

Consequently, water security is becoming increasingly vulnerable in China, particularly in the northern and northwestern regions where available water is anticipated to decrease by up to 24 percent by 2050.<sup>8</sup> Water security serves as a foundation for essential ecosystem services, particularly in water-scarce river basins such as the Yellow River Basin (YRB). As a result, water conservation and ecosystem restoration have become crucial tasks in river basin management throughout China.

Recognizing these important factors, China officially announced the Yellow River Basin's ecological protection and high-quality development as one of its national strategies.

Water scarcity, coupled with competing development-related demands on natural resources, poses a serious challenge to the inclusive and sustainable development of the YRB.

Estimates by the Ministry of Water Resources (MWR) suggest that the river's natural annual flows have decreased significantly, with the 2001-2015 annual average being 25 percent lower than that in 1956-1979.<sup>9</sup> In addition, the water resources development and utilization rate – the ratio of total water use to total water resources in a river basin or region – has reached 80 percent, significantly exceeding the nationally determined sustainable utilization threshold of 40 percent.<sup>10</sup>

Mo, Xing-Guo, Shi Hua, Zhong-Hui Lin, Su-Xia Liu, and Jun Xia.

<sup>8</sup> Ministry of Water Resources.

<sup>9</sup> Ministry of Water Resources.

Ecosystem degradation is a multidimensional problem, demanding cross-sectoral integrated land and water resource management solutions at the basin level.

After devastating floods occurred in several major river basins including the Yangtze River Basin and the Yellow River Basin in the late 1990s, the Government successfully initiated six key forestry and 'Grain for Green' conservation programs as the core of the 'National Ecological Restoration Plan' to address the soil and water erosion issues. These programs increased the country's forest area significantly and provided biodiversity, carbon sequestration, and recreational benefits. However, without integrated planning, restoration outcomes could be undermined by persistent degradation drivers, such as unchecked pollution and competition for limited water. For example, water use for revegetation in the Loess Plateau is reportedly reaching the upper limit for water resource sustainability.<sup>1 3</sup> An integrated landscape approach, as reflected in the official technical guidance on the 'Mountain-River-Forest-Farmland-Lake-Grassland-Desert' approach jointly issued in 2020 by the Ministry of Natural Resources (MNR), the Ministry of Finance (MOF) and the Ministry of Ecology and Environment (MEE), attempts to optimize the spatial interventions and interactions among a range of land cover types, institutions, and human activities in watersheds. This helps to balance sectoral priorities and the competing demands on land and water resources, and enhancing ecosystem services.

Acknowledging the trade-offs and the competing demands on scarce water resources for both ecosystem preservation and transitioning to a high-quality development path, China's declaration of a national strategy of Yellow River Basin Ecological Protection and High-Quality Development (YRB EP&HQD) in 2019 underscores the significance of integrated ecosystem restoration and protection. The national strategy for YRB EP&HQD was followed by a national YRB EP&HQD Plan (hereafter referred to as 'the YRB Plan') issued in 2021, which is an overarching document that provides the guiding principles, emphasized ecological protection as a pre-requisite for high-quality development in the YRB.

The country's 14th Five-Year Plan (FYP) for National Economic and Social Development 2021-2025 and its Long-term Vision for 2035, both announced in 2021, set ecological protection, natural resource management, and climate change adaptation as top national priorities. The Yellow River Protection Law was approved by the National Congress in October 2022, further providing the legislative foundation for implementing the YRB plan.

The World Bank-supported Yellow River Basin Ecological Protection and Environmental Pollution Control Program (P172806) invests in the middle reaches of the YRB in Henan and Shaanxi provinces (hereafter referred to as YRB-HS), and has water scarcity as its primary focus. Approved in March 2022, YRB-HS supports activities to strengthen water use efficiency, water pollution control, and ecosystem management in selected areas in Henan and Shaanxi for better natural resource economy - ecosystem tradeoffs and minimum cumulative impacts on water use in a water-scarce context. This is done through determining the basin- and province-level water balance across water consumption (evapo-transpiration, ET), environmental capacity (EC) and ecosystem services (i.e., the 'ET-EC-ES' approach). The water balance serves as the foundation for identifying and prioritizing sectoral interventions so that water demand for development does not exceed the water thresholds and encourages and incentivizes approaches and investments that optimize water efficiency. Besides the provincial Programs, YRB-HS also has a basin level program (with US\$1.5 million from the World Bank loan) to support the national entity, the Yellow River Conservancy Commission (YRCC), for cross-province coordination and management of water resources in the YRB. The basin-level program will assist YRCC to develop: (a) monitoring capacity; (b) improved knowledge of the relationship among water withdrawal, water drainage and water consumption; (c) technical guidelines for monitoring water consumption based on remote sensing in the YRB; and (d) basin-wide capacity building.

