4. **Ecosystems in China's river basins are under increasing threat from declining water security caused by water scarcity and water pollution, land use change, and climate change.** Projections indicate a decrease in precipitation across western China under all climate scenarios, thereby increasing the likelihood of extreme weather events, particularly extreme temperatures and droughts. 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.[5] 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. Addressing these challenges is imperative to ensure the sustainability and resilience of ecosystems, as well as to safeguard the vital services they provide within river basins.

B. Sectoral and Institutional Context

5. **The Yellow River Basin (YRB) is one of the most important river basins in both China and East Asia, providing important ecosystem services for socio-economic development and a critical biodiversity corridor in the East Asian-Australasian and Central Asian flyways of global migratory birds.** As the country's second-longest river, the Yellow River flows through nine northern provinces and is regarded as the cradle of Chinese civilization.[6] These nine provinces have a total population of 420 million (30 percent of China's population) with 160 million living within the basin (12 percent of China's population). The YRB annually generates a GDP of over US$4.4 trillion (25 percent of the China's GDP and nearly 5 percent of the world's economy) and produces more than one-third of the total national grain and meat. The YRB also hosts biodiversity hotspots of global importance, including eight wetlands – one of which is the Yellow River Delta – recognized by the Ramsar Convention on Wetlands and are identified as a national conservation priority in the National Biodiversity Strategy and Action Plan. The delta is home to hundreds of species and provides critical wintering, breeding, and stop-over sites for millions of domestic and migratory birds.[7] Recognizing these important factors, China officially announced the Yellow River Basin's ecological protection and high-quality development as one of its national strategies.

6. **Water scarcity, coupled with competing development-related demands on natural resources, poses a serious challenge to the inclusive and sustainable development of the YRB.** Located in a semi-arid region with average annual precipitation of only about 400 millimeters, the YRB has very limited water resources, with a total available flow of 64.7 billion cubic meters (less than 7 percent of that of the Yangtze River Basin and just 2 percent of the nation's renewable water resources endowment). However, over 160 million people and 15 percent of the country's irrigated area depend on the limited water available in the Yellow River.[8] Significant social and economic development over the past four decades has accentuated the basin's water stress. 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.[9] 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.[10]

[5] Mo, Xing-Guo, Shi Hua, Zhong-Hui Lin, Su-Xia Liu, and Jun Xia. 2017. "Impacts of Climate Change on Agricultural Water Resources and Adaptation on the North China Plain." *Advances in Climate Change Research* 8 (2): 93–8 (*link*)

[6] These nine provinces/autonomous regions from upstream to downstream are Qinghai, Sichuan, Gansu, Ningxia, Inner Mongolia, Shaanxi, Shanxi, Henan and Shandong.

[7] China Ministry of Ecology and Environment (MEE). 2018. Key River Basin Biodiversity Protection Plan.

[8] Ministry of Water Resources. 2015. *China Water Resources Bulletin (in Chinese)*.

[9] Ministry of Water Resources. 2020. *China Water Resources Bulletin (in Chinese)*.

[10] Interpretation of the Water Law of the People's Republic of China. National People's Congress. http://www.npc.gov.cn/zgrdw/npc/flsyywd/xingzheng/2003-09/17/content_321402.htm

7. **The spread of invasive species and wildfires and climate-induced natural disasters cause further ecosystem degradation and threaten critical ecosystem services in the YRB.** Good and stable vegetation cover is critical to stabilizing soil, minimizing erosion and sediments, lowering the nutrient loading from human activities, and sustaining the water supply, all of which are essential to providing important ecosystem services to human development. In the upper reaches of the YRB, overgrazing and agricultural expansion as well as pollution from human activities have led to degradation of the natural environment, especially grasslands and wetlands, exacerbating soil erosion, nutrient and agro-chemical runoff, and water pollution. This long history of exploitation and unsustainable land and water use, and the likely increasing impacts from climate change, has resulted in signifiant deterioration of the YRB's semi-arid ecosystems. For example, on multiple occasions in recent years the dessicated lower reaches of the Yellow River have led to saltwater intrusion and the receding of delta wetlands. Such impacts are particularly harmful for biodiversity. The richness of fish species in YRB declined by 35.4 percent over the past five decades.[11] Moreover, widespread invasive species, such as saltmarsh cordgrass (*Spartina alterniflora)* in the river delta where the river enters the sea, threaten local ecosystems and are associated with reduced freshwater flows. The Climate and Disaster Risk Screening conducted for this Program highlighted risks from extreme climate-induced weather events such as drought and flooding. [12]

8. **Ecosystem degradation is a multidimensional problem, demanding cross-sectoral integrated land and water resource management solutions at the basin level. However, institutional segmentation which favors sectoral planning and practices hinders the provision of broader ecosystem services.** Ecosystem degradation demands cross-sectoral solutions as it is a multidimensional problem. 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.[13] 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.

9. **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. A national Leadership Group, headed by the Vice Premier and housed in the National Development and Reform Commission (NDRC), was established at the same time to coordinate cross-sector and inter-jurisdictional issues for implementing the YRB Plan. Provincial governments are responsible for developing and

[11] Xie, J. Y., W. J. Tang, and Y. H. Yang. 2018. "Fish Assemblage Changes over Half a Century in the Yellow River, China." *Ecology and Evolution* 8: 4173– 4182.

[12] Between 1951 and 2018, the YRB's average temperature increased by 1.38oC, while its average rainfall decreased by 10 mm. Ma, Z.G., et al. "Status and Ponder of Climate and Hydrology Changes in the Yellow River Basin." *Bulletin of Chinese Academy of Sciences*, 2020, 35(1): 52-60

[13] Feng et al. 2016.; Zhang, S., D. Yang, Y. Yang, S. Piao, H. Yang, H. Lei, and B. Fu. 2018. "Excessive Afforestation and Soil Drying on China's Loess Plateau." *Journal of Geophysical Research: Biogeosciences* 123: 923– 935.

implementing provincial plans (including various sectoral plans), and municipal and county governments are responsible for implementing programs and activities at the local level. 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.

10. **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.

11. **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).** See the Program Map in Annex 7**.**

a. **Gansu province's delicate loess ecosystems, situated near the headwaters of the Yellow River, play a vital role in providing essential ecosystem services for a healthy river basin, for instance soil conservation, necessary for reducing sediment loads and mitigating flood risks downstream. However, these services are under increasing pressure due to social and economic imperatives.** Gansu province had the lowest GDP per capita in China at RMB 41,046 yuan (about US$5,780) in 2021, less than one quarter of that of Beijing. The province's socio-economic development is significantly impacted by ecological degradation, including severe desertification (45.8 percent of the provincial land); low forest cover (11 percent); and soil and water erosion, which contributes to over 30 percent of the river's annual total sediment loads. Water scarcity is further exacerbated by low water conservation capacity due to low vegetation cover. Soil erosion and water pollution further reduce water available for human use. Poor water quality is another concern due to inadequate wastewater treatment facilities in rural areas and agricultural non-point pollution sources (NPS), further compounded by soil erosion, which causes nutrient and agro-chemical runoffs.

b. **Shandong province is home to the Yellow River Delta, a globally significant biodiversity area facing serious biodiversity loss challenges primarily due to habitat loss and invasive species.** The Yellow River Delta receives significant sediment deposits where the Yellow River meets the Yellow (Bohai) Sea. The local ecosystem structure and function have been negatively impacted by intensive development and reduced ecological flows from the upper and middle reaches. Riverine and coastal wetlands have been significantly reduced and converted to salt and aquaculture ponds. Soil salinization has expanded from the coastline to inland areas of the Yelow River Delta due to insufficient groundwater recharge with fresh surface water from upstream, resulting in seawater intrusion.

12. **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. Under YRB-GS, the ET-EC-ES approach established under YRB-HS will continue to be utilized to evaluate the effects of ecosystem restoration activities on water scarcity and to inform integrated and cross-sector planning and decision-making for ecosystem restoration. 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. Box 1 depicts the evolution from YRB-HS to YRB-GS.

Box 1. 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 Provinces. 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. Quantitative and spatially explicit recommendations are provided for promoting nature-based solutions for maximizing climate and biodiversity co-benefits.

13. **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.** YRB ecosystems capture and store large amounts of carbon into healthy and well-functioning soils, plants, and coastal marine ecosystems, and function as important carbon sinks.[14] Afforestation activities in the YRB could potentially increase carbon stock by an additional 59.5 million tons.[15] Restoring and protecting river estuary and coastal zones, such as seagrass meadows, also contributes to increasing blue carbon functions. 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. In addition, healthy soils play a fundamental role in the conservation of global biodiversity, as soil ecosystems not only host a quarter of global biodiversity but also play a key role in global cycles that make all life possible. Integrated landscape planning would prepare communities that are

[14] 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. See Ran, L.; Lu, X.; Fang, N. and Yang, X. (2018) Effective soil erosion control represents a significant net carbon sequestration. Scientific Reports. 8: 12018.

[15] Lv, Y.; Fu, B. et al. (2022) The potential for carbon sequestration by afforestation can be limited in dryland river basins under the pressure of high human activity. The Science of the Total Environment 858: 159817.

under an increasing risk of environmental degradation and natural and climate disasters with the capacity for ecological and climate sensitive land and water management.

C. Relationship to the CPS/CPF and Rationale for Use of Instrument

14. **The proposed Program is closely aligned with the World Bank Group's Country Partnership Framework (CPF) for China (FY2020-2025, Report No. 117875-CN) which was discussed by the World Bank Board of Executive Directors on December 5, 2019 and the Evolution Roadmap.** 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. The proposed Program is also closely aligned with the Green, Resilient, and Inclusive Development (GRID) framework and the Climate Change Action Plan 2021–2025 and builds on the recommendations of the China Country Climate and Development Report (CCDR) by promoting climate mitigation strategies, increasing resilience to climate change threats, and promoting inclusive economic opportunities.[16] 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.

- **Climate Change Mitigation.** 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.
- **Biodiversity Conservation.** The Program will directly address some of the main drivers of biodiversity loss in the YRB and contribute to global biodiversity conservation. It will promote water resource conservation and reduce water pollution to increase ecological flows for protecting and restoring fragile ecosystems in Gansu and the key sections of the Yellow River Delta, a critical site for more than six million migratory waterbirds on their annual migration, along with other endangered species such as the Oriental stork and Sanders' gull. In addition, the Program will also expand ecosystem-based adaptation efforts and enhance the climate adaptation and resilience those critical ecosystems have towards related extreme weather events, and thus contribute to global biodiversity conservation.
- **Knowledge for Development.** 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.

15. **The proposed Program is consistent with China's key climate commitments and builds on the key findings and recommendations from the China CCDR.** 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. In order to achieve its 30-

[16] World Bank Group. 2022. *China Country Climate and Development Report*. CCDR Series. Washington, DC: World Bank Group.

60 goal, the Long-Term Strategy commits to increasing the forest stock volume by 6 billion cubic meters from the 2005 level by 2030. 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. These recommendations are used for the Program to develop climate actions.

16. **The Program for Results (PforR) financing instrument is appropriate to support the Government's YRB strategy**. 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. The Program's design is well aligned with the government's fiscal structure and government responsibilities at the different levels outlined in the national YRB Plan. 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.

17. **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.

II. PROGRAM DESCRIPTION

A. Government program

18. **The Government's national strategy is articulated in the YRB Plan.** 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.

19. **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.** These provincial plans are further underpinned by a series of sector-specific implementation plans, with municipal and county governments responsible for their implementation. This proposed PforR Program will support a subset of activities from the provincial programs in Gansu and Shandong provinces. 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. Specifically, it outlines tasks in twelve priority areas, including enhancing water conservation capacity through ecosystem restoration, promoting soil and water conservation in the Loess plateau, promoting integrated

environmental pollution management, strengthening water saving, and improving resilience towards climate-exacerbated disasters. 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. Government programs have been developed in each of the provinces to implement their provincial YRB Plan. 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.

B. Theory of Change

20. **The Theory of Change (ToC), shown in Figure 1, identifies the key environmental challenges to address and present the expected results and long-term outcomes under three proposed Results Areas.** 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. While the YRB-HS basin-level Program is expected to improve knowledge and capacity at the YRB basin level (paragraph 10), the YRB-HS and YRB-GS are two separate Programs. Achievement of those results under YRB-GS within the Gansu and Shandong Provinces are independent from the progress of YRB-HS.

