-mile connectivity to ports.

Component 2: Subnational Technical Assistance and Pilots (cost at appraisal and at restructuring US\$3.05 million; actual cost: US\$2.77 million)



Component 2A: Selected activities related to multimodal transport across the Bohai Gulf, including, inter alia to: (i) develop policies and incentives to attract freight traffic to the sea ferry route; (ii) evaluate the performance of local logistics operators; (iii) develop solutions to improve the efficiency of freight transport; and (iv) monitor and evaluate carbon emission reductions.

Component 2B: Selected activities related to Urban Freight Joint Distribution in Weifang, including, inter alia to: (i) collect urban freight data and install emission monitoring sensors in sample trucks; (ii) develop recommendations to improve the efficiency of urban freight distribution; and (iii) carry out training for truck drivers and campaigns on green urban freight distribution schemes.

Component 2C: Selected activities related to Sea-Rail Intermodal Transport in the port of Xiamen, including, inter alia to: (i) develop a multimodal transport information platform for sea-rail-road orders; and (ii) develop an optimization plan for multimodal freight operations at Xiamen Port.

Component 2D: Selected activities related to Integrated Urban-Rural Distribution in Guangdong, including, inter alia to: (i) develop a transport organization plan for urban-rural integrated distribution; (ii) develop the common module for integrated urban-rural distribution and apply the module in the existing logistics platform; (iii) monitor and evaluate activities; and (iv) carry out training and campaigns on urban-rural integrated distribution.

Component 2E: Selected activities related to the Integrated Development of the Inland Waterway of the Han River, including, inter alia to: (i) the develop a strategic plan for the integrated development of the inland waterway of the Han River; and (ii) purchase and install solar-powered navigation lights along selected pilot segments of the Han River.

During the 2022 restructuring, Component 2C: Selected activities related to Sea-Rail Intermodal Transport in the port of Xiamen was cancelled and the development of a data collection and analysis platform for freight vessels and pilot emission reduction measures on selected freight vessels on the Yangtze River in Hubei were added.

Component 3: Capacity Building, Monitoring and Evaluation, and Project Management (cost at appraisal US\$5.77 million; cost at restructuring US\$5.27 million; actual cost: US\$6.50)

Component 3A: Capacity Building to provide technical support for, inter alia: (i) knowledge and capacity building on multimodal freight transport and urban freight distribution; (ii) dissemination activities; and (iii) eco-driving professional standard development and training courses for truck drivers.

Component 3B: Monitoring and Evaluation (M&E).

Component 3C: Project Management.

During the 2022 restructuring, the international study tours were cancelled.

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

Project Cost. The actual total project cost was US\$21.21 million, which is 155 percent of the appraisal estimate of US\$13.67 million (ICR, annex 3). The higher project cost was due to an increase in the



depth and breadth of the research carried out under component 1, which happened because of the recipient's strong interest in the efficient and green freight agenda (ICR, para 62). The Bank team in its written response to IEG of November 13, 2024 (all references to the Bank's written response refer to this date) noted that 15 technical assistance (TA) activities were completed instead of six TA activities envisaged at appraisal.

Financing. The project was expected to be partially financed through a GEF grant of US\$8.25 million. The project disbursed US\$7.58 million, corresponding to 92 percent of the appraisal estimate. The full grant amount was not disbursed because of the appreciation of US dollar vis-a-vis the Chinese Yuan.

Recipient Contribution. The expected recipient contribution at appraisal was US\$5.42 million. The actual recipient contribution was US\$13.63 million, corresponding to 251 percent of the appraisal estimate.

Dates and Project Restructuring. The project was approved on December 18, 2018, became effective on March 31, 2019, and was expected to close on December 31, 2022. The closing date was extended by one year to December 31, 2023 to make up for the delays caused by an initial slow project start and the impact of COVID. The December 1, 2022 restructuring, in addition to extending the closing date, (i) under component 2, cancelled the Xiamen pilot and reallocated of US\$700,000 from Xiamen to Hubei to support new pilot activities, (ii) reallocated US\$500,000 from component 3 to component 1 to support the new TA activities, (iii) revised the results framework, and (iv) changed the implementation schedule.

Split Rating. Several outcome targets were revised, but on balance the project scope remained the same or even slightly expanded. Therefore, no split rating is applied, and the project achievements are assessed based on the revised targets.