The proposed Yellow River Basin Ecological Protection and Environmental Pollution Control Program (Gansu and Shandong) will geographically expand the World Bank-supported YRB Program area upstream to the fragile loess ecosystems in Gansu Province, and downstream to the river delta wetland ecosystems in Shandong Province (hereafter referred to as YRB-GS).

In this context, the proposed YRB-GS deepens efforts to address water scarcity and water pollution while simultaneously aiming to address the drivers of ecosystem degradation, and to restore and protect key ecosystems in the two provinces. Although provinces across the YRB are confronted with a shared set of development challenges centered around water scarcity, the most heightened competition for limited water resources arises in the middle reach due to the expansion of irrigation, whereas critical ecosystems in the upper and lower reaches provide crucial basin functions and biodiversity benefits. Building on YRB-HS' primary focus on tackling water scarcity and pollution issues to address the water needs for ecosystems, YRB-GS takes a broader approach by not only addressing water scarcity and pollution but also by placing an emphasis on the protection of vulnerable loess ecosystems in the upper reaches and wetland ecosystems in the lower reaches.

This ensures that the ecosystem restoration outcomes remain sustainable, especially considering the constraints imposed by limited water resources and poor water quality. In addition, YRB-GS adopts a landscape approach to identify priority ecosystems for restoration through integrated landscape assessments and spatial prioritization.

#### Evolution from YRB-HS to YRB-GS

YRB-HS aims to strengthen integrated water use efficiency, water pollution control, and ecosystem management in selected regions in the middle reach of the Yellow River Basin in Henan and Shaanxi Province. It adopts the ET-EC-ES approach to incorporate water quantity and quality constraints into ecosystem management. YRB-HS contains a basin-level Program to provide technical guidance and coordination in cross-province water allocation and basin-wide balance. For ecosystem restoration, the primary focus was only to restore basic biophysical conditions (vegetation and topography for erosion control) without ecological assessment or prioritization at the landscape scale.

YRB-GS further expands the World Bank's engagement in the YRB to fragile and globally significant ecosystems upstream to Gansu Province and downstream to Shandong Province. While it will continue to address water scarcity, water pollution and other drivers of ecosystem degradation, YRB-GS emphasizes the restoration of degraded ecosystems. Built on the ET-EC-ES approach, YRB-GS further identifies priority ecosystems for restoration through landscape ecosystem assessments and spatial prioritization.

YRB-GS' focus on ecosystem restoration and protection will improve climate adaptation and mitigation as well as biodiversity conservation outcomes in its Program area and benefit other YRB provinces, as well as be of global benefit.

Healthy and well-managed ecosystems in the YRB could potentially increase carbon stock by an additional 59.5 million tons.<sup>14</sup> Restoring and protecting river estuary and coastal zones, such as seagrass meadows, also contributes to increasing blue carbon function. Restored riparian, aquatic, and coastal ecosystems also provide ecosystem services through filtration, and contribute to mitigating pollution, especially from non-point sources such as agricultural fertilizer. Investments in nature-based solutions, such as riparian woodlands, can improve both water storage and flood resilience.

Integrated landscape planning would prepare communities that are

<sup>14</sup> For instance, it was estimated that soil conservation under the YRB's 'Grain for Green' program sequestered 9.7 million tons of carbon each year from 2000 to 2015 by restoring plants and soils in the Basin. (2018) Effective soil erosion control represents a significant net carbon sequestration.

(2022) The potential for carbon sequestration by afforestation can be limited in dryland river basins under the pressure of high human activity.

The Program supports CPF Engagement Area Two: Promoting Greener Growth, by promoting ecosystem restoration and protection, strengthening sustainable natural resources management, enhancing incentives and institutional coordination for ecosystem management, reducing water pollution, and tackling the issues of soil erosion and salinization.

6 The proposed Program is also aligned with the World Bank Evolution Roadmap, which highlights that urgent action is needed to address growing global challenges, including forest and biodiversity loss as well as climate change, thus contributing to the World Bank's Global Challenge Program on Forest for Development, Climate and Biodiversity. The Program also supports restoration of river and lake ecosystems as well as reducing water pollution from improved wastewater management, thus is also fully aligned with the Global Challenge Program on Water Security and Climate Adaptation. The Program is expected to make a significant contribution to global public goods including climate mitigation and adaptation, biodiversity conservation, and knowledge for development.

The Program will contribute to increased carbon sequestration through the expansion of nature-based solutions, specifically restoration/enhancement of carbon-rich ecosystems (including wetlands, forests, and grasslands) and soil conservation. Through support for efforts to improve wastewater management, the Program will also reduce GHG emissions, including fugitive methane emissions.