C. PforR Program Scope

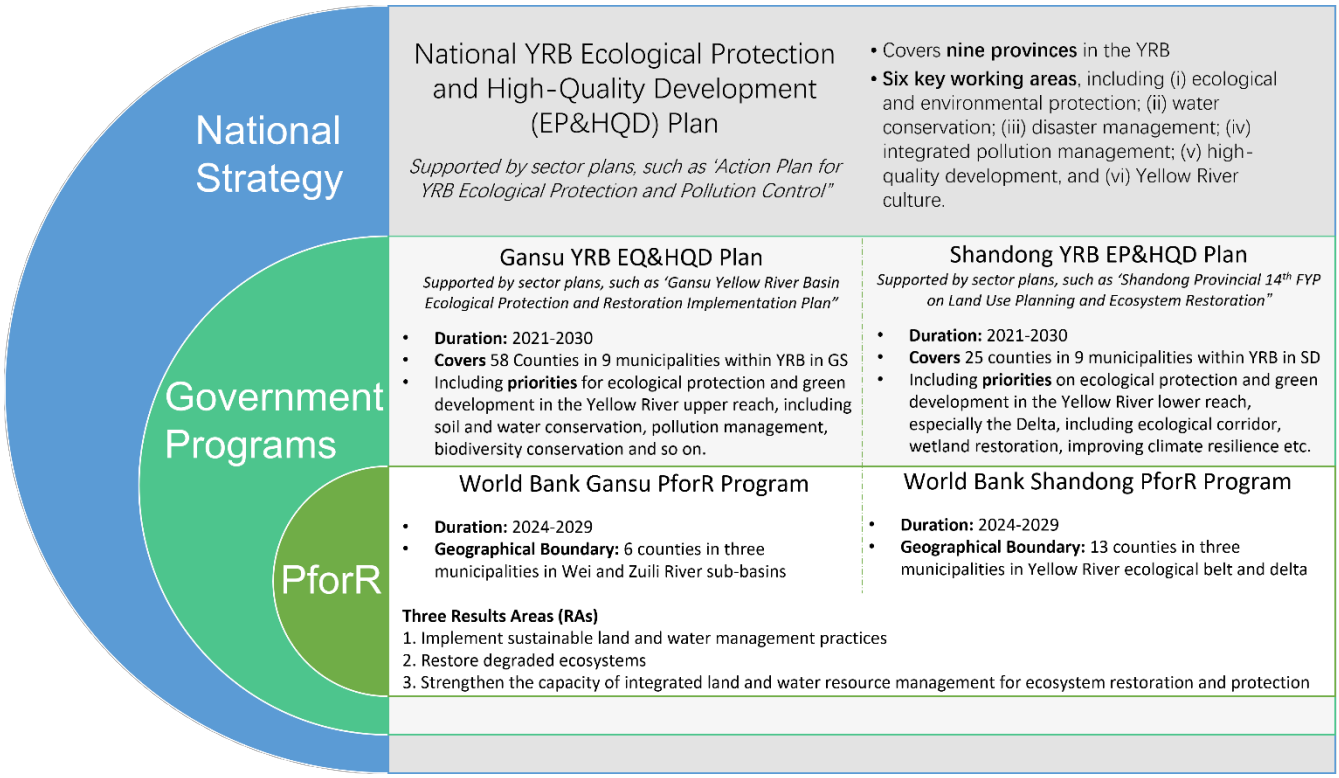
21. **The proposed PforR ("the Program") is intended to support institutional interventions at the provincial level and direct investments for ecosystem restoration and protection in selected watersheds in Gansu and Shandong Provinces.** Program areas in Gansu Province cover the municipalities of Baiyin, Dingxi, and Tianshui. 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. In all, six counties (Huining and Jingyuan counties in Baiyin; Anding and Tongwei counties in Dingxi; Gangu and Maiji in Tianshui) are included in the Program's geographical boundary. Program areas in Shandong Province cover the municipalities of Binzhou, Dongying, and Liaocheng. They cover the Yellow River Delta and the main stem of the Yellow River; Dongying is located on the Yellow River estuary, while Binzhou and Liaocheng are upstream. In all, 13 counties (one in Binzhou, seven in Dongying, and five in Liaocheng) are included in the Program's geographical boundary.

22. **The proposed Program will support a subset of provincial YRB program activities in the Gansu and Shandong program areas**, see Figure 2. Three criteria were used to screen proposed activities to be included in the Program boundary: (a) Relevance - alignment with national priorities and the proposed development objectives of the Program; (b) Scalability - potential to be scaled up and replicated for greater impact; and (c) Risks - with activities that may involve high social and environmental risks being excluded.

***Figure 1**. Theory of Change*

Critical assumptions required for the Program's success are that: (a) there are no major external changes to pollutant loads, for instance from industrial sources, or land use changes that are beyond the scope of this program, which could undermine the outcomes of ecosystem restoration and protection; (b) there are no major external environmental shocks from, for example, climate or natural disasters that undermine the expected outcomes; (c) the integrated landscape planning technical guidelines developed under the Program at the provincial level are implemented in the provincial planning process; and (d) cross-sectoral coordination at the provincial and sub provincial levels is effective.

Figure 2. *Government Programs and World Bank-financed PforR Program*



23. **The following three Results Areas (RAs) are proposed reflecting key Program intervention focal areas.** The difference between YRB-HS and YRB-GS is presented in Table 1 below.

- **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.
- **Results Area 2**: **Restore degraded ecosystems.** This RA focuses on the restoration of critical ecosystems that have been degraded, including degraded wetlands, riparian zones, grassland, and forest ecosystems. 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.** This RA aims to strengthen government capacity for integrated landscape planning

and decision-making 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. It will support: (a) development and approval of implementation plans for integrated landscape management for ecosystem restoration and protection in demonstration sub-basins, and technical guidelines at the province level; (b) piloting ecosystem health monitoring and evaluation systems; (c) enhancing opportunities for female leadership in ecosystem protection, with more female forest, grassland, and wetland chiefs (including both official and civil chiefs); and (d) capacity improvement for government officials and practitioners, e.g. farmers, rangers, plantation owners on integrated landscape planning and decision-making for ecosystem restoration and protection.

Table 1. Differences between Results Areas and Outcomes under YRB-HS and YRB-GS

YRB-HS	YRB-GS	Differences	Rationale
RA1: Improve water use efficiency	RA1: Implement sustainable land and water management practices	YRB-GS does not include outcome indicators on water efficiency improvement	The two YRB-HS provinces in the middle reach of YRB include several large irrigation districts and face big water scarcity and balance challenges. YRB-HS therefore includes agricultural water efficiency improvement as a primary focus. Although water scarcity is also a common challenge facing the two YRB-GS provinces, YRB-GS Program counties do not have large irrigation expansion and, therefore, agricultural water efficiency outcome was not included under YRB-GS. Water balance assessment considers other government activities (such as high-quality farmland and water saving irrigation development and reforestation of water-saving tree species) to ensure that water consumption in the Program areas remains within sustainable limits.
RA2: Improve water quality		YRB-GS includes the same results under YRB-HS RA2 and additional results on improved land management practices	Soil erosion control is a particularly relevant issue in the upstream areas and soil salinity is a prominent issue in the downstream and delta region
RA3: Improve ecosystem management	RA2: Restore degraded ecosystems	YRB-HS focuses on restoring basic biophysical conditions. YRB-GS targets to restore critical ecosystems through integrated and spatial ecological assessment	The restoration activities are informed by identifying priority ecosystems for restoration through landscape spatial assessments
		YRB-GS also includes outcomes on river channel restoration in the upper reach	Critical for the enhancement of river and riparian ecosystems while reducing flood risks downstream
RA4: Integrating ecosystem and water resources management into strategic planning	RA3: Strengthen the capacity of integrated land and water resources management for ecosystem	YRB-GS does not include a basin-level program which YRB-HS has and therefore does not target outcomes in the whole YRB	The achievements made under the YRB-HS basin-level program will be utilized to provide technical guidance for YRB-GS

	restoration and protection		

24. **Duration.** The Program would be implemented between Fiscal Year 2024 and 2029. This is within the implementation period of the Government's program (from 2021 to 2030), with the Program preparation and implementation period coinciding with the Government's schedule to implement the 14th FYP (2021-2025) and to inform the preparation of the 15th FYP (2026-2030).

25. **The Program financing arrangement is shown in Table 2 below.** 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.

Table 2. Program Financing

Source	Amount (US$ Million)	Percentage of Total
Counterpart Funding	**1411.00**	82.5
Borrower/Recipient	1411.00	82.5
International Bank for Reconstruction and Development (IBRD)	**300.00**	17.5
Total Program Financing	**1711.00**	

26. **Eligible Program expenditures will be used to support a range of activities that are aligned with and will contribute to the government strategy and World Bank corporate priorities.** The Program activities and their expected outcomes are also aligned with the Paris Agreement (see paragraphs 43 and 44 below), and will contribute to co-benefits in both climate mitigation and adaptation (see Table 4) and closing gender gaps in ecosystem restoration and protection in the Program areas (see paragraph 45). Citizen engagement will also be an integral part of Program design and implementation as described in the Environmental and Social Systems Assessment (see Part IV Section C).

D. Program Development Objective(s) (PDO) and PDO Level Results Indicators

27. **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.**

28. **PDO-level Indicators:**

a. 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_2eq 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

29. **Proposed Disbursement-Linked Indicators (DLIs) and rationale for their selection.** Five DLIs listed in Table 3 below have been selected based on their importance for incentivizing and capturing key program impacts, coupled

with the feasibility of verifying target values, and the degree of government influence on their achievement.

Table 3. Proposed Loan Allocation to DLIs

DLI	Gansu		Shandong		Total of 2 provinces	
	$ million	%	$ million	%	$ million	%
DLI1: Land area under sustainable landscape management practices (CRI, Ha)	45.2	30.2	15.0	10.0	60.2	20.0
DLI2: Areas of wetlands in priority river basin locations restored (Ha), annual	3.0	2.0	74.9	49.9	77.9	26.0
DLI3: Areas of forests in priority river basin locations restored (Ha), annual	78.8	52.5	45.0	30.0	123.7	41.3
DLI4: Length of river channels in priority river basin segments restored (km), annual	7.6	5.0	0.0	0.0	7.6	2.5
DLI5: Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved	15.4	10.3	15.1	10.1	30.6	10.2
Total	150.0	100.0	150.0	100.0	300.0	100.0

30. **Verification will be carried out by third-party agencies based on data collected by provincial and sub-provincial Program management agencies.** At the Program municipal and county levels, data will be collected by the corresponding municipal and county Program Management Office (PMO), whereas the Provincial PMO (PPMO) will monitor the progress of provincial institutional support and capacity building activities. The verification agencies will be contracted by the PPMO and/or sub-provincial PMOs within three months after effectiveness and will use a consistent and agreed verification protocol. 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. Definition and verification protocols of the five DLIs are detailed in Annex 2.

III. PROGRAM IMPLEMENTATION

A. Institutional and Implementation Arrangements

31. **The National Program Steering Group (PSG) will provide coordination and guidance for YRB-GS activities.** 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. It comprises leaders from national line agencies, including MOF, MNR, MWR, MEE, and the Ministry of Agriculture and Rural Affairs among others, as well as representatives from the provinces supported under YRB-HS, i.e., Henan and Shaanxi. YRB-GS plans to extend the PSG to include representatives from Gansu and Shandong provinces. The extended PSG will provide coordination and guidance for the implementation of both the YRB-HS and YRB-GS Programs.