3. Relevance of Objectives

Rationale

Country and Sector Context. At appraisal, China had experienced rapid economic growth over decades, resulting in increased energy consumption and greenhouse gas (GHG) emissions. At that time, China was the largest GHG emitter, accounting for about one quarter of global GHG emissions (ICR, para 3). China continues to be a large emitter of GHG emissions, with its carbon dioxide (CO₂) emissions accounting for nearly a third of annual global CO₂ emissions (World Bank China Overview: <https://www.worldbank.org/en/country/china/overview>). At appraisal, 66 percent of freight in China was moved by carbon-intensive road transport. Railway and waterway transport, which is cost effective and environmentally friendly, was underutilized. The problems that caused obstacles to multimodal transport were (i) lack of multimodal freight hubs, (ii) lack of standardization of transport units, equipment and operational rules and documentation, (iii) institutional barriers between mode operators and lack of incentives, and (iv) lack of information sharing. China also had no national freight flow model to support data informed policy analysis and decisions. Because of the booming e-commerce, urban freight transport was rapidly increasing, but approaches to last-mile urban distribution were inefficient. This caused air pollution, GHG emissions, and traffic congestion.

Alignment with Strategy. At appraisal in 2018, the PDO was fully in line with the Bank's FY13-FY16 China Country Partnership Strategy, which focused on greener development and low-carbon transport. By aiming



to foster greener freight solutions, the PDO supported the Strategic Theme 1: Supporting Greener Growth. The PDO remained consistent with Engagement Area 2: Promoting Greener Development and its objective of Promoting Low-Carbon Transport in the FY20-FY25 China Country Partnership Framework. At appraisal, the PDO was also aligned with China's 2016-2020 13th Five-Year Plan, which focused on the development of a modern integrated transport system. It remained in line with China's 2021-2025 14th Five-Year Plan, which supported Modern Comprehensive Transport Development.

Previous Sector Experience. The PDO built on the Bank's previous efforts in China to foster efficient and green freight transport. This included several logistics and freight transport projects, such as the (i) Guangdong Green Freight Demonstration Project (P119654), which demonstrated the global and local environmental benefits of applying energy efficient vehicle and operating technologies, improving energy efficiency, and reducing GHG emissions in the road freight transport sector, (ii) Hubei Xiaogan Logistics Infrastructure Project (P132562), which enhanced the connectivity and efficiency of logistics operations, (iii) Three Gorges Modern Logistics Center Infrastructure Project (P153473), which improved freight transport and logistics services, and (iv) Hubei Inland Waterway Improvement Project (P158717), designed to improve inland waterway transport capacity and reliability along the Han River.

The relevance of the Objectives is rated as substantial. At appraisal and project closing, the PDO was fully aligned with the country's and Bank's previous and current strategies. The PDO was also designed to build on the efforts in previous projects in the freight sector in China. The PDO was appropriate to address the development problems of an inefficient and not sufficiently environmental-friendly freight transport system. However, the second objective of the PDO, i.e., to pilot innovative carbon emission reduction measures in the freight transport sector in selected provinces, could have been formulated with greater focus on the transformational expectation of the pilots given the experience and capacity in China and because the indicators to measure this objective were mostly outcome indicators.

Rating

Substantial

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

To improve the recipient's institutional capacity to formulate and evaluate policies and strategies to promote green freight transport systems

Rationale

According to the theory of change (ToC), activities to develop national policies, plans, strategies, standards, guidelines, tools and capacity for a low carbon multimodal freight transport system and green urban freight distribution were expected to have as main outputs (i) national policies, plans, strategies, standards and guidelines for a low carbon multimodal freight transport system and urban freight distribution, (ii) a national freight flow model, and (iii) an abatement cost analytical tool. In terms of outcomes, this was to lead to the (i)



Ministry of Transport (MOT) approving the national policies, plans, strategies, standards, and guidelines, (ii) the provinces and cities complying with and using these MOT-issued documents and tools, and (iii) officials and other stakeholders with greater capacity. All this was expected to contribute to improved institutional capacity to formulate and evaluate policies and strategies to promote green freight transport systems. The ToC has logical gaps insofar as not all outputs, while necessary, are sufficient to achieve the desired outcomes. For instance, the approval of plans and guidelines and the development of tools does not necessarily mean that they are used and hence strengthen the institutional capacity to formulate and evaluate policies and strategies to promote green freight transport systems. There is limited linking of the various activities to an overall trajectory towards reasonable change in the sector. The main assumptions were that (i) the TA and analytical support would be of good quality, (ii) the MOT would approve the policies, plans, strategies, standards, and guidelines, (iii) the national government, provinces, and cities would comply with and use the policies, plans, strategies, standards, guidelines, tools, and models, and (iv) the capacity strengthening activities would lead to greater capacity.