Integrated landscape approaches targeting the interconnected challenges of climate change, ecosystem degradation, biodiversity loss, and pollution will identify good practices for scale-up across the basin, China, and beyond. Lessons and knowledge generated by the Program are expected to be relevant for other arid countries or regions grappling with trade offs between development and ecosystem resilience/protection.

China has put several climate commitments in place, including its commitment to peak its carbon emissions by 2030 and achieve carbon neutrality by 2060 (30-60 goal), a Long-Term Strategy for Low GHG Emission Development, and the National Climate Change Adaptation Strategy 2035, to implement actions that address climate change mitigation and adaptation as outlined in its Nationally Determined Contribution. The Nationally Determined Contribution highlights cross-sector coordination and carbon sequestration for climate change mitigation by key ecosystems, including forests, grasslands, and wetlands.

The National Climate Change Adaptation Strategy highlighted the role of nature-based solutions in climate change adaptation, such as forest and wetland restoration, as well as actions to enhance soil and water conservation and wastewater management in small rural towns. The CCDR recommends cross-sector coordination and mobilizing financing to sustain ecosystem conservation results. It also highlights both the adaptation and mitigation benefits of nature-based solutions as ecosystem restoration activities.

The Government's ambitious EP&HQD strategy for the YRB is supported by strong political and financial commitments from central, provincial, and local governments and agencies.

As in the case of YRB-HS, the PforR instrument was also selected for this YRB-GS Program as it can leverage significant resources under existing Government programs to achieve impacts beyond traditional Investment Project Financing (IPF) operation. It also provides an opportunity to introduce performance-based incentives to improve the efficiency, effectiveness, and impact of expenditures by linking the disbursement of funds to the achievement of specific results.

The proposed Program builds on the World Bank's extensive international experience and the lessons learned from previous and ongoing World Bank-financed operations on ecosystem restoration and protection. The World Bank has a long history of supporting ecosystem protection, restoration, biodiversity conservation, and environmental and water resource management globally and in China, with highlights including projects supporting the Xiaolangdi Multipurpose Dam and Loess Plateau watershed rehabilitation. China now highlights ecosystem integrity and health as the core of its high-quality development. The World Bank brings global experience and expertise in incorporating ecosystem management into long-term development and balancing various competing demands on limited ecosystem services in water scarce river basins. The proposed Program particularly leverages the innovations of the YRB-HS, by building on the 'ET-EC-ES' approach to address the interconnection of water consumption, environmental quality and capacity, and ecosystem services under the YRB's rigid water constraints.

The YRB Plan, approved in 2021, highlights four general principles of the YRB national strategy: (a) prioritizing ecological protection, restoration, and green development; (b) enhancing water saving and developing socio-economic activities that comply with water availability constraints; (c) improving spatial planning and development by incorporating ecosystem considerations; and (d) strengthening cross-sectoral coordination and inter-jurisdictional cooperation. The YRB Plan specifies six key task areas including enhancing ecological and environmental protection; promoting water conservation; strengthening disaster management; enhancing integrated pollution management; facilitating high-quality development; and protecting and promoting the Yellow River culture.

Guided by the YRB Plan, Gansu and Shandong developed their respective provincial 'Yellow River Basin Ecological Protection and High-quality Development Plan' (hereafter the Gansu YRB Plan and the Shandong YRB Plan) for 2021 - 2030.

The Gansu YRB Plan calls for a new and integrated model for natural resource and ecosystem management in the upper reach of the Yellow River.

The Shandong YRB Plan aims to protect and restore the Yellow River Delta and calls for a new and integrated model for natural resource and ecosystem management. Specifically, it promotes activities in nine priority areas, including building an ecological corridor along the lower reaches of the Yellow River, promoting integrated environmental pollution management, strengthening water conservation, and improving resilience towards climate-exacerbated disasters.

Each provincial government program includes a set of investments and technical assistance activities that meet two criteria: (a) included within the provincial 14th Five Year Plan project list; and (b) aligned with the provincial YRB plans.

The Program's results will be measured in terms of: (a) improved land and water management for reduction of soil erosion and of water pollution; (b) critical ecosystems restored for ecosystem services and biodiversity co-benefits; and (c) capacity strengthened for integrated landscape planning and management for ecosystem restoration and protection.

The proposed PforR (the Program) is intended to support institutional interventions at the provincial level and direct investments for ecosystem restoration and protection in selected watersheds in Gansu and Shandong Provinces. Among them, Dingxi and Tianshui municipalities are in the Wei River basin (a main tributary of the Yellow River, which drains into Shaanxi Province), with activities supported under YRB (Henan and Shaanxi); Baiyin is in the Zuli River basin (another Yellow River tributary), in which water quality poses serious challenges for ecosystem restoration and protection that are compounded by limited flows.