32. **Provincial PSGs and Provincial Program Management Offices (PPMOs) have been established in both Gansu and Shandong for Program preparation and implementation.** The provincial PSG is headed by a senior provincial leader and comprises officials from the relevant departments, including the Provincial Development and Reform Commission, the Provincial Finance Department (PFD), the DNR, the Department of Ecology and Environment (DEE), the DWR, the Department of Rural and Agriculture (DRA), and the Forestry and Grassland Administration (FGA), as well as representatives from the Program municipalities. The Provincial PSGs will provide leadership/coordination among

the related government departments at the provincial level and provincial sector agencies will provide technical guidance. The Program municipalities and counties have established similar institutional arrangements (Steering Group and PMO) for Program preparation and implementation. There are clear roles and responsibilities at the provincial and county levels that will be outlined in the PIP. While the PPMOs are responsible for institutional and capacity building activities, Program counties will be responsible for implementation of physical investments. PPMOs will be responsible for consolidating and reporting Program outcomes, hiring the verification agency and ensuring implementation of the actions in the PAP.

33. **The PPMOs will be supported by a Joint Expert Group (JEG) in each province**. 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.

B. Results Monitoring and Evaluation

34. **Program Monitoring and Evaluation Capacity.** 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. M&E focal points of the PMOs at the provincial, municipal, and county levels will be responsible for results M&E, with the assistance of a project management consultant team. The World Bank team has provided hands-on M&E training for both provincial teams during the preparation phase. A detailed M&E plan will be included in the PIP. 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. The PPMOs will prepare and submit semi-annual progress reports (including M&E reports), a mid-term review report (expected no later than 36 months after Effectiveness Date), and a Program Implementation Completion and Results Report (ICR) by Program closure.

C. Disbursement Arrangements

35. **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. The World Bank loan will be disbursed upon achievement of the DLIs and their verification, as stipulated in the loan agreement.

D. Capacity Building

36. **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[17] model. 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

[17] The Soil & Water Assessment Tool (SWAT) is a river basin-scale model used to simulate the quality and quantity of surface and ground water and predict the environmental impact of land use, land management practices, and climate change.

implementation. 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.

IV. ASSESSMENT SUMMARY

A. Technical (including Program economic evaluation)

37. **Strategic relevance and program boundaries.** 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. The municipalities of Baiyin, Dingxi, and Tianshui in the upper reaches of the Yellow River in Gansu are in fragile and semi-arid ecosystems, which have been degraded due to over-exploitation, soil erosion, and pollution. The municipalities of Binzhou, Dongying, and Liaocheng in Shandong are in the lower reaches and the river delta area, which provide critical ecosystem services and biodiversity values to local economies and the world. 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.

38. **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. Economic assessments were also carried out to ensure the viability of Program activities.

39. **Critical ecosystem services and priority areas for ecosystem restoration were identified through the Technical Assessment and are incentivized through DLIs.** The spatial assessment found that the current vegetation is dominated by monoculture plantations, croplands, and orchards, while the remaining secondary forests and shrubland vegetation have low biodiversity levels. 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.

40. **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. For each DLI, verification Protocol in Annex 2 reflects required

technical standards at national and local level, as well as applicable lessons and experience from international best practices[18].

41. **Water resource availability in the Program area will be taken into consideration so that any increased water consumption from Program activities is assessed to be offset by water-saving activities within the Government program (paragraph 19), so that there will be no detrimental impacts on downstream ecological flows.** Water balance assessments were carried out using remote sensing and site visits to inform necessary adjustments to Program activities**.** While activities under the PforR Program will increase natural water consumption by 6.01 million m^3 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^3, resulting in a reduction of 3.19 million m^3 in water consumption by the end of the Program. Similarly, in the Tuhai River Basin in Shandong, 9.10 million m^3 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^3 of water consumption incurred by this Program, resulting in an expected decrease of 5.46 million m^3 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.

42. **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.** Assessments of water pollution and the resulting water quality conducted in selected sub river basins found that the major water pollutants are organics, measured by Chemical Oxygen Demand (COD), ammonia nitrogen (NH3-N), and total phosphorous (TP). Rural domestic wastewater, chemical fertilizer, livestock, and poultry farms are the primary sources of these pollutants. 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.

43. **The Program is aligned with the mitigation goals of the Paris Agreement, since all supported activities under the proposed Program are universally aligned on mitigation.** 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.

44. **The Program is aligned with the goals of the Paris Agreement on adaptation and resilience, since it adequately reduces physical climate risks to its outcomes, and its climate risk reduction measures limit exposure to low levels of residual risk therefore acceptable.** The Program areas are vulnerable to climate change and are affected by extreme temperatures and rainfall events, with a high frequency of floods and droughts. Floods damage infrastructure and increase soil erosion and runoff of pollutants into rivers and lakes, while droughts reduce flows for ecosystem restoration, such as afforestation, wetland restoration, and other uses; they also increase conditions for pests, diseases,

[18] Referred international best practices include: INCN (2020) Global Standard for Nature-based Solutions, Version 1.0; TNC (2021) Nature-based solutions in agriculture: The case and pathway for adoption; UNDP (2011) Community Based Adaptation to Climate Change Through Coastal Afforestation in Bangladesh (CBACC-CF Project); World Bank (2021) A Catalogue of Nature-Based Solutions for Urban Resilience.

and fires. Forest fires due to climate-induced heat waves have the potential to severely impact the ecosystem and its main functions. The Program has adopted an ecosystem-based adaptation approach, using nature-based solutions to tackle these risks and build resilience to extreme events. 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. Such nature-based solutions can also enhance water supply to wildlife during prolonged dry seasons; reduce runoff and soil erosion through improved terracing; modulate and reduce peak runoff and floods; and lower discharges into rivers of non-point source pollutants (such as chemicals and pesticides). 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.

Table 4: Climate Change Mitigation and Adaptation Considerations in DLIs

DLI Name	Climate Change Mitigation	Climate Change Adaptation
DLI1: Land area under sustainable landscape management practices (CRI, Ha).	Increased vegetation cover from terracing and salinity-tolerant plants contributes to increased carbon sequestration and climate change mitigation.	Soil and water conservation measures, i.e., farmland terracing, can: (a) modulate and reduce peak runoff and floods that are expected to increase under climate change (paragraph 7); (b) improve downstream flood risks by reducing sediments and increasing channel capacity and 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.
DLI2: Areas of wetlands in priority river basin locations restored (Ha), annual.	Coastal wetland systems are restored through measures including invasive species management and seagrass bed restoration, which increase the blue carbon sequestered by marine and coastal ecosystems.	Increase local flood mitigation capacity through wetland restoration, a nature-based solution which can act as a buffer zone, to modulate flooding during the rainy season and runoff peaks as well as enhance water supply to wildlife during prolonged dry seasons. Floods and droughts are expected to be exacerbated by climate change (paragraph 7).
DLI3: Areas of forests in priority river basin locations restored (Ha), annual.	The Intergovernmental Panel on Climate Change pointed out that deforestation is a direct cause of the increased presence of CO_2 in the air over the past decade. Forests are important carbon sinks contributing to climate change mitigation. According to GHG accounting, 8.41 million tonnes of CO_2e emission reduction can be realized over the life of the Program.	Improve forest health and ecosystem vitality to enhance ecosystem resilience to heavy rains, floods, and droughts and against forest fires, pest and disease outbreaks under extreme temperatures, all of which are expected to worsen under climate change (paragraph 7). Afforestation can also mediate the impact of climate-change exacerbated natural disasters by addressing other environmental issues, such as soil erosion and barren land.
DLI4: Length of river channels in priority river basin segments	The River's natural shape and banks are restored using native revegetation species, which increases carbon sinks along the river system.	River restoration contributes to mitigating flood and drought risks that are expected to be exacerbated under climate change, by supporting a river's natural capacity to retain water. River channel rehabilitation reduces the likelihood of high water levels and at the same time improves the river's

restored (km), annual.		natural functions. Riparian ecosystem restoration and increased vegetation can act as natural barriers and nature-based solutions against climate change induced erosions.
DLI5: Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved	Carbon sequestration through natural ecosystem restoration is incorporated into integrated landscape plans for ecosystem restoration and protection and other management documents to meet climate change mitigation goals at both the watershed and provincial levels.	Integrated landscape planning and technical guidelines for ecosystem restoration and protection developed at both the watersheds and the provincial level will identify location-specific climate change-exacerbated risks, including floods and droughts, and identify adaptation measures such as promoting nature-based solutions to increase water storage and retention, river channel rehabilitation to increase channel capacity, and soil erosion control to improve downstream reservoir water storage.

45. **Gender. Identified gender gaps are being addressed through appropriate measures in the Program design.** Women are notably under-represented in decision-making roles in grassroot governance systems for ecosystem restoration and protection activities. At the municipal level, women account for only 15.4 percent of the forest chiefs in Shandong and 11.1 percent in Gansu. At the county-level, women are even less represented as forest chiefs, at 7.7 percent in Shandong and 13.3 percent in Gansu. Data from sample counties in both provinces show that women account for only 10 to 30 percent of the 'civil forest chiefs', i.e., forest rangers. There are also gender gaps in local forest administration bodies such as forest management bureaus, where women make up 26.8 to 44.9 percent in Shandong and 24.4 to 29.0 percent in Gansu. Both provinces also have gender wage gaps in their forest management bureaus. Gender-specific actions are included in the Program design to address these gaps, including: pilot interventions to improve the gender composition of the FCS in Shandong and Gansu, such as rolling out a gender-sensitive public engagement manual; and Program support for the forestry system in achieving gender equality by attracting and retaining women in forestry management, such as by eliminating gender discrimination in the recruitment process as well as for those already working in the forest system. Progress will be monitored by measuring an increase in "Women in leadership positions in ecosystem restoration and protection (Percentage)," including the proportion of women in both official and civil forest chief roles at the county level and below. Annex 3 provides details of the gender analysis.

Program Expenditure Framework

46. **As Program boundaries are established within the Program counties in both Gansu and Shangdong, the Program's expenditure framework was assessed at the county level.** 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.[19] 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. The expenditure framework thus comprises multiple relevant budget lines, rather than a single Government program fund.

47. **The expenditure framework in Gansu and Shandong Provinces presents an adequate basis for the PforR.** 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. The total budget allocated for the government program in the six Gansu counties during 2019 to 2021 amounted to US$304.4 million, and in the 13 counties in Shandong to US$542.1 million. Based on these numbers, the

[19] State Council General Office. 2020. The Reform Plan for Delineating the Functions and Expenditure Responsibility between the Central Government and Provinces regarding Ecology and Environment Protection (Guo Ban Fa [2020] No. 13).

estimated budget to be allocated for the Program in each of the two provinces during the Program implementation period from Fiscal Year 2024 to 2029 would be US$507 million in Gansu and US$904 million 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). The rest was used for RA1 in institution strengthening. Funding sources of these expenditures are from multiple sectors, including water, agriculture, environment, and natural resources (seethe 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 analysis shows that budget funds for the identified government program in both Gansu and Shandong are stable and can be guaranteed.

48. **Economic conditions in both provinces are sound, as are the fiscal positions of the provincial governments.** The unfolding impacts associated with the COVID-19 pandemic and the slowing economic growth are expected to be negative on government finances. However, as the budget allocation for Program activities accounts for less than 0.9 percent and 0.2 percent of the general budget revenue in Gansu and Shandong, respectively, these negative factors are unlikely to cause any risk to the financial sustainability and continuity of Program-related activities in the years beyond the Program. The results of the expenditure framework assessment have been reviewed and confirmed with client government officials.

Economic evaluation

49. **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.[20] 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.[21] 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.[22]

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_2e emission reduction from improved forest cover of 52,245 ha (DLI 3). Although wetland restoration (DLI 2) and river rehabilitation (DLI 4) are also expected to contribute to GHG reduction by enhancing carbon sequestration through increased vegetation, their potential impact on GHG reduction is qualitatively outlined in Table 4 due to the absence of appropriate quantification methodologies. In all, the Program is expected to realize a GHG emission reduction of 8.41 million tonnes of CO_2e over its lifetime. This, however, represents only a subset of the total amount of the expected GHG emission reduction benefits attributable to the Program. The calculations are also limited to the demonstration sub-basins of the Program.

[20] This approach is used because, under a PforR, Government and World Bank funds are combined to achieve results, with virtually no distinction at the activity level between World Bank-financed and Government-financed achievements. This approach can determine whether the overall program—which the World Bank financing partly supports—is net socially beneficial.