Outputs

The following outputs materialized during the life of the project to achieve objective 1 (ICR, paras 26 - 41 and annex 1):

- 15 national TAs, **exceeding the target of 9 national TAs completed**. The Bank team, in its written response to IEG, pointed out that all TAs had to pass a technical review committee before acceptance in line with what is mentioned in the PAD (page 31). According to the Bank team, such approval indicates a higher likelihood that the TAs will be used, as it reflects the committee's endorsement of their relevance and quality. In its written response, the Bank team also pointed out that the results of these TAs has influenced the contents of the documents adopted under this project. Finally, the Bank team in the interview with IEG of November 14, 2024 (all references to the interview of the Bank team with IEG refer to this date) pointed out that all the TAs completed before the 2022 restructuring have been used in policy making or as inputs for tools, recommendations, or other measures. However, more recent TAs added with the restructuring, such the research on the impact of China's demographic change trends on green freight and countermeasures, were completed just before project closing and their impact is not yet known.
- 5 national TAs informed by citizen engagement, **achieving the target of 5 TAs informed by citizen engagement**.
- A national freight flow model to optimize the allocation of transport system resources at the national or regional levels, **achieving the target of completing this model**.
- 1,153 people trained in national-level trainings and workshops on finance, procurement, and areas necessary to implement of different project activities, **exceeding the target of 500**.
- 6,458 trained truck drivers in national green truck driver trainings, **exceeding the target of 300**.

Outcomes

- The MOT adopted the MAC analysis tool and the national freight model for freight emissions reduction, **achieving the target of two analytical tools adopted by MOT for implementation in national planning and policy development**. The national freight flow model has been used to inform several key policy documents at national and provincial level, such as the Guangdong Province Comprehensive Transportation Service Development Plan (2021-2025) (ICR, para 28).



- The MOT adopted the Action Plan to Promote the Development of Multimodal Transport and Optimize and Adjust the Transport Structure (2021-2025), the 14th Five-Year Plan for Comprehensive Transportation Services, and the 14th Five-Year Plan for Modern Integrated Transportation Hub Systems, **achieving the target of three national plans adopted by MOT for implementation.** The Bank team, in its written response and the interview with IEG, explained that these plans set out the high level objectives at national level, which provinces, autonomous regions, and cities translate into their own plans. The Bank team also pointed out that China is a compliance-oriented country, therefore, if a national plan is adopted by the MOT, it is generally complied with. However, a lack of commitment of local authorities and the unavailability of resources for implementation might jeopardize the implementation of the plans.
- The China Greater Bay Area (Guangdong-Hong Kong SAR-Macao SAR) Standards Innovation Alliance adopted the guidelines on Urban Distribution Path Optimization and Intelligent Scheduling, **largely achieving, in substance, the target of one guideline on improving urban freight transport issued by MOT for implementation.** The Bank team, in its interview with IEG, clarified that the adoption by the China Greater Bay Area Standards Innovation Alliance, the leading alliance in the trucking sector, means that the industry already uses the guideline without need for a formal issuance by the MOT. The MOT's involvement in this area consisted of adopting standards to assess how green the urban freight distribution system is and issuing draft guidelines on Urban Distribution Path Optimization and Intelligent Scheduling.
- The Bank team, in its written response and the interview with IEG, clarified that the project supported the development of a low-carbon urban freight solution, i.e., a freight scheduling and optimization software, which the MOT recognized and widely and actively disseminated. The project also supported pilot applications of the solution in logistics companies in Meizhou, Shenzhen, Jieyang, Chaozhou, Qingdao, Weifang, Jinan and other places. For instance, in Guangdong an estimated 20 percent of freight operators uses the urban freight solution. Therefore, since part of the industry is already using the solution even without the MOT's formal adoption, **the target of the MOT adopts the E-commerce based urban freight distribution solution, in substance, is considered largely achieved.**
- The MOT adopted the Action Plan to Promote the Development of Multimodal Transport and Optimize and Adjust the Transport Structure (2021-2025) and the 14th Five-Year Plan for Comprehensive Transportation Services, **achieving the target of MOT adopts the action plan for multimodal freight transport development.** The Bank team, in its written response and the interview with IEG, confirmed that the outcomes under this target are the same as the ones reported for the target of three national plans adopted by MOT for implementation above.

The project outputs were used as inputs in regulatory measures not captured by targets in the results framework, such as (i) the MOT's Guiding Opinions on Accelerating the Construction of a Modern Transportation and Logistics System, which are still in draft (ICR, para 37), (ii) the China Railway Corporation's policies on railway-waterway combined transport and the construction of relevant dedicated railway lines for railway-waterway combined transport (ICR, para 31), and (iii) Implementation Opinions of the Ministry of Transport, the National Railway Administration, the Civil Aviation Administration of China, and the State Post Bureau.