Results Area 1: Implement sustainable land and water management practices. This RA aims to address the drivers of ecosystem degradation, such as soil erosion, water pollution, fires, and forest pests, and to achieve soil and water conservation, improved forest management and water pollution reduction. It will support: (a) soil and water conservation measures (farmland terracing) and reduction of soil erosion; (b) improved forest and grassland management (including fire and disease prevention and control); (c) improved management of soil salinity; (d) reduced pollution discharged to river systems through improving township domestic wastewater management (through new and rehabilitated wastewater treatment plants and networks); and (e) improved monitoring and capacity building for addressing pollution from livestock and other non-point source agricultural sources.

Critical ecosystems for prioritized restoration are identified through the Technical Assessment (paragraph 39) to increase landscape-level ecosystem service values, biodiversity and climate co-benefits and to account for ecological flow water constraints. It will support: (a) restoration of wetlands (invasive species management, including of plants and animals, restoration of coastal and riparian wetland ecosystems, and seagrass beds); (b) rehabilitation of river ecosystems, including river channel and riparian ecosystems, as well as flood plains; (c) reforestation and forest ecosystem restoration; and (d) grassland and other ecosystem restoration.

Results Area 3: Strengthen the capacity of integrated land and water resource management for ecosystem restoration and protection.

The RA promotes integrated landscape approaches that simultaneously consider water scarcity and quality constraints in ecosystem restoration and protection, including the provision of ecosystem services and biodiversity benefits.

farmers, rangers, plantation owners on integrated landscape planning and decision-making for ecosystem restoration and protection.

YRB-HS therefore includes agricultural water efficiency improvement as a primary focus.

The World Bank loan of US\$300 million will leverage US\$1.411 billion of counterpart funding from the two provinces, while the basin-level Program established under YRB-HS will also provide institutional coordination and technical guidance for YRB-GS.

The proposed Program Development Objective is to improve land and water resource management and restore degraded ecosystems in selected areas in the Yellow River Basin in Gansu Province and Shandong Province.

Land area under sustainable landscape management practices (Corporate Results Indicator (CRI), Ha)

b. Reduced Pollutant loads (COD) entering rivers (Tons/year)

c. Hectares of terrestrial and aquatic areas under enhanced conservation and management (Corporate Scorecard indicator, Ha), cumulative

d. Sequestered CO<sub>2</sub>e due to ecosystem restoration (tons/year)

e. Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved

E. Disbursement-Linked Indicators and Verification Protocols

The verification procedures, implementation arrangements, and M&E plan for the Program will be included in a Program Implementation Plan (PIP), which will be prepared by Gansu and Shandong by loan effectiveness.

The national PSG, which will be established under YRB-HS within three months after the loan becomes effective and chaired by the NDRC Regional Economy Department, is tasked by the national government to coordinate implementation of the national Yellow River EP&HQD strategy.

While the PPMOs are responsible for institutional and capacity building activities, Program counties will be responsible for implementation of physical investments.

Gansu and Shandong have established their JEGs, consisting of experts in the fields of ecosystem protection, biodiversity, water resources, and pollution control, as well as environmental, social, and fiduciary aspects. The role of JEGs is to provide technical supports to the PPMOs during Program preparation and implementation, including carrying out technical assessments and having technical discussions with the corresponding World Bank specialists.

Program results targets will be monitored internally by the PMOs and the DLIs will be verified by a third-party verification agency (TPVA) engaged by the implementation entity in each province, with the Terms of Reference cleared by the World Bank.

Technical assistance on M&E will be provided during implementation to the Shandong and Gansu Program teams as part of the World Bank's implementation support.

A 25 percent advance payment from the loan (US\$75 million) has been proposed by the Shandong and Gansu provinces towards covering a part of the implementation costs for achieving the initial results and support Program activities for subsequent results.

Capacity building activities will be carried out at the provincial, municipal, and county levels to enhance technical capacity, institutional collaboration, fiduciary management, and the management of environmental and social systems. Technical training will be given to carry out the necessary assessments for implementation of the integrated landscape approach for ecosystem restoration and climate resilience across sectors and jurisdictions, including: (a) assessments and optimization of ecosystem services and their adaptation to climate change; (b) remote sensing approaches to consumption-based monitoring and water balance assessments; and (c) water quality modeling using the SWAT<sup>17</sup> mode. Training will be conducted by the Bank to enhance the capacity for institutional collaboration, fiduciary management, and the management of environmental and social systems, particularly the standards and requirements for the PforR instrument, within three months of loan effectiveness and throughout Program

<sup>17</sup> The Soil & Water Assessment Tool (SWAT) is a river basin-scale model used to simulate the quality and quantity of surface and ground

Training on Program implementation, monitoring, and verification will be financed by the identified government expenditure with the outcome monitored by an intermediate indicator under RA3.