[21] The discount rate of 6 percent is recommended for investments with long-term unquantified social and environmental benefits. See World Bank. 2015. Technical Note on Discounting Costs and Benefits in Economic Analysis of World Bank Projects; and NDRC. 2006. Economic Analysis of Construction Projects: Methods and Parameters. China Planning Press, Beijing

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

The potential to scale up these numbers is large, when the Program methods are implemented elsewhere in the two provinces and in YRB.

B. Fiduciary

51. **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.

52. **Financial Management (FM) Overview.** The prevailing Budget Law, Accounting Law, and Audit Law of the People's Republic of China (PRC) provide the legal framework for government budget management, government accounting, and auditing. 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 Program FM is governed by the PFM system and is supplemented by additional Bank requirements.

53. **FM Risks and Mitigation Measures.** Major FM risks identified by the Integrated Fiduciary Systems Assessment (IFSA) are: (a) Program expenditure payments might not be prioritized or could be delayed due to tight cash flow in the treasury account; (b) Program financial statements are not a requirement under the current government financial reporting architecture, which creates a risk of non-compliance with the PforR financial statement requirements; (c) Audit of Program financial statements is not a requirement under China's public financial management practice, whereas the audit of Program financial statements will require coordination across government audit units and the application of comprehensive audit techniques, which may create a risk of weak audits, at least in the Program's initial years; and (d) the multi-sector nature of the Program, the various budget resources that support the Program, and the large volume of activities bring complexity to Program financial management.

54. **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.

55. **Procurement Overview.** Procurement under the Program will follow the Tendering and Bidding Law (TBL) and the Government Procurement Law (GPL), as well as relevant implementation regulations. Open competitive bidding is one of the preferred procurement methods. Standard bid documents issued by respective line ministries will be used for procurements under the Program. Local public resources' transaction centers will provide a venue, system and expert pool to carry out procurement. An overall assessment of the legal framework and the procurement system found them to meet the Bank's principles of economy, efficiency, effectiveness, transparency, and accountability. 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 / Pubic-Private-Partnerships, and US$75 million for goods / information technology / non-consulting services, and US$30 million for consultant services.

56. **Procurement Risks and Mitigation Measures.** Two major procurement risks were identified. The first risk is that contracts may be awarded to firms or individuals which are debarred or are under temporary suspension by the World Bank or other multilateral development banks. The following mitigation measures have been proposed in this regard:

(a) the Provincial PMO shall issue a high-level official letter or official instruction on Program loan effectiveness requiring that all Program implementation agencies ensure that no contract is awarded to ineligible firms or individuals; (b) Procurement staff at the Provincial PMOs should check the latest lists of the debarred and temporarily suspended firms and individuals on a regular basis; and (c) the TOR for the annual external audit shall include the task of randomly selecting contracts and assessing whether they have been awarded to an ineligible firm or individual. The second risk is that the World Bank may not be informed of allegations of fraud and corruption during Program implementation. According to the World Bank anti-corruption guidelines, which are referenced in the LA, PPMOs are required to inform the World Bank of credible and material fraud and corruption issues, and the PAP specifically requires reporting through the Program progress report.

57. **Fraud and Corruption Risks.** The government has put in place multiple institutions to prevent, report, detect, investigate, prosecute, and sanction fraud and corruption. These institutions include the discipline inspection commissions within all implementation agencies, supervision bureaus, anti-corruption bureaus under the People's Procuratorates, and audit offices at the central, provincial, prefectural, and county levels. These agencies have comprehensive mandates to combat fraud and corruption, and any bidder or party can report fraud and corruption issues to any of these government agencies.

58. **The Program will be subject to the World Bank "Guidelines on Preventing and Combating Fraud and Corruption in Program-for-Results Financing' dated February 1, 2012 and revised on July 10, 2015** (the Anti-Corruption Guidelines). These guidelines shall be applied in an unrestricted manner on all activities within the Program boundary. To implement the various areas covered in the Anti-Corruption Guidelines, the implementation agencies shall perform the following:

- Maintain and compile a report of Program related complaints as part of the Program progress report.
- 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.
- Maintain and compile a report of any contract awards made to any ineligible/suspended firms/individuals, as part of Program progress reports.
- Ensure that each participating bidder submits a self-declaration that the firm is not subject to ineligibility or has not been sanctioned under the World Bank system of debarment and cross-debarment at the time of bidding.
- Ensure that timely and appropriate actions are taken to address issues and indications of fraud and corruption, and that these actions are reported to the World Bank.
- Ensure that the Program's implementation agencies will cooperate fully with the World Bank, or any firm/individual appointed by the World Bank, in any inquiry conducted by the World Bank into allegations or other indications of fraud and corruption in connection with the Program.

C. Environmental and Social

59. **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.

60. **E&S screening of the proposed Program activities will exclude those with high-risk potential to the environment and/or affected people and communities.** Based on the ESSA, excluded activities are those that may: (a) involve new or significant expansion of large-scale infrastructure; (b) involve significant conversion or degradation of critical natural habitats; (c) lead to significant adverse impacts on the health or safety of people or ecosystems; (d) result in significant negative changes to water quality or availability; (e) involve the acquisition of basic farmland; (f) involve changes of land use not compliant with national and local terrestrial and spatial planning; (g) result in large-

scale land acquisition, resettlement, or access restrictions to land, water and/or natural resources that affect livelihoods; (h) require land acquisition, resettlement, or changes in land use (including through restoration) that lead to forced eviction; (i) relocate ethnic minorities from their traditional ownership or customary use or occupation of land and natural resources, or cause significant impact on the cultural heritage of ethnic minorities; (j) entail significant legacy E&S issues; (k) involve complicated potential secondary pollution; (l) involve complicated pollution issues; (m) use chemicals to treat land with soil salinity; and (n) lead to any other potentially significant E&S impacts requiring the development of an Environmental Impact Assessment (EIA) report under China's existing legislation.

61. **With these exclusions, the overall E&S risk associated with the Program is considered Substantial.** 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. By excluding large-scale and environmentally/socially sensitive activities, the expected associated adverse E&S effects are largely temporary, construction-related, and site-specific, neither significant nor irreversible, and are expected to be readily avoided, minimized, and mitigated through known technologies. 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). The Substantial environmental risk rating stems from the number of activities of different kinds over a large portion of two provinces. 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. The potential impacts from worker and community health and safety, as well as the presence of ethnic minority populations (mainly Hui) within the Program area in both provinces (e.g., in Gansu's Huining County and in Shandong's Shen County) makes the social risk Substantial. Neither OP/BP 7.50 Projects on International Waterways, nor OP/BP 7.60 Projects in Disputed Areas, will be triggered.

62. **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.

63. **The ESSA identified some gaps in E&S management practices**. For Program activities with substantial and moderate impacts and risks, the current risk management system and measures are effective; however, the risk identification and related management measures are not adequately documented in critical Program documents (e.g., FSR or SSRA). There is some space for improvements in terms of mitigation measures such as sufficient personnel and budget, arrangements for implementation and monitoring, and recording and documentation of public consultation and information disclosure. For activities with minor impacts that are exempt from EIA and SSRA according to Chinese regulations but need cross-departmental collaboration in implementation, there is no clear arrangement on ES considerations in the documentation and implementation. The planning and implementation of TA activities in the existing regulatory framework lack consideration of potential downstream E&S risks/impacts of risks.

64. **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.; and (c) to incorporate E&S considerations in non-physical activities

to avoid/mitigate potential downstream E&S impacts/risks associated with the planning and implementation of the targeted deliverables (e.g., the integrated landscape plans).

65. **Meaningful stakeholder engagement was conducted during ESSA preparation.** Since December 2022, relevant government authorities at provincial/city/county/district levels and local communities/villagers from the two provinces have been consulted in face-to-face meetings, through field visits, and online interviews to understand the Program-related E&S issues and the management practice, particularly in the counties of Huining, Tongwei, and Gangu in Gansu, and Hekou, Zouping, and Dong'e in Shandong. The consultations engaged local communities, including the ethnic minority. The draft ESSA report in Chinese was shared with the two provinces for comments in late March 2023, followed by consultation meetings in Gansu and Shandong in April 2023, and the feedback received (largely on the accuracy of system description) was addressed in the current ESSA revision. The revised ESSA was disclosed locally on June 15, 2023 in Shandong, on June 16, 2023 in Gansu, and on the World Bank's website on July 31, 2023, and will be redisclosed locally and in WB website after the World Bank Board approval of the Program. Additional consultations were conducted in July 2023 in four villages in the Program area, including two ethnic minority villages. The supplementary consultations confirmed that meaningful consultations on activities exist between government and villages, and within villages, and that the Program has gained wide support from the local communities due to the expected positive impacts on people's livelihoods.

66. **Grievance redress.** Communities and individuals who believe that they are adversely affected as a result of a Bank-supported PforR operation, as defined by the applicable policy and procedures, may submit complaints to the existing Program grievance mechanism or the Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address pertinent concerns. Program-affected communities and individuals may submit their complaint to the Bank's independent Accountability Mechanism (AM). The AM houses the Inspection Panel, which determines whether harm occurred, or could occur, as a result of Bank non-compliance with its policies and procedures, and the Dispute Resolution Service, which provides communities and borrowers with the opportunity to address complaints through dispute resolution. Complaints may be submitted at any time after concerns have been brought directly to the Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the Bank's GRS, please visit http://www.worldbank.org/GRS. For information on how to submit complaints to the Bank's Accountability Mechanism, please visit https://accountability.worldbank.org. In parallel, communities and individuals who believe that they are adversely affected by the PforR operation may also submit complaints through the existing Grievance Redress Mechanism (GRM) at the community, village, and enterprise levels.

V. RISK

67. **The overall risk for the proposed PforR Program is rated Substantial**.

68. **The technical design risk is rated Substantial.** Ecosystem restoration and protection outcomes face the risk of water-consuming activities outside of the Program areas, both within the Program provinces and beyond, such as increased water consumption by revegetation in the upper reaches and reduced ecological flows to the Yellow River Delta. The Program will set up Provincial Program Management Offices in both Provinces and establish multi-sectoral and multi-agency Program Steering Groups headed by senior officials at the provincial, municipal, and county levels. To mitigate the aforementioned risk, these entities will: (a) strengthen cross-sector coordination; (b) ensure that water availability and water impacts downstream are considered for restoration efforts; and (c) monitor the execution of the implementation plans for integrated landscape management for ecosystem restoration and protection in the selected sub-basins.The Program will also use results-based financing to incentivize agencies to develop integrated and cross-sectoral plans within the Program areas, as well as through developing and implementing technical guidelines at the provincial level and establishing cross-sectoral institutional arrangements for Program implementation.

69. **The implementation capacity risk is rated Substantial.** Neither Gansu nor Shandong has yet had extensive experience with results-based financing supported by the World Bank. The capacity risk for Program implementation therefore remains Substantial. 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.

70. **The E&S risk is Substantial.** The Program will have significant and broadly positive E&S effects in the targeted regions. 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. Furthermore, implementation of TAs may have downstream E&S effects.

71. **The stakeholder risk is rated Substantial.** The ESSA identified all Program stakeholders in three types of affected, interested and management agencies, including ethnic minorities and other vulnerable groups (Annex 4). Stakeholer analysis and consultation concluded the risk is mainly from management agencies. The Program's support for cross-sector coordination for ecosystem restoration and protection raises the risk for overall stakeholder engagement, as it would require extensive consultation and consensus building among diverse institutional actors at different levels and branches of government. 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. Municipal and county-level PMOs are headed by government leaders who can coordinate sector agencies within their jurisdiction.

ANNEX 1. RESULTS FRAMEWORK MATRIX

Results Framework
COUNTRY: China
China: Yellow River Basin Ecological Protection and Environmental Pollution Control Program (Gansu and Shandong)

Program Development Objective(s)

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.