The efficacy of this objective is rated as substantial. The recipient's institutional capacity to formulate and evaluate policies and strategies to promote green freight transport systems improved. At the output level, the project exceeded the target of national TAs completed, achieved the targets for citizen engagement and the national freight model, and exceeded the target of trained officials and other stakeholders. At the outcome



level, the project achieved the targets with minor shortcomings. These shortcomings are as follows: (i) reporting the same outcomes for the two separate targets of "three national plans adopted by the MOT for implementation" and "the MOT adopts the action plan for multimodal freight transport development"; and (ii) the lack of MOT's formal issuing of the guideline on improving urban freight transport and its formal adoption of the E-commerce-based urban freight distribution solution. This meant that these targets were in substance largely achieved without the interventions of the MOT. The project provided inputs for additional regulatory measures not captured in the results framework, and it is plausible to assume that the trained officials and other stakeholders at least somewhat enhanced their capacity in the field of green freight transport systems.

Rating

Substantial

OBJECTIVE 2

Objective

To pilot innovative carbon emission reduction measures in the freight transport sector in selected provinces

Rationale

According to the ToC, activities to (i) develop policies and incentives for highway-waterway multimodal freight transport and logistics solutions in the Yantai pilot on the Bohai Gulf, (ii) improve urban freight efficiency in the Weifang pilot, (iii) foster integrated urban-rural distribution in the Guangdong pilot, (iv) foster integrated development of inland waterway transport in the Hubei pilot, and (v) disseminate knowledge through TransFORM were expected to have as outputs (i) an enabling environment for drop-and-pull for freight transport and an association to attract logistics operators, (ii) recommendations to improve urban freight efficiency, (iii) completed pilot on integrated urban-rural distribution, (iv) an integrated development plan, freight vessels analysis platform, and freight vessels emission reduction pilot, and (v) disseminated lessons and knowledge. These outputs were expected to have as outcomes (i) increased sea ferry-highway freight transport in the Bohai Gulf freight corridor, (ii) piloted urban freight distribution solutions in Weifang, (iii) less empty trucks on return trips from rural to urban in Guangdong, and (vi) better planning of multimodal freight transport for the Han River. All these outcomes were expected to lead to CO2 emission reductions. The main assumptions were that (i) the project outputs would be of good quality and (ii) the plans, policies, recommendations, and other outputs would be adopted and implemented. While comprehensive in covering the full range of activities, the ToC misses a clear connection to how several of the outputs, such as an integrated development plan and recommendations to improve urban freight efficiency are sufficient motivators for change.

Outputs

The following outputs to achieve objective 2 and measured in the results framework materialized (ICR, paras 26 - 41 and annex 1), but most indicators do not well capture the outputs of the planned project activities (see section 9):

- The project trained 233 villagers under the Guangdong integrated urban-rural distribution system pilot, **exceeding the target of 200 villagers trained.**



- The project trained 134 female villagers under the Guangdong integrated urban-rural distribution system pilot, **exceeding the target of 100 female villagers trained.**
- Three Yangtze River cargo vessels enrolled in the Hubei pilot, **achieving the target of three.**
- Four international freight transport conferences held under TransFORM, **achieving the target of four.**

The following outputs not captured in the results framework were also achieved:

- Under the Yantai pilot, the project designed solutions to promote the development of drop-and-pull transport, which include information networking promotion, logistics parks construction improvements, upgrading for cargo roll-on-roll-off transport ships, further optimization of regional docking work, and forming logistics alliances (ICR, para 43). It also supported unified technical standards for drop-and-pull trucks, a single bill of lading operated by third-party logistics operators through established ICT platforms, and facilities at the port, such as a lounge for truck drivers (ICR, page 13).
- Under the Weifang pilot, the project supported the installation of 140 emission monitoring sensors in sample trucks and developed the Weifang City Logistics Vehicle Sample Configuration Plan and the Weifang City Logistics Vehicle Access Plan (ICR, page 14 and para 44). The Bank team, in its interview with IEG, clarified that these sensors collect data on driving behavior, which is monitored by the city's Transport Bureau and used for policy making.
- Under the Hubei pilot, the project financed in-depth study of the Yangtze River's complex navigation environment and ship type characteristics, new energy technologies for ships, and energy efficiency improvement technologies for ship operations (ICR, para 46) and a carbon emission data analysis software system for Yangtze River cargo ships (ICR, para 47). It also financed 20 solar-powered navigation lights along the Han River (ICR, page 14).
- Under the Guangdong pilot, the project supported open-source smartphone application software that was used by freight companies to develop three smartphone applications "Yue Cheng Pei", "Huo Hao Hao Yun", and "Qing Cheng Pei". These applications helped match drivers with cargo sources to reduce the percentage of empty trucks and the driver waiting time and corresponding expenses (ICR, page 14 and para 45).