The proposed YRB-GS will support Gansu and Shandong in implementing their provincial and local investment plans to achieve the ecosystem restoration and protection objective specified in the YRB Plan and the Yellow River Protection Law. The selected Program areas are critical to ecosystem restoration in the YRB.

They are facing competing demands for water resources, periodic water shortages or floods, sedimentation, and the loss of wetlands and biodiversity, which have global significance. The Program activities include physical investments in the six municipalities and technical assistance in institutional and capacity strengthening at the provincial and municipal/county levels. They are aligned with the administrative responsibilities of the different levels of government and will be used to support the implementation of the YRB plan, as well as institutional and capacity building for ecosystem restoration and protection at the provincial level.

The integrated consideration of the various requirements for natural resource utilization and ecosystem protection is emphasized through an integrated landscape management approach. The proposed Program activities were assessed and prioritized through the Technical Assessment following an integrated landscape approach in two representative sub river basins within the Program area: the Sandu River Basin in Gansu and the Tuhai River Basin in Shandong. This included: (a) a spatial planning exercise to identify priority ecosystem services (ES) and areas for ecosystem restoration; (b) a water balance assessment using remote sensing and site visits to evaluate water resource availability; and (c) a water quality assessment to determine the environmental carrying capacity (EC) for pollution loads in the selected watersheds. The water balance and EC assessments help make sure that interventions identified by the ES assessment can achieve sustainable outcomes within water resource and quality constraints.

Critical ecosystem services and priority areas for ecosystem restoration were identified through the Technical Assessment and are incentivized through DLIs.

The assessments identified the priority locations for ecosystem restoration and provided a set of recommendations to: (a) improve ecosystem quality through augmented ecosystem structures and species compositions; (b) increase patches of natural habitats for biodiversity conservation; and (c) enhance landscape connectivity by creating ecological corridors that connect fragmented habitats in the landscape. DLIs 1 to 4 incentivize sustainable landscape management measures and the restoration of critical wetlands, forest and river ecosystems that are identified as the most important through such spatial assessment. DLI5 incentivizes the adoption and scaling-up of such integrated landscape planning and decision-making to improve the provinces' approach to prioritizing restoration actions, which will generate long-term institutional impacts even beyond the Program.

Ecosystem restoration interventions will follow international best practices as well as existing technical standards at national and local level. The Technical Assessment draws on the international best practices on landscape approach and Nature-based Solutions (NbS) to maximize the synergies of development and nature conservation. NbS interventions are proposed with specific guidance on designs and spatial prioritization for farmland terracing, restoration of forests, wetlands and river ecosystems.

While activities under the PforR Program will increase natural water consumption by 6.01 million m<sup>3</sup> in the Sandu River Basin, forest quality improvement, high standard cropland construction and water-saving irrigation activities in the Government program are assessed to reduce water consumption by 9.2 million m<sup>3</sup>, resulting in a reduction of 3.19 million m<sup>3</sup> in water consumption by the end of the Program. Similarly, in the Tuhai River Basin in Shandong, 9.10 million m<sup>3</sup> of water consumption are expected to be saved from forest quality improvements, high standard croplands, and water-saving irrigation activities in the Government program, exceeding the additional 3.64 million m<sup>3</sup> of water consumption incurred by this Program, resulting in an expected decrease of 5.46 million m<sup>3</sup> in net water consumption in the basin by the end of the Program. Furthermore, the Program also support the Government to develop appropriate institutions (DLI5) to implement the integrated landscape management for ecosystem restoration and protection taking into water resource considerations.

The water pollution reduction efforts and outcomes supported by the Program contribute to water quality compliance within the assessed sub river basins, underpinning sustainable outcomes for healthy ecosystem restoration.

TP and ammonia nitrogen concentrations failed to meet the water quality requirement during dry seasons from January to March, when river flows are low, particularly in the Sandu River Basin in Gansu. The assessments highlight the importance of: (a) incorporating water quality in the integrated planning for ecosystem restoration; (b) including pollution-reduction investments to ensure adequate water quality for sustainable ecosystem restoration and protection outcomes; and (c) strengthening water quality monitoring, especially in the areas affected by non-point sources.

Afforestation and reforestation, soil health improvement, conservation of natural habitats and ecosystems, and domestic wastewater treatment are all activities considered universally aligned with the Paris Agreement's mitigation goals. In addition, the Program intends to implement the following measures in the Program area: (a) incorporate climate mitigation and adaptation measures in integrated landscape plans for ecosystem restoration and protection and other documents, at both demonstration sub-basin and provincial levels; (b) increase carbon sequestration in forest management and wetland restoration; and (c) reduce fugitive methane emissions from polluted water bodies through reduced pollutant discharges.