Program Development Objective Indicators by Objectives/Outcomes

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
PDO Indicators								
Land area under sustainable landscape management practices (CRI, Hectare(Ha))	DLI 1, 6	0.00	1,230.00	1,310.00	1,330.00	1,290.00	1,217.00	6,377.00
Reduced Pollutant loads (COD) entering rivers (Tons/year)		0.00	866.00	4,123.00	7,808.00	7,958.00	9,665.00	9,665.00
Hectares of terrestrial and aquatic areas under enhanced conservation and management (Hectare(Ha))		0.00	20,358.00	27,163.00	17,013.00	11,521.00	267.00	57,482.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Areas of wetlands in priority river basin locations restored, annual (Hectare(Ha))	DLI 2, 7	0.00	5,208.00	5,208.00	5,207.00	5,207.00	7.00	5,237.00
Areas of forests in priority river basin locations restored, annual (Hectare(Ha))	DLI 3, 8	0.00	15,150.00	21,955.00	11,806.00	6,574.00	0.00	52,245.00
Sequestered CO2eq due to ecosystem restoration (Tons/year)		0.00	280,333.00	280,333.00	280,333.00	280,333.00	280,333.00	1,401,665.00
Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved (Text)	DLI 5, 9	No	Gansu and Shandong Provinces approve implementation plans for integrated landscape management for ecosystem protection and restoration for six demonstration sub-basins (three in each province, respectively)	N/A	Gansu and Shandong (through DWR for Gansu; DNR for Shandong) approve technical guidelines for integrated landscape planning for ecosystem protection and restoration in river basins at the provincial level	N/A	N/A	Six implementation plans in demonstration sub basins (three in Gansu and three in Shandong) and two provincial technical guidelines (one in Gansu and one in Shandong) are issued.

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Intermediate Results Indicator by Results Areas

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Implement sustainable land and water management practices								
Areas of improved forest management, annual (Hectare(Ha))		0.00	13,500.00	18,500.00	16,500.00	11,500.00	8,933.00	72,706.00
Number of township wastewater treatment plants upgraded or built (Number)		0.00	2.00	0.00	1.00	0.00	0.00	3.00
Number of rural villages newly covered with rural wastewater network (Number)		0.00	12.00	12.00	12.00	0.00	0.00	36.00
Restore degraded ecosystems								
Length of river channels in priority river basin segments restored, annual (Kilometers)	DLI 4	0.00	34.00	66.00	40.00	28.00	16.00	184.00
Areas of grasslands and other types of ecosystems restored, annual (Hectare(Ha))		0.00	7,300.00	7,300.00	7,300.00	7,300.00	7,300.00	36,500.00
Increased biodiversity monitored in selected program areas (Percentage)		0.00	0.00	0.00	10.00	10.00	20.00	20.00
Strengthen the capacity of integrated land and WRM for ecosystem restoration and protection								

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Established number of ecosystem health monitoring and evaluation system pilots, annual (Number)		0.00	0.00	0.00	2.00	2.00	2.00	6.00
Number of participants completing training and capacity building activities implemented at provincial, municipal and county levels (person times) (Number)		0.00	4,000.00	4,000.00	3,500.00	3,500.00	3,300.00	18,300.00
Of which are female participants (person times) (Number)		0.00	1,200.00	1,200.00	1,050.00	1,050.00	1,050.00	5,490.00
Women in leadership positions in ecosystem protection and restoration (proportion of women in both official and civil forest chiefs at the county level and below) (Percentage)		10.00	10.00	10.00	15.00	15.00	20.00	20.00

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Monitoring & Evaluation Plan: PDO Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Land area under sustainable landscape management practices	The indicator measures, in hectares, the land area for which new and/or improved sustainable landscape management practices have been introduced. Land is the terrestrial biologically productive system comprising soil, vegetation, and the associated ecological and hydrological processes; Adoption refers to change of practice or change in the use of a technology promoted or introduced by the project; Sustainable landscape management (SLM) practices refers to a combination of at least two technologies and approaches to increase land quality and restore degraded lands for example, agronomic, vegetative, structural, and	Semi-annual	Verification Report	Monitors (a) annual newly added land areas with soil and water conservation measures implemented which meet national technical standards in Gansu, i.e. farmland terracing; and (b) newly added land areas with soil salinity treatment measures applied in Shandong, including leaching, crop pattern change, water evaporation reduction and so on. Data can be collected from survey with the results verified by TPVA. Details of methodologies and verification processes are in a separate verification protocol table.	Provincial and county PMOs

	management measures that, applied as a combination, increase the connectivity between protected areas, forest land, rangeland, and agriculture land.				
Reduced Pollutant loads (COD) entering rivers	Monitors COD load reduction through improving rural wastewater management, including upgrading and constructing municipal wastewater treatment plants, improving the coverage of rural wastewater networks.	Semi annual	Semi-annual Program Progress Report	For upgraded and newly built WWTPs, pollution reduction will be measured according to the water quality monitoring records of WWTP influent and effluent. Those monitoring records can be verified at environmental bureaus.	PPMO, Provincial Ecology and Environment Department and Program Counties
Hectares of terrestrial and aquatic areas under enhanced conservation and management	Monitors the total areas of restored critical wetland ecosystems (as monitored by sub indicator 1 and DLI2) and restored critical forest ecosystems (as monitored by sub indicator 2 and DLI3).	Semi annual	Verification Report	Survey with the results verified by TPVA. Details of methodologies and verification processes are in separate verification protocol tables for each of the two sub indicators.	Provincial and County PMOs
Areas of wetlands in priority river basin locations restored, annual	This indicator measures the Program wetland areas (in ha) where interventions are carried out on an annual basis to restore	Semi annual	Verification Report	Survey with the results verified by TPVA. Details of methodologies and verification processes are in a separate	Provincial and county PMOs

	degraded habitats, i.e., for waterbirds and other taxa (fish, amphibians, insects). Locations for wetland restoration that are critical to river basin ecosystem health have been identified by the Technical Assessment. While annual targets for Gansu are incremental, in Shandong, 5,200 hectares of wetlands will be restored over a consecutive period of four years from Year 1 to Year 4 as required to completely remove Spartina as an invasive species. During each year of this period, the same wetland area of 5,200 hectares will need to verified to ensure that they meet the restoration targets (i.e., absence of Spartina and other targets according to the technical standards).			verification protocol table.	
Areas of forests in priority river basin locations restored, annual	This indicator measures the areas (in ha) with forest ecosystems restored,	Semi annual	Verification Report	Survey with the results verified by TPVA. Details of methodologies and	Provincial and County PMOs

	including three types of interventions: (a) mixed species plantations established, (b) degraded and monoculture forests restored to mixed species forests, and/or (c) assisted natural regeneration promoted. Areas for forest restoration are identified by Technical Assessment that are critical to river basin ecosystem health.			verification processes and technical standards and requirements are presented in a separate verification protocol table.	
Sequestered CO2eq due to ecosystem restoration	Monitors greenhouse gas emission reduction through carbon sequestration by newly added and restored forest ecosystems during the project implementation period. Restored forests ecosystems under this Program are expected to sequester 8.41 million tons of CO2eq through the Program's 30-year life time (including 5 years of implementation period), equalling to 280,333 tons of CO2eq sequestrated per year.	Semi annual	Semi-annual Program Progress Report	The carbon sequestration model developed by FAO and a 30-year project life cycle can be used to estimate the carbon dioxide equivalent of the project to be sequestered.	Provincial and county PMOs

Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved	This DLI addresses challenges of institutional strengthening and cross-sector collaboration by incentivizing integrated planning process upscaling from demonstration sub-basin level to provincial level adopting a landscape approach for ecosystem restoration and protection at river basins: (a) Gansu and Shandong provinces develop the implementation plans for integrated landscape management for ecosystem restoration and protection for three selected sub-basins, respectively. The implementation plan aims at integrated ecosystem restoration and protection based on a consumption-based water balance and water quality analyses, considering institutions, gender, and future climate change impacts; and (b) Provincial governments	Annual	Verification Report	Official documents (sub-basin level integrated plans and provincial guidelines) are approved and are made available to the verification agency. All these documents will need to be acceptable to the World Bank and hence they should have previously been reviewed by the World Bank and comments incorporated.	Provincial and County PMOs

	(through DWR in Gansu and DNR in Shandong) issue technical guidelines on how to prepare integrated landscape plans for ecosystem restoration and protection at the river basin level, based on the experience from the demonstration sub-basins. These implementation plans and guidelines will consider the impacts of future climate change, and will include actions for both mitigation and adaptation.				

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Areas of improved forest management, annual	Monitors the areas of improved forest management (fire and pest prevention and control, among others) interventions applied.	Semi annual	Semi-annual Program Progress Report	Data can be obtained from inventory data at local forestry bureaus	PPMO, Provincial Forestry Department and Program Counties
Number of township wastewater treatment plants upgraded or built	Monitors both upgraded and newly built township wastewater treatment plants in Program municipalities and counties. Number of wastewater treatment plants with effluent discharge standard upgraded from Class 1A; treatment capacity of newly built wastewater treatment plants cannot exceed 50,000 tons per day. Climate-resilient designs will be incorporated in constructing or upgrading wastewater treatment plants.	Semi annual	Semi-annual Program Progress Report	Data will be obtained from program progress report and verified by official records from relevant departments	PPMO and Program Counties
Number of rural villages newly covered	Number of rural villages	Semi-	Semi-annual	Data will be obtained	PPMO and Program

with rural wastewater network	newly covered with rural wastewater network through network expansion by Program activities	annual	Program Progress Report	from program progress report and verified by official records from relevant departments	Counties
Length of river channels in priority river basin segments restored, annual	Monitors the length of river ecology restoration, including river channel restoration and riparian ecological restoration in Gansu. Restored rivers should follow national and advanced local technical standards and specific additions detailed in the verification protocol, restoring river's natural shape and banks, using native revegetation species, and with micro-habitats created for wildlife.	Semi annual	Verification report	Survey with the results verified by TPVA. Details of methodologies, verification processes, applicable technical standards and requirements are presented in a separate verification protocol table.	PPMO and Program Counties
Areas of grasslands and other types of ecosystems restored, annual	Monitors the area of protection and restoration of grassland and other types of ecosystems	Semi annual	Semi-annual Program Progress Report	Data can be obtained from natural resource department and combined with satellite data and groundtruthing.	PPMO, Provincial Natural Resources Department and Program Counties
Increased biodiversity monitored in selected program areas	Monitors the increased number of species (including birds, plants and benthons) within selected	Semi annual	Semi-annual Program Progress Report	According to eDNA method conducted by a technical consultant and traditional monitoring	PPMO, Provincial Natural Resources Departments, Provincial Ecology and

	sample program areas as monitored by eDNA and other traditional technologies as proposed in Program Implementation Plan.			methods by natural resources and/or Ecology and Environment agencies	Environment Departments
Established number of ecosystem health monitoring and evaluation system pilots, annual	Monitors ecosystem health and pilots evaluation systems in selected areas (one in each program municipality). Municipal pilots are established according to the below four criteria: Workforce or staffing designated; financial resources allocated; technical guidelines issued; infrastructure, e.g. monitoring stations, established.	Semi annual	Semi-annual Program Progress Report	Official documents on the four criteria are available to the World Bank	PPMO, Provincial Natural Resources Department and Program Counties
Number of participants completing training and capacity building activities implemented at provincial, municipal and county levels (person times)	Number of participants (people times) participated in training and capacity building activities organized at provincial, municipal and county levels. These training and activities are on topics including (a) ecosystem services assessment and	Semi annual	Semi-annual Program Progress Report	Training and activity completion reports of PMOs at county, municipal and provincial levels	Provincial, Municipal and County PMOs

	ecosystem restoration, water balance assessment, water pollution modelling and management, climate change mitigation and adaptation, gender inclusion etc. and (b) Program management (Fiduciary, Environment & Social management).				
Of which are female participants (person times)	Number of female participants (people times) participated in training and capacity building activities organized at provincial, municipal and county levels. These training and activities are on topics including (a) ecosystem services assessment and ecosystem restoration, water balance assessment, water pollution modelling and management, climate change mitigation and adaptation, gender inclusion etc. and (b) Program management (Fiduciary, Environment & Social management).	Semi annual	Semi annual Program Progress Report	Training and activity completion reports of PMOs at county, municipal and provincial levels	Provincial, Municipal and County PMOs

Women in leadership positions in ecosystem protection and restoration (proportion of women in both official and civil forest chiefs at the county level and below)	Proportion of women as Forest, Grassland and Wetland Chiefs (including official chiefs and civil chiefs) in Program counties and below. Civil forest, grassland and wetland chiefs include rangers and vulnunteers registered at natural resources department.	Semi annual	Semi-annual Program Progress Report	Data can be obtained from the list of Forest, Grassland and Wetland Chiefs at the Natural Resources Department.	PPMO, Provincial Natural Resources Department and Program Counties