Outcomes

- The project is expected to reduce 33,164,175 tons of CO2 emissions, **significantly exceeding the target of 15,600,000 tons.** These are indirect scale-amplified reductions, directly from the project pilots and indirectly from replication of successful pilots as a result of policy incentives and capacity strengthening, during the project's lifecycle in line with what was envisaged in the PAD (page30).
- The drop-and-pull Bohai Gulf ferry traffic is 10.16 percent, **slightly exceeding the target of 10 percent.**
- Weifang adopted the Weifang City People's Congress Standing Committee's Decision on Strengthening the Management of Limited-time Free Parking in Public Places, **achieving the target of Weifang adopts the proposal for improving urban freight transport efficiency.** This decision is partially based on work done for the Weifang City Logistics Vehicle Access Plan.
- The Hubei Province's 14th Five-Year Plan for Comprehensive Transportation Development, 14th Five-Year Plan for Water Transport Development, Inland Waterway Planning (2035)", and 14th Five Year Plan for Integrated Transportation Services were adopted, **achieving the target of Hubei Department of Transport adopts the Han River inland waterway integrated development plan.** All four plans make use of the findings of the project-financed TA.



- The empty trucks on the return trip from rural villages to urban centers in Guangdong were reduced from 95 percent at appraisal to 79.1 percent by project end, **achieving the target of 80 percent of empty trucks on the return trip from rural villages to urban centers in Guangdong.**

The efficacy of this objective is rated as high. At the output level, the project piloted innovative carbon emission measures in the freight sector and exceeded or achieved its targets. However, these targets did not adequately capture the outputs of the project pilots. At the outcome level, the estimated CO2 emission reduction significantly exceed the target. The project also fully achieved the target of adopting proposals and plans and reducing the percentage of empty return trips from villages to urban centers. So, while there were limitations in the connection between the outputs and their ability for emission reductions, the indicators showed that there was considerable uptake and openness to change that resulted in improved performance in the sector.

Rating
High

OVERALL EFFICACY

Rationale

The **overall efficacy is rated substantial.** The project achieved the first objective with minor shortcomings, and it is rated substantial. The project fully achieved and partially exceeded its second objective, which is rated high.

Overall Efficacy Rating

Substantial

5. Efficiency

Economic Analysis

At appraisal, an incremental cost analysis to assess the incremental costs and environmental benefits of the project scenario compared to the business as usual case was carried out. The incremental costs of the project included the funds to support national-level TA to improve the efficiency of intermodal freight systems, provide support for local pilot projects, and carry out capacity building. The environmental benefits included direct and indirect CO2 emission reduction benefits. Detailed analyses of the direct and indirect environmental benefits for the Yantai (Bohai Golf) and Guangdong pilots were carried out. The incremental cost analysis showed an estimated incremental cost of US\$13.67 million and estimated total global environmental benefits of US\$15.6 million. Based on this, the cost effectiveness of the project, i.e., the unit cost of CO2 emissions mitigated under the projects, was US\$0.876 per ton of CO2 (PAD, para 68).



By project end, the same analysis was repeated with minor changes. The analysis covered one additional year of useful life of the pilot interventions because of the one-year project closing data extension. The project covered the Yantai (Bohai Golf), Guangdong, Hubei, and Weifang pilots, but only considered the scale up effects of the Yantai (Bohai Golf) and Guangdong pilots to estimate the indirect environmental benefits (ICR, para 51 and annex 5). In its written response, the Bank team specified that the incremental cost of the project was US\$21.21 million and the estimated total global environmental benefits amounted to US\$33.16 million. Based on this, the cost effectiveness of the project is estimated at US\$0.640 per ton, which is 27 percent more efficient than the US\$0.876 per ton estimated at appraisal.

Administrative and Operational Efficiency

The project was expected to be implemented in four years. However, it had a slow start after its approval in December 2018 because it took the national project management office (NPMO) more than one year to open the project's designated account and sign the agreements on the implementation arrangements with the pilot provinces. The project was also affected by the COVID outbreak in 2020, especially at the local level where the Transport Bureaus were fully occupied to ensure mobility and logistics in their jurisdictions (Restructuring paper, para 20). In addition, staff turnover in some local project agencies negatively affected the projects efficiency (ICR, annex 6). Because of all this, the one-year closing date extension was needed.

The actual project cost was 55 percent higher than the appraisal estimate because, as mentioned in section 2, more TAs and TAs with greater depth and breadth were carried out.

On balance, the efficiency of project implementation is rated substantial. The project's cost effectiveness was 27 percent higher than estimated at appraisal because of the larger global environmental benefits. However, the project suffered from administrative inefficiencies.