The Program intends to implement the following measures in selected demonstration sub-basins in the YRB: (a) improve resilience to water pollution by reducing pollutant discharges, and improve resilience against climate-exacerbated natural disasters, e.g., floods and droughts, by incorporating climate-resilient designs in wastewater management facilities; (b) improve forest health and ecosystem vitality to enhance ecosystem resilience to heavy rain, hail, snow, wind, droughts and extreme temperatures, reduce the risks of forest fires and pest and disease breakouts; and (c) increase local flood mitigation capacity through river and wetland restoration as a nature-based solution which can act as a buffer zone to modulate flooding during the rainy season and runoff peaks.

Climate change adaptation measures will be incorporated into integrated landscape planning processes for ecosystem restoration and protection and other policy documents at both the sub-basin and provincial levels.

reservoir water storage; (c) lower non-point source pollutants (such as chemicals and pesticides) discharged into the river can lower water pollution risks that are most severe during climate-exacerbated drought events when there is less water in the river to dilute pollutants.



Implementation of the national YRB program is funded through a range of financial instruments at the provincial and local levels in accordance with the Responsibilities for Expenditures on Ecological and Environmental Protection, issued in May 2020.<sup>18</sup> Funds required to finance investment activities for meeting the Program's objectives are not directly linked to a specific and single government program budget, but come from various budget lines of a range of stakeholders which include, among others, the forestry, agricultural, environment and water departments.

Program expenditures are anchored in the implementation of the provincial 'Ecological Protection and High-Quality Development Plan for the Yellow River Basin' that respectively covers six counties in Gansu and 13 counties in Shandong.

These funds were mostly used for RA2, making up about 44 percent in Gansu and 43 percent in Shandong, followed by RA3 (40 percent in Gansu and 40 percent in Shandong). Funding sources of these expenditures are from multiple sectors, including water, agriculture, environment, and natural resources (see the separate Technical Assessment Report for details on Program financing). Most funds are sourced from both central and provincial governments, with over 65 percent coming from the central government.

The major activities of the Program are economically justified by either cost benefit analysis (CBA) or cost effectiveness analysis (CEA). Forestry activities have adopted CBA, while wastewater treatment and wetland improvement activities have adopted CEA (as the benefits are difficult to quantify). The assessment compared a no Program scenario to a scenario of a government program that includes World Bank support.<sup>50</sup> For forest activities, the Program economic rates of return (ERRs) with and without GHG emission reduction are estimated at 13 percent and 16 percent, respectively, i.e., significantly above the discount rate of six percent.<sup>51</sup> Detailed comparisons of alternatives and selected options for the rehabilitation of waste water treatment plants and sewage collection systems, as well as wetland improvement, will be conducted when the feasibility study reports are prepared for location specific interventions by the county development and reform committees. Improved land management activities will follow the established national and local technical standards for quality assurance and cost controls.<sup>52</sup>

50. GHG reduction accounting. In line with the DLIs' contributions to climate change mitigation and adaptation (see Table 4), the reduction in GHG emissions over the 30-year Program life (including five years of implementation) was estimated primarily from the quantifiable emissions benefits of 8.41 million tonnes CO<sub>2</sub>e emission reduction from improved forest cover of 52,245 ha (DLI 3).

In all, the Program is expected to realize a GHG emission reduction of 8.41 million tonnes of CO<sub>2</sub>e over its lifetime. This, however, represents only a subset of the total amount of the expected GHG emission reduction benefits attributable to the Program.

<sup>50</sup> This approach is used because, under a PforR, Government and World Bank funds are combined to achieve results, with distinction at the activity level between World Bank-financed and Government-financed achievements.

<sup>51</sup> The discount rate of 6 percent is recommended for investments with long-term unquantified social and environmental benefits. Technical Note on Discounting Costs and Benefits in Economic Analysis of World Bank Projects; and NDRC.

China Planning Press, Beijing

<sup>52</sup> Including, among others, code for soil and water conservation engineering design (GB-51018-2014), technical specification for soil conservation (GB/T16453-2008), and completion acceptance standards for integrated soil and water conservation (GB/T15773-2008).

The integrated assessment of fiduciary systems - procurement, financial management (FM) and governance systems of Gansu and Shandong Provinces concluded that, subject to the agreed actions to strengthen the Program fiduciary systems as reflected in the PAP and other proposed mitigation measures being implemented, the Program's fiduciary risk is Moderate and the Program fiduciary systems would provide reasonable assurance that the Program's financing proceeds will be used for intended purposes, with due attention to the principles of economy, efficiency, effectiveness, transparency, and accountability.

#### Financial Management (FM) Overview.

The Government Accounting Standards, approved in 2017 and implemented from 2019, set the accounting and reporting standards for all government budget units in China, and constitute the public financial management (PFM) system with various fiscal and financial related decrees, regulations, standards, and procedures.