ANNEX 2. DISBURSEMENT LINKED INDICATORS, DISBURSEMENT ARRANGEMENTS AND VERIFICATION PROTOCOLS

Disbursement Linked Indicators Matrix

DLI 1	1a. Land area under sustainable landscape management practices (CRI, Ha), annual (Gansu)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Hectare(Ha)	45,220,000.00	15.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
2024	1,190.00		9,044,000.00	US$7,600 per hectare of land area implementing soil and water conservation measures
2025	1,190.00		9,044,000.00	US$7,600 per hectare of land area implementing soil and water conservation measures
2026	1,190.00		9,044,000.00	US$7,600 per hectare of land area implementing soil and water conservation measures
2027	1,190.00		9,044,000.00	US$7,600 per hectare of land area implementing soil and water conservation measures
2028	1,190.00		9,044,000.00	US$7,600 per hectare of land area

				implementing soil and water conservation measures

DLI 2	2a. Areas of wetlands in priority river basin locations restored, annual (Gansu)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Hectare(Ha)	3,024,750.00	1.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
2024	8.00		654,000.00	US$81,750 per hectare of wetland restored
2025	8.00		654,000.00	US$81,750 per hectare of wetland restored
2026	7.00		572,250.00	US$81,750 per hectare of wetland restored
2027	7.00		572,250.00	US$81,750 per hectare of wetland restored
2028	7.00		572,250.00	US$81,750 per hectare of wetland restored

DLI 3	3a. Areas of forests in priority river basin locations restored (Ha), annual (Gansu)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Hectare(Ha)	78,752,500.00	26.25
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
2024	14,250.00		24,225,000.00	US$1,700 per hectare of forest ecosystem restored
2025	18,955.00		32,223,500.00	US$1,700 per hectare of forest ecosystem restored
2026	8,806.00		14,970,200.00	US$1,700 per hectare of forest ecosystem restored
2027	4,314.00		7,333,800.00	US$1,700 per hectare of forest ecosystem restored
2028	0.00		0.00	N/A

DLI 4	4a. Length of river channels in priority river basin segments restored, annual (Gansu)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Kilometers	7,562,000.00	2.50
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			

2024	32.00	1,592,000.00	US$49,750 per kilometer of river ecosystem restored
2025	56.00	2,786,000.00	US$49,750 per kilometer of river ecosystem restored
2026	30.00	1,492,500.00	US$49,750 per kilometer of river ecosystem restored
2027	18.00	895,500.00	US$49,750 per kilometer of river ecosystem restored
2028	16.00	796,000.00	US$49,750 per kilometer of river ecosystem restored

DLI 5	5a. Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved (Gansu)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Text	15,440,750.00	5.25
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	No			
2024	Gansu approves implementation plans for integrated landscape management for ecosystem restoration and protection at the sub-basin level for each of the three demonstration sub-basins		11,580,562.50	US$3,860,187.5 per integrated landscape plan approved at sub-basin level
2025	N/A		0.00	N/A

2026	Provincial Department (DWR in Gansu) approves a technical guideline for integrated landscape plans for ecosystem restoration and protection in river basins at the provincial level	3,860,187.50	US$3,860,187.5 for the provincial technical guideline approved
2027	N/A	0.00	NA
2028	N/A	0.00	N/A

DLI 6	1b. Land area under sustainable landscape management practices (CRI, Ha), annual (Shandong)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Hectare(Ha)	14,987,700.00	5.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
2024	40.00		1,404,000.00	US$35,100 per hectare of additional land area implementing soil salinity measures
2025	120.00		4,212,000.00	US$35,100 per hectare of additional land area implementing soil salinity measures
2026	140.00		4,914,000.00	US$35,100 per hectare of additional land area implementing soil salinity measures
2027	100.00		3,510,000.00	US$35,100 per hectare of additional land area implementing soil salinity

			measures
2028	27.00	947,700.00	US$35,100 per hectare of additional land area implementing soil salinity measures

DLI 7	2b. Areas of wetlands in priority river basin locations restored (Ha), annual (Shandong)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Hectare(Ha)	74,880,000.00	24.98
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
2024	5,200.00		18,720,000.00	US$3,600 per hectare of wetland restored
2025	5,200.00		18,720,000.00	US$3,600 per hectare of wetland restored
2026	5,200.00		18,720,000.00	US$3,600 per hectare of wetland restored
2027	5,200.00		18,720,000.00	US$3,600 per hectare of wetland restored
2028	0.00		0.00	N/A

DLI 8	3b. Areas of forests in priority river basin locations restored (Ha), annual (Shandong)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Hectare(Ha)	44,992,000.00	14.99
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
2024	1,000.00		7,600,000.00	US$7,600 per hectare of forest ecosystem restored
2025	2,000.00		15,200,000.00	US$7,600 per hectare of forest ecosystem restored
2026	2,000.00		15,200,000.00	US$7,600 per hectare of forest ecosystem restored
2027	920.00		6,992,000.00	US$7,600 per hectare of forest ecosystem restored
2028	0.00		0.00	N/A

DLI 9	5b. Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved (Shandong)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Intermediate Outcome	Yes	Text	15,140,300.00	5.03
Period	**Value**		**Allocated Amount (USD)**	**Formula**

Baseline	No		
2024	Shandong approves implementation plans for integrated landscape management for ecosystem restoration and protection at the sub-basin level for each of the three demonstration sub-basins	11,355,225.00	US$3,785,075 per integrated landscape plan developed at sub-basin level
2025	N/A	0.00	N/A
2026	Provincial Department (DNR in Shandong) approves a technical guideline for integrated landscape plans for ecosystem restoration and protection in river basins at the provincial level	3,785,075.00	US$3,785,075 for the provincial technical guideline approved
2027	N/A	0.00	N/A
2028	N/A	0.00	N/A

Verification Protocol Table: Disbursement Linked Indicators	
DLI 1	1a. Land area under sustainable landscape management practices (CRI, Ha), annual (Gansu)
Description	Sustainable Landscape Management Practices mean select practices to increase land quality and restore degraded lands combining at least two technologies related to soil and water conservation (with respect to Gansu Province) and soil salinity treatment (with respect to Shandong Province), as set form in the respective Program Implementation Plan. In Gansu, this indicator measures annual newly added land areas with soil and water conservation measures implemented which meet national technical standards, refering to farmland terracing combined with other farming practice changes, including conservation agriculture, application of organic fertilizer and so on.
Data source/ Agency	Verification report
Verification Entity	Verification agency
Procedure	**Verification:** The annual additional new land area with soil and water conservation measures implemented can be verified based on national technical standards combining site-verification with remote sensing technology and ground-truthing. The projects will be randomly selected to be verified according to the related national standards (Guobiao, GB) as below. In addition, an advanced local standard from Beijing (DB) that is aligned with internal good practices will also be applied. • Code for soil and water conservation engineering design (GB-51018-2014) • Technical specification for soil and water conservation (GB/T16453-2008) • Completion acceptance standards for integrated soil and water conservation (GB/T15773-2008） • Technical guidelines for ecologically-clean small watershed construction (SL534-2013) • Technical specification for ecologically-clean small watershed construction (DB11/T548-2008) **Disbursement** will be made scalable based on the number of hectares (0.01 hectare) implemented with eligible soil and water conservation measures and will not be capped at the annual target within the total 5,950 hectares within the Program implementation period.
DLI 2	2a. Areas of wetlands in priority river basin locations restored, annual (Gansu)
Description	This indicator measures the Program wetland areas (in ha) where interventions are carried out on an annual basis to restore degraded habitats, i.e., for waterbirds and other taxa (fish, amphibians, insects). Locations for wetland restoration that are critical to river basin ecosystem health have been identified by the Technical Assessment.

Data source/ Agency	Verification report
Verification Entity	Verification agency
Procedure	**Verification**: Two levels of inspection and acceptance will be carried out according to the below 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 to TPVA for verification. TPVA will carry out the verification for activities completed through random field surveys covering a percentage, to be agreed upon in the PIP, of the county's reported qualified areas, which will, in turn, cover a percentage, to be agreed upon, of the total for each program county. 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. In addition, the following technical requirements should be followed: Wetland restoration should recreate gradual slopes between 1 ‰ and 4 ‰ as surrounding edges as well as inundated areas of 10cm ～30cm depth. Use natural materials for bank rehabilitation. Use no less than 5 native wetland plants for rehabilitation, including submerged plants, floating plants, and emergent plants. The planted wetland vegetation should be self-establishing, requiring low maintenance, with a survival rate of higher than 80 % after one planting season. The area of emergent plants plus floating plants should be restricted to less than 10% of the total restored wetland where large ungulates are absent. Re-introduce native carnivore fish as top-down control. Create suitable habitats for birds and amphibians. Create habitat islands for open water surfaces over 8 ha. Habitat islands should be larger than 0.5 ha, and should not be higher than 1.5 meters above water surface. **Disbursement** will be made scalable based on the number of hectares (0.01 hectare) with restored wetland areas in the Program areas. The annual DLI values are indicative, and they can be met at any time during the period of Program implementation.
DLI 3	3a. Areas of forests in priority river basin locations restored (Ha), annual (Gansu)
Description	This indicator measures the area (in ha) of forest ecosystems restored, including three types of interventions: (a) mixed species plantations established; (b) degraded and monoculture forests restored to mixed species forests; and/or (c) assisted natural regeneration promoted. Areas for forest restoration that are critical to river basin ecosystem health are identified by the Technical Assessment.

Data source/ Agency	Verification report
Verification Entity	Verification agency
Procedure	**Verification**: Two levels of inspection and acceptance will be carried out according to the below technical standards. 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. TPVA will carry out the verification for activities completed through random field surveys covering a percentage, to be agreed upon in the PIP, of the county's reported qualified areas, which will, in turn, cover a percentage, to be agreed upon, of the total for each program county. The technical specifications should comply with applicable technical standards, including (a) National Afforestation and Forest Management Comprehensive Verification Technical Regulation (LY/T2083-2013); (b) Forest Management Verification Technical Regulation (Forestry 2014 – No. 140); (c) GB/T 15163-2004 - Technical regulations for setting apart hills including sand area for tree growing; as well as the relevant Gansu Provincial Technical Standards. Additional requirements based on this verification procedure include: resulting restored ecosystem should be mixed species forests with minimum 3 different species of native tree or shrubs, with a survival rate of 85 percent one growing season after planting (except for regions with precipitation less than 400 mm, a 70 percent survival rate is required). Degraded and monoculture forests will be restored through enrichment planting or seeding of diverse native species, assisted natural regeneration and other measures. 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 areas. The annual DLI values are indicative, and they can be met at any time during the period of Program implementation period.
DLI 4	4a. Length of river channels in priority river basin segments restored, annual (Gansu)
Description	This indicator measures the length of river restored, including the restoration of river channel and banks, riparian wetlands, and forest strips along river banks. Segments of river channels for restoration that are critical to river basin ecosystem health are identified by Technical Assessment. Restored refers to the restoration to the river's natural shape, using natural materials for bank stabilization, leaving cracks along the embankments to facilitate natural exchange of energy and

	nutrients, and the use of wetland vegetation cover for additional wildlife habitats.
Data source/ Agency	Verification report
Verification Entity	Verification agency
Procedure	**Verification**: Two levels of inspection and acceptance will be carried out according to the below technical standards. 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. TPVA will carry out the verification for activities completed through random field surveys covering a percentage, to be agreed upon in the PIP, of the county's reported qualified areas, which will, in turn, cover a percentage, to be agreed upon, of the total for each program county. Applicable technical standards are (a) 2014 Technical Guidelines for Ecological Restoration of Inlet Rivers and Rivers in Lake Basins by the Ministry of Ecology and Environment ; (b) DB11/T 1300—2015 Technical Regulations for Wetland Restoration and Construction; (c) DB11/T 1605-2018 Technical Regulations for the Evaluation of Bird Diversity and Habitat Quality; and (d) DB11/T 1722-2020: Technical Regulation for Water Ecological Health Assessment. These are all local standards from Beijing which align with international good practices. 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. **Disbursement** will be made scalable based on the length (km) with restored river ecosystems in the Program areas. The annual DLI values are indicative, and they can be met at any time during the period of Program implementation period.
DLI 5	5a. Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved (Gansu)
Description	This DLI addresses challenges of institutional strengthening and cross-sector collaboration by incentivizing the upscaling of integrated planning processes from demonstration watershed level to the province adopting a landscape approach for ecosystem restoration and protection at river basins by: (a) Gansu and Shandong provinces developing implementation plans for integrated landscape management for ecosystem restoration and protection for three selected sub-basins, respectively; The integrated implementation plans need to include a consumption based water balance analysis, and covers ecosystem management, water resource conservation and water pollution reduction, considering future climate change impacts, both mitigation and adaptation, and gender; and (b) provincial governments (through the Department of Water