Efficiency Rating

Substantial

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		0	0 <input type="checkbox"/> Not Applicable
ICR Estimate		0	0 <input type="checkbox"/> Not Applicable

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

6. Outcome

The project's overall outcome is rated as satisfactory. The relevance of the PDO to government priorities and the World Bank strategies is rated as substantial. The project achieved its PDO, and the efficacy of the



objectives is rated as substantial. The project was implemented largely efficiently despite an one-year closing data extension.

a. Outcome Rating
Satisfactory

7. Risk to Development Outcome

The following pose risks to development outcomes:

Government ownership and commitment risk: The most significant and likely risk is that measures implemented in the Bohai Bay pilot in Yantai will not be replicated in at least 10 other locations and the measures implemented in the Guangdong pilot will not be replicated in at least 20 other locations as assumed in the CO2 emission reduction estimate. For the Bohai Bay pilot in Yantai, the ICR (para 77) states that "it is promising that this target will be met since the MOT made commitments to accelerate the development of multimodal transport in at least 63 major ports across the country and it was assumed that at least some of these developments would be influenced by the learnings derived from this pilot". In its written response, the Bank team clarified that the main stakeholder to replicate the pilot experiences is the MOT. Similarly, for the Guangdong pilot, the ICR (para 77) states that "as of July 2023, the MOT announced 118 counties as the third batch of urban and rural transport integration demonstration counties. Of these, there are 74 counties that have characteristics [...] suitable for the replication of the measures done in the Guangdong pilot." the Bank team, in its written response highlighted that "the measures supported by the project are now well and truly mainstream across China and are not considered risky." The Bank team, in its interview with IEG, clarified that most of the TA activities carried out early during project implementation have already been used extensively. However, there is a risk that some of the more recent activities will not be fully used, hence will not contribute to improve the recipient's institutional capacity to formulate and evaluate policies and strategies to promote green freight transport systems.

Technical risk: The project developed innovative policies, strategies, and pilots in the area of green freight transport, which have a low technical risk. As pointed out by the Bank team in its written response, "things in China move fast and the recipient and other stakeholders have high capacity. While these policies, strategies, and pilots were innovative at project appraisal, they have been massively mainstreamed as business as usual across China since then."

8. Assessment of Bank Performance

a. Quality-at-Entry

The quality at entry is rated as satisfactory. The Bank team ensured that the project design built on the government's development priorities and the previous project experience in China. The Bank team made sure that the project design was closely aligned with the Bank's engagement strategy. The



Bank team supported a project design that combined TAs at the national level to shape the framework for green freight transport and pilot projects at the subnational level. The selection of these pilot projects was based on how well they fitted with the national green freight transport priorities. This had proven successful on green urban transport in China in the past. The Bank team also provided international best practices on green freight transport and logistics and built strong strategic partnerships with the public, academic, professional institutions, and private organizations, in Germany, Canada, USA and UK to inform the pilot projects on planning, development, and financing of the logistics clusters (PAD, para 42).

The Bank team paid attention to citizen engagement by including an indicator to measure the TAs informed by citizen engagement in the results framework.

The Bank team also ensured that sound institutional arrangements were set up. Since the implementation agencies for three pilot projects had no previous experience with World Bank projects, the Bank team provided training on fiduciary aspects and supported adequate safeguards preparation. Given the nature of project and the previous World Bank experience in China, a modest overall risk rating was adequate. Risks were adequately identified, and mitigation measures were mostly sound (the staff turnover in some project implementation agencies, while anticipated and mitigated through repeat training and consultant support, still negatively affected project efficiency). The ICR (annex 6) notes that the recipient praised the professional support provided by the Bank team during project initiation.

Although the Bank team did ensure that the PDO was clear and achievable, one of the objectives could have been improved with greater focus on the transformational expectations for the intervention given the experience and capacity in China. The Bank team could also have mitigated the heavy reliance on assumptions in the project results' logic. Finally, although the M&E system design was adequate to assess the achievement of the results, the Bank team could have insisted on better capturing some of the project outputs.

Quality-at-Entry Rating Satisfactory

b. Quality of supervision

The Bank team supported project implementation by focusing on technical aspects and project management. It provided extensive technical guidance to the implementing agencies on all aspects of the project, including but not limited to the overall project management approach and strategic study outputs.

The Bank team worked closely with the implementing agencies to manage implementation challenges, such as the delay in setting up the designated account and the implication of COVID. The Bank team provided regular trainings to the implementing agencies. Because the Bank team was Beijing-based, it was able to provide swift and just-in-time support to the recipient (ICR, para 74). The Bank team satisfactorily supported safeguard and financial management issues. The ICR (annex 6) notes that the recipient appreciated the professional support and guidance provided by the Bank team during project implementation.



Finally, the Bank team restructured the project promptly after the Mid-Term Review. In terms of minor shortcomings, the Bank team could have added indicators to the results framework to capture key outputs of the pilot projects at the restructuring.

Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

According to the PAD (para 55), the NPMO under the MOT and the local project management offices (PMO) were expected to be responsible for M&E. The local PMOs were to ensure that local level enterprises submitted the data needed for project M&E. In addition, the project had a M&E budget for consultants to assist the PMOs in data collection and analysis, particularly with collecting data and assessing the CO₂ emission reductions and targets of the pilot projects.