The proposed mitigation measures include: (a) a Program expenditure payment plan will be prepared on a monthly basis, so that the treasury account can better manage its cash flow; (b) tailored Program financial statements have been developed and agreed upon for the Program in a format and content acceptable to the Bank and the Government; (c) audit of Program financial statements will be required to be conducted on an annual basis based on tailored audit Terms of Reference that will be developed and agreed between the Bank and government audit offices; and (d) appropriate institutional arrangements have been established for the Program's coordination and management with clear roles and responsibilities.

Procurement under the Program will follow the Tendering and Bidding Law (TBL) and the Government Procurement Law (GPL), as well as relevant implementation regulations.

Local public resources transaction centers will provide a venue, system and expert pool to carry out procurement.

The Program does not include activities with either significant environmental and social impacts or those with a contract value at or above US\$115 million for works / supply & installation of plants / Public-Private-Partnerships, and US\$75 million for goods / information technology / non-consulting services, and US\$30 million for consultant services.

- Incorporate the World Bank's list of debarred and temporarily suspended firms / individuals in the filter used by procuring entities under the Program as part of their due diligence before contract award.

An Environmental and Social Systems Assessment (ESSA) was conducted to assess environmental and social (E&S) risks and the existing management systems applied to the Program (see the ESSA report). In general, the Program is expected to bring significant E&S benefits by: restoring forestry, grassland, and riparian ecosystems; controlling soil erosion; reducing sewage discharge; and reducing pollution impacts to river water quality in selected areas of the Yellow River Basin in Shandong and Gansu provinces

The Program will support both physical infrastructure and technical assistance activities and is designed to secure broadly positive E&S effects, addressing water scarcity, water pollution and ecosystem degradation.

These E&S risks and impacts will be managed under existing and generally well-performing national, provincial, and local E&S management systems (see the ESSA report).

Some ecological rehabilitation activities are planned within existing nature reserves/ecological redline zones, i.e., those areas with officially recognized biodiversity importance. Though designed to protect and conserve local biodiversity and habitats in compliance with existing planning and regulatory requirements, these activities will require the adoption of a precautionary approach and the application of adaptive mitigation and management measures during implementation.

Neither OP/BP 7.50 Projects on International Waterways, nor OP/BP 7.60 Projects in Disputed Areas, will be triggered.

The ESSA concludes that China has established comprehensive systems to manage the Program-related E&S impacts/risks at the national, provincial, and local levels. The performance of the E&S systems associated with the Program is found to be satisfactory in general, with sound regulatory frameworks, management procedures, and institutional arrangements in place for E&S management covering EIA, social stability risk assessment (SSRA), pollution prevention and control, conservation of natural resources, land acquisition and resettlement, management of labor and working conditions, and community health and safety. The system provides a good basis for addressing the potential E&S issues, including adequately addressing risks from climate hazards.

The planning and implementation of TA activities in the existing regulatory framework lack consideration of potential downstream E&S risks/impacts of risks.

The ESSA recommends that the Program be taken as an opportunity to enhance E&S management capacity and efficiency in Gansu and Shandong. This will be achieved by implementing the Program Action Plan, including: (a) to clearly document social risk management processes and measures in key Program documents (e.g., feasibility studies, design documents, and social stability risk assessment reports); (b) to develop and implement an environmental and social operational manual to clarify environmental and social management responsibilities and procedures for cross-departmental collaboration.;



To mitigate this risk, the following measures are being incorporated in the proposed PforR: (a) design and selection of DLIs that target priority outcomes which are relatively simple and easy to measure and verify; (b) previous and forthcoming training on the PforR instrument to provincial and local government officials, including training on DLI verification and loan disbursement, environmental and social risk management, and fiduciary risk management; and (c) Program management teams at the provincial and county levels staffed with qualified technical experts to support the design, implementation, and supervision of the Program.

With the exclusion of activities that may cause significant adverse E&S impacts, the Program will still involve a large number of different kinds of activities over a large portion of two provinces, and some ecological rehabilitation activities are planned within the areas with officially recognized biodiversity importance that require careful management during implementation.

The Program mitigates such risks by establishing a participatory PPMO comprised of representatives from the relevant sector departments at the provincial level, who provide technical supervision and guidance to local technical agencies.

















Areas for forest restoration are identified by Technical Assessment that are critical to river basin ecosystem health.

(including 5 years of implementation period), equalling to 280,333 tons of CO<sub>2</sub>eq sequestered per year.







Monitors both upgraded and newly built township wastewater treatment plants in Program municipalities and counties.

Climate-resilient designs will be incorporated in constructing or upgrading wastewater treatment plants.



Monitors ecosystem health  
and pilots evaluation  
systems in selected areas  
(one in each program  
municipality).

and (b)  
Program management  
(Fiduciary, Environment &  
Social management).

and (b)  
Program management  
(Fiduciary, Environment &  
Social management).





