	Resources (DWR) in Gansu and the Department of Natural Resources (DNR) in Shandong) issuing technical guidelines to prepare integrated landscape plans for ecosystem restoration and protection at the river basin level, based on the experience from the demonstration sub-basins. The Technical Guideline will provide guidance for priortizing ecosystem restoration actions in river basin contexts that maximize ecosystem services and climate and biodiversity co-benefits, prescribing international good practices and taking into consideration on water resource constraints and water quality conditions, particularly in water-scarce river basins.
Data source/ Agency	Verification report
Verification Entity	Verification agency
Procedure	**Verification:** Official documents (sub-basin level integrated plans and provincial guideline) are approved provincial technical departments and are made available to the verification agency. All these documents will need to be acceptable to the World Bank and hence they should have previously been reviewed by the World Bank and comments incorporated. **Disbursement:** (a) Disbursement will be made scalable upon the number of sub-basin level Integrated landscape Plans for ecosystem protection and restoration developed; Three in total. (b) A one-off disbursement will be made upon the provincial technical guideline being approved by the provincial department of water resources in Gansu.
DLI 6	1b. Land area under sustainable landscape management practices (CRI, Ha), annual (Shandong)
Description	Sustainable Landscape Management Practices mean select practices to increase land quality and restore degraded lands combining at least two technologies related to soil and water conservation (with respect to Gansu Province) and soil salinity treatment (with respect to Shandong Province), as set form in the respective Program Implementation Plan. 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.
Data source/ Agency	Verification report
Verification Entity	Verification agency
Procedure	**Verification:** The annual additional new land area with soil salinity treatment measures implemented can be verified based on national technical standards combining site-verification with remote sensing technology and ground-truthing. The

	projects will be randomly selected to be verified according to the related national standards (Guobiao, GB) as below. In addition, an advanced local standard from Beijing (DB) that is aligned with internal good practices will also be applied. • 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.
DLI 7	2b. Areas of wetlands in priority river basin locations restored (Ha), annual (Shandong)
Description	This indicator measures the Program wetland areas (in ha) where interventions are carried out on an annual basis to restore degraded habitats, i.e., for waterbirds and other taxa (fish, amphibians, insects). 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 wetlands will be restored over a consecutive period of four years from Year 1 to Year 4. During each year of this period, the same wetland area of 5,200 hectares will need to verified to ensure that they meet the restoration targets (i.e., absence of Spartina and other targets according to the technical standards).
Data source/ Agency	Verification report
Verification Entity	Verification agency
Procedure	**Verification**: Two levels of inspection and acceptance will be carried out according to the below 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 to TPVA for verification. TPVA will carry out the verification for activities completed through random field surveys covering a percentage, to be agreed upon in the PIP, of the county's reported qualified areas, which will, in turn, cover a percentage, to be agreed upon, of the total for each program county. 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. In addition, the following technical requirements should be followed: Wetland

	restoration should recreate gradual slopes between 1 ‰ and 4 ‰ as surrounding edges as well as inundated areas of 10cm ～30cm depth. Use natural materials for bank rehabilitation. Use no less than 5 native wetland plants for rehabilitation, including submerged plants, floating plants, and emergent plants. The planted wetland vegetation should be self-establishing, requiring low maintenance, with a survival rate of higher than 80 % after one planting season. The area of emergent plants plus floating plants should be restricted to less than 10% of the total restored wetland where large ungulates are absent. Re-introduce native carnivore fish as top-down control. Create suitable habitats for birds and amphibians. Create habitat islands for open water surfaces over 8 ha. Habitat islands should be larger than 0.5 ha, and should not be higher than 1.5 meters above water surface. **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.
DLI 8	3b. Areas of forests in priority river basin locations restored (Ha), annual (Shandong)
Description	This indicator measures the area (in ha) of forest ecosystems restored, including three types of interventions: (a) mixed species plantations established; (b) degraded and monoculture forests restored to mixed species forests; and/or (c) assisted natural regeneration promoted. Areas for forest restoration that are critical to river basin ecosystem health are identified by the Technical Assessment.
Data source/ Agency	Verification report
Verification Entity	Verification agency
Procedure	**Verification**: Two levels of inspection and acceptance will be carried out according to the below technical standards. 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. TPVA will carry out the verification for activities completed through random field surveys covering a percentage, to be agreed upon in the PIP, of the county's reported qualified areas, which will, in turn, cover a percentage, to be agreed upon, of the total for each program county. The technical specifications should comply with applicable technical standards, including (a) National Afforestation and Forest Management Comprehensive Verification Technical Regulation (LY/T2083-2013); (b) Forest Management Verification Technical Regulation (Forestry 2014 – No. 140); (c) GB/T 15163-2004 - Technical regulations for setting apart hills including

	sand area for tree growing; as well as the relevant Shandong Provincial Technical Standards. Additional requirements based on this verification procedure include: resulting restored ecosystem should be mixed species forests with minimum 3 different species of native tree or shrubs, with a survival rate of 85 percent one growing season after planting (except for regions with precipitation less than 400 mm, a 70 percent survival rate is required). Degraded and monoculture forests will be restored through enrichment planting or seeding of diverse native species, assisted natural regeneration and other measures. 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 annual DLI values are indicative, and they can be met at any time during the period of Program implementation period.
DLI 9	5b. Number of technical documents for integrated landscape planning and decision making for ecosystem restoration and protection approved (Shandong)
Description	This DLI addresses challenges of institutional strengthening and cross-sector collaboration by incentivizing the upscaling of integrated planning processes from demonstration watershed level to the province adopting a landscape approach for ecosystem restoration and protection at river basins by: (a) Gansu and Shandong provinces developing implementation plans for integrated landscape management for ecosystem restoration and protection for three selected sub-basins, respectively; The integrated implementation plans need to include a consumption based water balance analysis, and covers ecosystem management, water resource conservation and water pollution reduction, considering future climate change impacts, both mitigation and adaptation, and gender; and (b) provincial governments (through the Department of Water Resources (DWR) in Gansu and the Department of Natural Resources (DNR) in Shandong) issuing technical guidelines to prepare integrated landscape plans for ecosystem restoration and protection at the river basin level, based on the experience from the demonstration sub-basins. The Technical Guideline will provide guidance for priortizing ecosystem restoration actions in river basin contexts that maximize ecosystem services and climate and biodiversity co-benefits, prescribing international good practices and taking into consideration on water resource constraints and water quality conditions, particularly in water-scarce river basins.
Data source/ Agency	Verification report
Verification Entity	Verification agency

Procedure	**Verification:** Official documents (sub basin level integrated plans and provincial guidelines) are approved by provincial technical departments and are made available to the verification agency. All these documents will need to be acceptable to the World Bank and hence they should have previously been reviewed by the World Bank and comments incorporated. **Disbursement:** (i) Disbursement will be made scalable upon the number of watershed Integrated landscape Plans for ecosystem protection and restoration developed; Three in total. (ii) A one-off disbursement will be made upon the provincial technical guideline being approved by the provincial department of natural resources.

ANNEX 3. (SUMMARY) GENDER ASSESSMENT

1. **Women are notably under-represented in decision-making roles in grassroot forest governance.** A Rapid Assessment of FCS shows that on the municipal level, women account for just 15.38 percent of the forest chiefs in Shandong and 11.11 percent of those in Gansu. County level data also finds a substantial under-representation of women, with the ratio of male forest chiefs to female at 12:1 in Shandong, and about 6.5:1 in Gansu. The FCS comprises not only official forest chiefs, but also forest rangers, regarded as "civil forest chiefs" in some regions, who play a crucial role in village level forestry governance. These positions are social welfare positions supported by the government. Forest rangers are recruited and contracted from poor households and paid 8000 RMB per year. Data from sample counties in Gansu as well as from Liaocheng, Shandong, show that women account for 10 percent to 30 percent of forest rangers.

2. **Fewer women are engaged in technical/managerial roles in the forestry system[23] due to knowledge/skill gaps, social norms, and stereotypes.** Women account for 17-36 percent of managerial positions, and 25-54 percent of technical positions in the Program cities. Except for Liaocheng, city data shows that women occupy fewer managerial-technical-general position. There is also a wage gap between men and women across the FCS**.** In technical positions in Shandong, except for Liaocheng, women earn around 92-99 percent of their male counterparts. This earning gap is more pronounced in Gansu: between 72-96 percent. To address the abovementioned gender gaps in forest management, the following gender actions are being proposed.

3. **First, a public engagement manual will be developed and piloted in Shandong and Gansu.** It will provide guidelines to grassroots authorities on developing procedures to build women's capacity to engage and serve in multiple roles including as 'civil forest chiefs,[24] forest rangers, volunteers, etc., and to enhance gender balance in the system's workforce. Women's participation in public decision-making on forest management will be documented, and the proportion of women forest chiefs/forest rangers/volunteers in demonstration counties will be tracked and monitored against the target suggested by the Provincial government. The forest management bureau will collaborate with the women's federation to provide technical training, mentoring, and study tours for women forest chiefs to improve women's capacity and their engagement in local forest resource management decision-making. The forest bureau will also collaborate with the women's federation and local media to organize public awareness campaigns/communication programs to showcase and highlight women's contributions to forest management.

4. **Second, the program will support the forestry system in achieving gender equality by attracting and retaining women in forestry management.** A key mechanism would be to address gender discrimination in the recruitment process as well as internally in career advancement and ensure equal pay for equal work. The forest bureau, together with the women's federation, will develop and deliver a gender awareness training series to employers in the sector to enhance awareness regarding gender equality in Human Resources and in talent development. Certification training programs with a focus on forestry management, computer skills, data analysis, and leadership, among others, will be developed and delivered to up-skill women working in the sector, and to better equip them for technical and managerial positions.

[23] The forestry system here includes relevant public entities. This program focuses on women's employment in the formal administrative bodies and independent non-profit organizations.

[24] Not every county in Shandong and Gansu has civil forest chiefs.