The results framework included 19 indicators. All indicators had baselines and realistic project end targets. The indicators to assess the achievements of the efficacy of objectives 1 and 2 were adequate, but the project could have benefitted from better targeted or additional output indicators to monitor the key outputs of each pilot project.

The PAD (annex 1) included clear definitions for the descriptive indicators, which were useful in assessing the project achievements. It also included guidance on data collection. However, as the Bank team clarified in its interview with IEG, the methodology to assess the CO₂ emission reductions was not spelled out in a sufficiently clear manner at appraisal, which gave rise to lengthy discussion during project implementation and at evaluation.

b. M&E Implementation

According to the ICR (para 64), the NPMO and the local PMOs diligently collected the data required for the indicators. The ICR (para 64) and the Bank team in its interview with IEG stated that indicators related to CO₂ emission reductions were largely calculated following the methodology established at appraisal, but updates were made to some assumptions based on more recent and accurate data. Data used was reliable and of good quality.

The indicators were updated during each mission and reported in the Implementation Status and Results Reports. During the 2022 restructuring, the indicators and targets were revised to reflect the project



changes, but the project missed an opportunity to add indicators to better monitor the outputs of the pilot projects.

Finally, the ICR (para 64) states that the M&E functions and processes will likely not be sustained after project closing as the indicators were designed specifically for project monitoring.

c. M&E Utilization

The ICR (para 65) notes that the M&E data was used by the Bank team, the NPMO, and the local PMSs to monitor project progress and inform the directions of project implementation.

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

At appraisal, the project was classified as category B for environmental assessment purposes. The project included no civil works or feasibility studies for civil works. The TAs to be carried out under the project focused on green freight transport, so they were designed with environmental protection objectives through energy saving and pollution and CO2 emission reductions. However, it was anticipated that the TAs could have potential environmental implications in terms of downstream implementation of their findings and recommendations. The following safeguards policies were triggered: Environmental Assessment OP/BP 4.01, Natural Habitats OP/BP 4.04, Indigenous Peoples OP/BP 4.10, and Involuntary Resettlement OP/BP 4.12 mainly as a precautionary measure. The project prepared and disclosed an Environmental and Social Management Framework (ESMF). The environmental classification and the triggered safeguards policies did not change with the 2022 restructuring.

In terms of environmental and social performance during project implementation, the NPMO assigned an environmental and social focal point to manage the project's environmental and social performance and contracted an environmental and a social consultant to assist in the ESMF implementation. The project conducted environmental and social capacity building and training workshops for the PMOs or contractors at least once a year. An effective working mechanism and procedure for environmental and social assessment was established between PMOs and contractors.

Since the outcomes of TAs and other project activities, such as the digital platforms, could have had environmental and social implications going forward, the project prepared terms of reference to carry out environmental and social assessments and incorporated them into the scope of the TA activities and platform development. This ensured that environment and social risks were identified and the corresponding measures were put forward. The ICR does not provide details on these risks and mitigation measures.

The ESMF performance was monitored and reviewed by both national PMO and the World Bank through the regular missions and progress reports. Existing grievance redress services were used to collect suggestions or complains related to the proposed TA studies and any downstream investment. The ICR



(para 68) points out that overall, the ESMF was well implemented, the project environmental and social performance is satisfactory.

There was no need to apply the safeguard polices on Involuntary Resettlement (OP4.12), Natural Habitats (OP4.04), and Indigenous Peoples (OP4.10) during project implementation because the environment and social impacts screening concluded that no TA supported the preparation of feasibility studies of infrastructure investments, technical designs, or other activities directly linked to future investment projects (whether or not funded by the World Bank).

b. Fiduciary Compliance

Procurement. The ICR (para 72) notes that the that the project carried out the procurement activities in line with the legal covenants and the World Bank’s procurement guidelines and that the project’s procurement performance was satisfactory. The ICRR does not mention any procurement problem. The project procured 35 consulting services and two contract for goods, which were all completed by project closing. The recipient’s procurement staff attended procurement training provided by the Bank team during project preparation and trainings organized by the World Bank and Tsinghua University during project implementation. In addition, the NPMO organized continuous capacity building events on procurement and contract management for staff members of the NPMO and the local PMOs.