Locations for wetland restoration that are

Verification will be based on county-level natural resources (including forestry) management checks carried out for all sites by local program implementation agencies; PPMOs will collect completion reports from all program counties, and submit to TPVA for verification.

Applicable technical standards are (a) DB11/T 1300-2015 Technical Regulations for Wetland Restoration and Construction, a local standard from Beijing considered to align with international good practice; (b) HJ 2005 - 2010 Constructed Wetland Sewage Treatment Technical Regulations.

Re-introduce native carnivore fish as top-down control.

Disbursement will be made available based on the number of hectares (0.01 hectare) with restored wetland areas in the Program areas.

by the Technical Assessment.

Areas for forest restoration that are critical to river basin ecosystem health are identified



Verification will be based on county-level forest management checks carried out for all sites by local program implementation agencies; PPMOs will collect completion reports from all program counties, and submit to TPVA for verification.

At least 5 percent of the new afforestation area should include biodiversity friendly flowering trees that can provide food sources for birds and other wildlife. If irrigation measures are applied for early-stage tree planting to improve survival rates, water-saving irrigation technologies need to be adopted. At least 5 percent of the new afforestation area should include biodiversity friendly flowering trees that can provide food sources for birds and other wildlife.

Verification will be based on county-level water management checks carried out for all sites by local program implementation agencies; PPMOs will collect completion reports from all program counties, and submit to TPVA for verification.

To adapt national and other regional standards to the project areas, appropriate local revegetation species as well as biodiversity indicator species for project areas have been provided in the Project technical assessment report.

The Technical Guideline will provide guidance for prioritizing ecosystem restoration actions in river basin contexts that maximize ecosystem services and climate and biodiversity co-benefits, in prescribing international good practices and taking into consideration on water resource constraints and water quality conditions, particularly in water-scarce river basins for priority

In Shandong, this indicator measures annual newly added land areas with soil salinity treatment measures applied, including leaching, crop pattern change, water evaporation reduction and so on.

- Technical standard for saline-alkaline land amelioration in landscape project (CJJT283-2018)
- Technical specification for soil salinity treatment in landscape projects (CJJ/T283-2018)
- Technical guidelines for ecologically-clean small watershed construction (SL534-2013)
- Technical specification for soil salinity treatment in coastal areas (DB32/T 4313-2022)

Disbursement will be made scalable based on the number of hectares (0.01 hectare) implemented with eligible soil salinity treatment measures and will not be capped at the annual target within the total of 427 hectares within the Program implementation period.

Locations for wetland restoration that are critical to river basin ecosystem health have been identified by the Technical Assessment. In Shandong, 5,200 hectares of wetland have been identified. During each year of this period, the same wetland area of 5,200 hectares will need to be verified to ensure that they meet the restoration targets (i.e., absence of *Spartina* and other targets according to the technical standards).

Verification will be based on county-level natural resources (including forestry) management checks carried out for all sites by local program implementation agencies; PPMOs will collect completion reports from all program counties, and submit them to TPVA for verification.

Applicable technical standards are (a) DB11/T 1300-2015 Technical Regulations for Wetland Restoration and Construction, a local standard from Beijing considered to align with international good practice; (b) HJ 2005 - 2010 Constructed Wetland Sewage Treatment Technical Regulations.

Re-introduce native carnivore fish as top-down control.

Disbursement will be made scalable based on the number of hectares (0.01 hectare), which on annual basis meet the abovementioned restoration targets in the Program areas. The annual DLR values are fixed at 5,200 hectares

by the Technical Assessment.

Areas for forest restoration that are critical to river basin ecosystem health are identified

Verification will be based on county-level forest management checks carried out for all sites by local program implementation agencies; PPMOs will collect completion reports from all program counties, and submit to TPVA for verification.

At least 5 percent of the new afforestation area should include biodiversity friendly flowering trees that can provide food sources for birds and other wildlife. If irrigation measures are applied for early-stage tree planting to improve survival rates, water-saving irrigation technologies need to be adopted. Disbursement will be made scalable based on the number of hectares (0.01 hectare) with restored forest ecosystem areas in the Program counties.

The Technical Guideline will provide guidance for prioritizing ecosystem restoration actions in river basin contexts that maximize ecosystem services and climate and biodiversity co-benefits, in prescribing international good practices and taking into consideration on water resource constraints and water quality conditions, particularly in water-scarce river basins for priority











The strategy and approach for implementation support includes an emphasis on the technical, fiduciary, and E&S support needed during implementation. Implementation support from the procurement and financial management team will focus on reviewing and monitoring compliance with the Government's own systems and the actions defined in the PAP, while the implementation support will also provide technical assistance to address shortcomings identified during the assessment.