ANNEX 4. STAKEHOLDER ANALYSIS

Result Area	Typical activities	Affected entities	Interested entities	Management agencies
RA1- Improve land and water resource management	• soil erosion control and water conservation (farmland terracing and slope land stabilization); • improved forest and grassland management (fire and disease prevention and control); • soil salinity treatment; • water-saving irrigation for forests and grasslands	• People may be affected by land acquisition or other forms of land use; • People may be affected by environmental impact during construction and operation.	• Service providers • Individuals or organizations concerned about ecological environment • organizations concerned about poverty and women's development	• Government department at different level, e.g., NRPB, EEB, WRB, NRB, etc. • township government involved • village committees involved
	• township domestic wastewater management (new and rehabilitated wastewater treatment plants and network).	• People affected by land acquisition/ occupation • People paying for wastewater treatment	• Operators and maintenance units of wastewater treatment facilities • Service and goods providers • Individuals or organizations concerned about ecological environment • Organizations concerned about poverty and women's development	• competent authorities, e.g., provincial and county level ARABs, EEBs, or HURDBs • county government • township government • village committees
RA2- Improve the quality of degraded ecosystems	• Wetland restoration (Spartina alterniflora management, Suaeda salsa restoration, seagrass bed restoration, benthos proliferation, flood plain restoration, and urban wetland restoration) • River channel rehabilitation	• Planters • people affected by land acquisition/occupation • People may be affected by environmental impact during construction and operation.	• Service providers • individuals or organizations concerned about ecological environment and soil quality • organizations concerned about poverty and women's development	• competent authorities, e.g., provincial and county level NRBs, FGBs, WRBs • county government • township government involved • village committees involved
	• Reforestation and forest ecosystem restoration; • Grassland and other ecosystem restoration; • Biodiversity monitoring of selected ecosystems using the environmental DNA (eDNA)	• None	• individuals or organizations concerned about ecological environment • Service providers	• competent authorities, e.g., provincial and county level EEBs, NRBs

Result Area	Typical activities	Affected entities	Interested entities	Management agencies
	method.			
RA3- Strengthen the capacity of integrated land and water resource management for ecosystem protection and restoration	• Development and approval of integrated landscape implementation plans for ecosystem protection and restoration in demonstration sub-basins and at the province level; • Piloting of ecosystem health monitoring and evaluation systems; • Improvement of female leadership in ecosystem protections with more women forest, grassland, and wetland chiefs; and • Capacity building activities (training) for government officials and practitioners.	• None	• Organizations concerned, e.g., research institutes, NGOs, agencies on gender equality and women's development; • Service Providers, if any	• competent authorities, e.g., provincial and county level NRBs, FGBs, EEBs, ARABs, WFs • county government • township government • village committees

ANNEX 5. IMPLEMENTATION SUPPORT PLAN

Role of Partners in Program Implementation

1. The implementation of the Program will require continuous support and attention from the World Bank team. The PforR instrument is new to some government teams involved in the Program, and support will be provided to ensure all teams are acquainted with its requirements. This annex also outlines the key activities proposed to address risks identified by the risk assessment and provides an indication of the technical assistance and resources needed to improve the quality of Program implementation. 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.

2. Tables 7.1 and 7.2 outline the estimated inputs from different specialists and resources required at different stages of Program implementation.

Table A7.1 Main focus of Implementation Support

Time	Focus	Skills Needed	Resources Estimate (Staff Weeks)
First 12 months	• Implementation of program management systems • Setting up cross administrative-level coordination mechanism • Staff capacity building, on-the-job training on E&S and fiduciary • Procurement process and training • E&S training, support to implementation of policy requirements • Technical support to activities and implementation • Financial management and disbursement training and capacity building	• Core team, particularly technical, FM, procurement, E&S experts • Integrated water and environment management expert	72
12–48 months	• Technical support to implementation • Conduct policy and technical research • Review of environmental, social, and financial performance of central components • Continued improvements in project management systems including fiduciary and safeguards • Program Midterm Review	• Core team, particularly technical, FM, procurement, E&S experts • Integrated water and environment management expert	120
Other	• Completion of activities • Capacity building and facilitate knowledge exchange and events	• Core team, particularly technical, FM,	56

Time	Focus	Skills Needed	Resources Estimate (Staff Weeks)
	• Support technical and financial analysis of program investments • End-term evaluation and client ICR	procurement, E&S experts • Integrated water and environment management	

Table A7.1. Task Team Skills Mix Requirements for Implementation Support

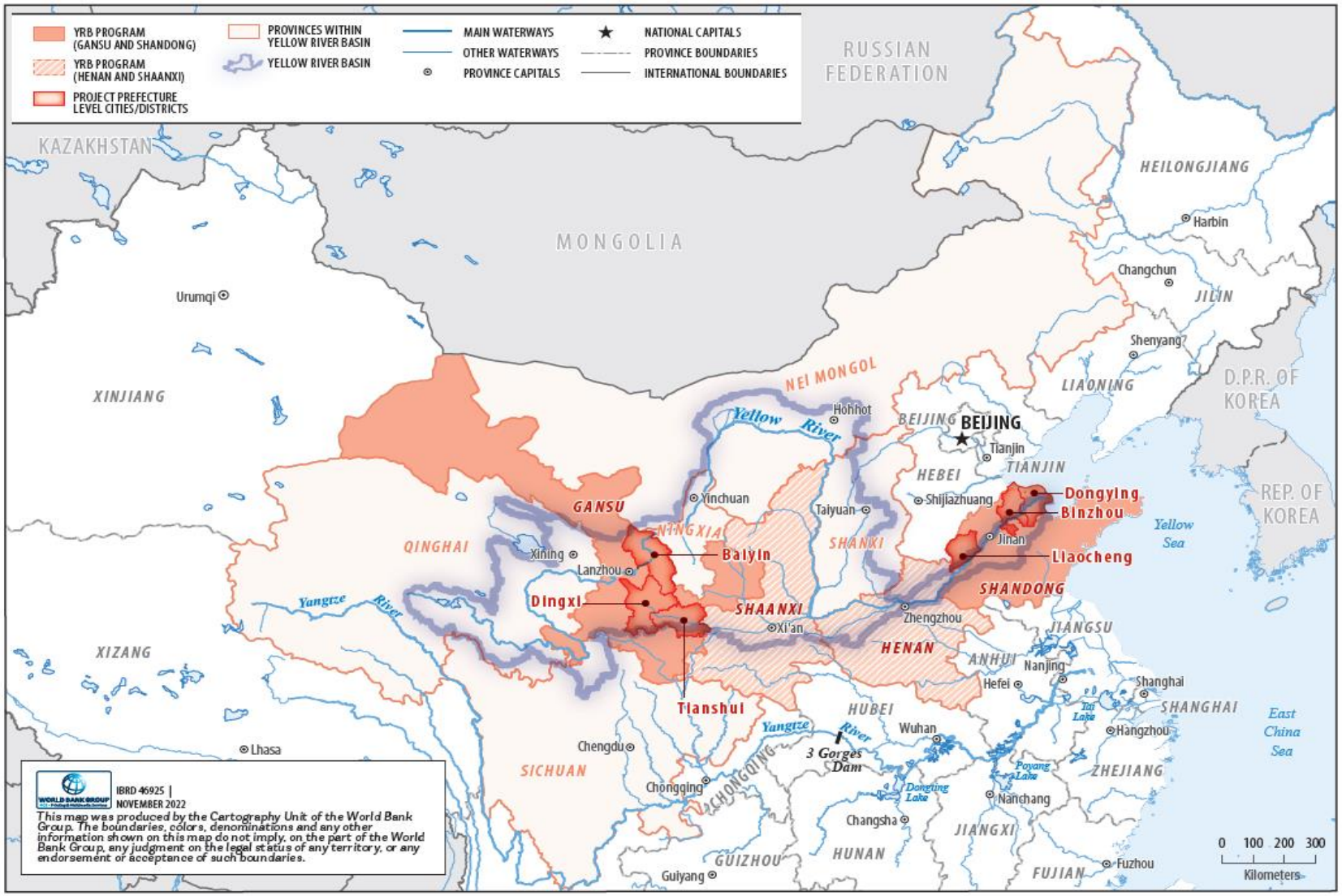
Skills Needed	Number of Staff Weeks per year	Number of Trips	Comments
Task team leader/program management/technical	3-4 annually	Three in the first year, two thereafter	Singapore office-based staff
Co-Task team leader(s)/program management/technical	14 annually	Three in the first year, two thereafter	Country office-based staff
Procurement specialist	3–6 annually	Two per year	Country office-based staff
Financial management specialist	2 annually	Two per year	Country office-based staff
Operations specialist	4–6 annually	Two per year	Country office-based staff
Environmental specialist	3–4 annually	Two per year	Country office-based staff
Social specialist	3–4 annually	Two per year	Country office-based staff
M&E specialist	4–6 annually	Two per year	Country office-based staff
Integrated ecosystems and water resources management expert	3–4 annually	Two per year	Consultant (national)
Water balance and satellite monitoring expert	2 annually	Two per year	Consultant (national)
Water quality expert	2 annually	Two per year	Consultant (national)

ANNEX 6. PROGRAM ACTION PLAN

Action Description	Source	DLI#	Responsibility	Timing		Completion Measurement
To develop and implement an environmental and social (E&S) management manual for typical Program activities (e.g, river/wetland rehabilitation).	Environmental and Social Systems		PMOs; local relevant government depart.	Other	Developed within six months after loan effectiveness and implemented throughout Program implementation	PPMOs should develop the manual and submit to the Bank for review; during PforR implementation, the PPMOs should provide regular reports on the implementation status of the manual as part of the semiannual progress reports.
To clearly document social risk management process and measures in key program documents (e.g., feasibility studies, design documents, social stability risk assessment reports, etc.).	Environmental and Social Systems		PMOs, local relevant gov agencies, PIUs	Recurrent	Continuous	Social risks identification, analysis and assessment are included in key program documents and available to be reviewed by the World Bank
To involve local sector departments and township governments in the preparation of specific activities to improve the quality and efficiency of social risks assessment and management	Environmental and Social Systems		PMOs and local relevant agencies	Recurrent	Continuous	Participation of sector agencies, e.g. natural resources bureaus, township governments and affected people during program preparation with written records available to be reviewed by the World Bank
To incorporate E&S considerations in non-physical activities (e.g. integrated landscape plans) to	Environmental and Social Systems		PMOs, local agencies, PIUs	Recurrent	Continuous	Terms and conditions on E&S impact screening and stakeholder engagement are included in the TORs for non-physical activities and submitted for the World Bank's

avoid/mitigate potential downstream E&S impacts/risks associated with the planning and implementation of the deliverables						review
To prepare Program financial statements in agreed format and substance	Fiduciary Systems		PPMOs	Recurrent	Yearly	Program financial statements developed and submitted to the Bank on an annual basis
To have Program financial statements audited	Fiduciary Systems		PPMOs	Recurrent	Yearly	Program financial statements are auditted on an annual basis during the Program implementation period and the audit reports are submitted to the World Bank on an annual basis
To issue official instructions to all implementation agencies that no contract will be awarded to firms or individuals in the debarred list or under temporary suspension.	Fiduciary Systems		PPMO	Other	No later than loan effectiveness	The official instruction should be included in the PIP to ensure that the completion can be monitored as part of the condition of effectiveness
To report actual procurement performance data to enable the World Bank to monitor whether procurement continues to perform as assessed	Fiduciary Systems		PPMO	Recurrent	Semi-Annually	Procurement data are provided in the semi-annual progress reports to the World Bank as required
To inform the World Bank of any credible and material allegations of fraud and corruption issues	Fiduciary Systems		PPMOs	Recurrent	Continuous	PPMOs shall inform the World Bank any credible and material allegations of fraud and corruption issues in a timely manner through the Program progress report

ANNEX 7. MAP


YRB PROGRAM (GANSU AND SHANDONG)
YRB PROGRAM (HENAN AND SHAANXI)
PROJECT PREFECTURE LEVEL CITIES/DISTRICTS
PROVINCES WITHIN YELLOW RIVER BASIN
YELLOW RIVER BASIN
MAIN WATERWAYS
OTHER WATERWAYS
PROVINCE CAPITALS
NATIONAL CAPITALS
PROVINCE BOUNDARIES
INTERNATIONAL BOUNDARIES
RUSSIAN FEDERATION
KAZAKHSTAN
MONGOLIA
HEILONGJIANG
Harbin
Changchun
JILIN
Shenyang
LIAONING
D.P.R. OF KOREA
REP. OF KOREA
Yellow Sea
East China Sea
Urumqi
XINJIANG
NEI MONGOL
Yellow River
Hohhot
BEIJING
BEIJING
Tianjin
TIANJIN
HEBEI
Shijiazhuang
Dongying
Binzhou
Jinan
Liaocheng
SHANDONG
Taiyuan
SHANXI
Yinchuan
NINGXIA
GANSU
QINGHAI
Xining
Lanzhou
Baiyin
Dingxi
Yangtze River
SHAANXI
Xi'an
Zhengzhou
HENAN
JIANGSU
ANHUI
Nanjing
Hefei
Shanghai
SHANGHAI
Tai Lake
Hangzhou
ZHEJIANG
XIZANG
Lhasa
Tianshui
HUBEI
Wuhan
Yangtze River
3 Gorges Dam
Chengdu
SICHUAN
CHONGQING
Chongqing
Poyang Lake
Dongting Lake
Nanchang
Changsha
JIANGXI
HUNAN
GUIZHOU
Guiyang
FUJIAN
Fuzhou
0 100 200 300
Kilometers
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