Financial management. The ICR (para 71) notes that the projects financial management performance was satisfactory. The project submitted the financial audit reports for 2019 to 2022 on time with acceptable quality. No significant financial management issues were disclosed in the audit reports, which all had unqualified opinions. Most of the interim financial reports (IFRs) were also submitted to the World Bank in a timely manner, but a few had short delays. The IFRs were found to be of acceptable quality.

c. Unintended impacts (Positive or Negative)

d. Other

11. Ratings

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



12. Lessons

The following lessons have been derived and summarized from the ICR, with additions by the IEG after discussions with the Bank team:

Supporting pilot projects that are fully aligned with national strategic priorities and focusing on key leverage points helped in achieving significant CO2 emission reductions. The project's success was significantly influenced by its close alignment with China's national strategic priorities, particularly on energy conservation and CO2 emission reduction. The Bank team clarified in its written comments, that when the project was designed, the national government laid out its objectives and selected the proposals from subnational government that most aligned with these objectives. By focusing on key leverage points within the transport sector, the project was also able to maximize performance benefits with minimal capital investment, demonstrating the effectiveness of targeted interventions. This is likely to have important consequences for the longevity and catalytic nature of the project's support.

Continuous capacity building and knowledge sharing ensured buy-in into the green freight agenda. The project's success in promoting green freight practices was significantly influenced by its capacity building and knowledge sharing activities, which included training programs, seminars, and knowledge sharing platforms. These activities helped spread green freight transport ideas to more industry stakeholders. In particular, by equipping companies with the knowledge and tools to measure their carbon footprints, set low-carbon goals, and develop sustainable roadmaps, the project has fostered a culture of environmental responsibility within the industry. The project's use of professional media platforms to publicize project results and promote the concept of green freight further amplified its impact and contributed to the long-term sustainability of its outcomes. This lesson therefore highlights the importance of investing in long-term capacity building and knowledge sharing to ensure that project outcomes are likely sustained beyond the project's completion.

Multimodal transport is a powerful tool for emission reduction. The project demonstrates the effectiveness of promoting multimodal transport, particularly rail-water intermodal transport, in reducing CO2 emissions and energy consumption. By shifting freight from road to rail and water, the project showed that it is possible to significantly reduce transport distances, leading to substantial reductions in fuel consumption and GHG emissions. This lesson underscores the importance of prioritizing multimodal transport strategies in future projects aimed at achieving sustainable freight transport.

Digital solutions and standardization are essential for optimizing freight efficiency. The project's success in implementing digital solutions (platforms) for freight matching, route optimization, and logistics information sharing highlights the crucial role of technology in improving freight efficiency and reducing costs. These digital solutions facilitated seamless connections, optimized vehicle loading rates, and reduced waiting times for truck drivers, ultimately contributing to a more efficient and cost-effective freight system. Furthermore, data standardization with platforms across modes, to share data, helps smoothen multi-modal operations, enable shorter connections times between different modes, and better route planning/optimization. This lesson emphasizes the need for incorporating digital solutions in future projects to enhance freight logistics and promote sustainable practices.



A lack of standardized CO2 emission data collection methodologies leads to difficulties in robust monitoring. The methodology to collect data on CO2 emissions of the pilot intervention used at appraisal was not very clear, and the project teams had many discussions on how best collect data and monitor CO2 emissions. Although the project made significant strides in collecting data on CO2 emissions and other environmental indicators, the data collection and monitoring systems still require further refinement. The project highlights the need for standardized data collection methodologies and robust monitoring systems to ensure accurate and reliable data CO2 emission reduction data. This lesson emphasizes the importance of investing in data infrastructure and strengthening data management practices to effectively track progress and measure the effectiveness of green freight initiatives.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR is clear, consistent, well-structured and written, and largely comprehensive. It includes useful tables with project outputs and outcomes. The ICR follows the ICR guidelines with regard to the narrative and the rating.

The quality of the evidence is adequate. The ICR is results oriented. It adequately analyses the outputs and outcomes captured in the results framework, but it could have given more focus on if and how several TA activities were used. It could also have described more in detail the link between the outputs of the pilot projects and the CO2 emission outcomes. For example, the ICR (page 14) reports that "140 emission monitoring sensors were installed in trucks and data from these sensors was sent to Weifang Transportation Energy Consumption Platform and Emergency Command Center Platform for further analysis." It does not explain what happened with the results of the analysis and how they contributed to CO2 emission reductions. Most links, however, are clear in the Carbon Emission Reduction Annex 5. The efficacy analysis could have dwelled more extensively on the attribution of CO2 emission reductions to project activities. It could also have benefitted from better justifications why certain outcomes were considered as achieved even if the target was not fully achieved. For example, two project outputs had to be approved by the MOT but were adopted by the industry instead.

The CO2 emission reduction calculations and the economic analysis are sound, but the ICR did not report the total incremental costs and the estimated million tons of CO2 emission reduction. The Bank performance and M&E sections are largely adequate. The safeguard and fiduciary sections are concise, well presented, and contain all necessary information. The lessons are derived from experience and based on analysis, but the presentation of a few could have benefitted from more details, and their importance only became fully clear in IEG's interview with the Bank team.



a. Quality of ICR Rating
Substantial