Program Information Documents (PID)

Appraisal Stage | Date Prepared/Updated: 11-Jan-2022 | Report No: PIDA247648

Public Disclosure Authorized

BASIC INFORMATION

A. Basic Program Data

Country	Project ID	Program Name	Parent Project ID (if any)
China	P172806	Yellow River Basin Ecological Protection and Pollution Control Program	
Region	**Estimated Appraisal Date**	**Estimated Board Date**	**Practice Area (Lead)**
EAST ASIA AND PACIFIC	07-Feb-2022	31-Mar-2022	Environment, Natural Resources & the Blue Economy
Financing Instrument	**Borrower(s)**	**Implementing Agency**	
Program-for-Results Financing	People's Republic of China	Yellow River Conservancy Commission (YRCC), Ministry of Water Resources, Shaanxi Provincial Financial Bureau, Henan Provincial Finance Bureau	

Proposed Program Development Objective(s)

To strengthen integrated water use efficiency, water pollution control, and ecosystem management, in selected regions of the Yellow River Basin

COST & FINANCING

SUMMARY (USD Millions)

Government program Cost	1,776.00
Total Operation Cost	1,776.00
Total Program Cost	1,776.00
Total Financing	1,776.00
Financing Gap	0.00

FINANCING (USD Millions)

Total World Bank Group Financing	380.00
World Bank Lending	380.00
Total Government Contribution	1,396.00

Decision

The review did authorize the team to appraise and negotiate

B. Introduction and Context

Country Context

1. **China is transitioning from a period of rapid infrastructure-led growth toward a more balanced and sustainable development model.** China's very rapid economic growth over the past four decades has come at a cost to the environment, with increasing challenges of natural resource depletion and environmental degradation. Nearly one-third of the country was ranked as being in poor environmental condition in 2019,[1] with low biodiversity and degraded environments considered unfavorable for human activities.[2] Around 90 percent of grasslands are degraded and prone to desertification,[3] and 40 percent of major wetlands are facing severe degradation. About half of China's vertebrates, including 62 percent of amphibians, and over 10 percent of higher plant species are threatened[4] with freshwater vertebrate populations falling more than twice as quickly as terrestrial populations globally.[5] The implied economic cost of environmental degradation was estimated as 2.2 to 3.1 percent of gross domestic product (GDP) annually between 2004 and 2017,[6] evident in widespread air, soil, and water pollution and diminishing biodiversity levels.[7] Impacts from climate change have compounded these environmental issues and contributed further to economic costs.[8]

2. **To date, supply-side solutions have dominated in the Government's response to meet increasing demand for natural resources.** China has the world's largest stock of public infrastructure, with more dams than any other country storing over 800 billion cubic meters (bcm) of water. China accounted for 20 percent of the world's 2.6 billion people who gained access to improved drinking water between 1990 and 2015 and over one quarter of the 2.1 billion people who gained access to improved sanitation.[9]

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[1] Technical Criterion for Eco-environmental Status Evaluation, Ministry of Environment Protection, (link)
[2] China Ecology and Environment Bulletin (2019), Ministry of Ecology and Environment, (link)
[3] Pan, Qingmin, Jiamei Sun, Yuanhe Yang, Wei Liu, Ang Li, Yunfeng Peng, Jianguo Xue, Hao Xia, and Jianhui Huang. 2021. "Issues and Solutions on Grassland Restoration and Conservation in China." *Bulletin of Chinese Academy of Sciences* 36 (6): 666–674 (link).
[4] Zhigang, Jiang. 2016. "Assessing the Surviving Status of Vertebrates in China." *Biodiversity Science* 24 (5): 495–499. (link)
Ministry of Environmental Protection. 2013. *Assessment Report on the Red List of China's Biodiversity—Higher Plants*. Ministry of Environmental Protection of China, Chinese Academy of Sciences. (link) [in Chinese].
Ministry of Environmental Protection. 2015. *Assessment Report on the Red List of China's Biodiversity—Vertebrates*. Ministry of Environmental Protection of China, Chinese Academy of Sciences. (link) [in Chinese].
[5] WWF. 2018. *Living Planet Report - 2018: Aiming Higher*. Grooten, M. and Almond, R.E.A.(Eds). WWF, Gland, Switzerland. (link)
[6] Ma, G., et al. 2020. "The Valuation of China's Environmental Degradation from 2004 to 2017." *Environmental Science and Ecotechnology* 1 (link).
[7] Ouyang, et al. 2016. "Improvements in Ecosystem Services from Investments in Natural Capital." *Science* 352: 1455–1459 (link).
[8] China is ranked 32 out of 180 countries on the Climate Risk Index. A lower number indicates greater relative exposure and vulnerability to extreme weather events (link).
[9] WHO (World Health Organization) and UNICEF (United Nations Children's Fund). 2015. *Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment.* Geneva: WHO Press. (link)

Wastewater collection and treatment in urban areas have increased from 14.86 percent in 1991 to over 95 percent in 2020, with more than 413,000 km of flood control structures built across all major river basins. Extensive irrigation development has seen the agricultural sector grow at an average of over 5 percent per year since 1978.[10] While infrastructure has been central to China's achievements in water development, some infrastructure has paradoxically exacerbated the challenges of water management. In some areas, such as in the upper reaches of the Yellow River, the rise in industrial and urban demand made possible by investments in water supply infrastructure exceeds reductions in agricultural water demand,[11] while extensive irrigation infrastructure has led to excess water diversion, resulting in waterlogging and salinity across wide areas, accentuating water scarcity.[12]

3. **The growing pressure on China's natural resources could constrain future growth.** Water resources are roughly one-third the global per capita average,[13] with the challenges imposed by the low per capita endowment accentuated by the uneven distribution of water resources, the large and increasingly prosperous population, and the effects of climate change. Increasing water demand and unsustainable water resources utilization have led to reductions in ecological flows, resulting in the loss of hydrological connectivity with floodplains and wetlands and threatening biodiversity. These issues are particularly acute in the northern part of the country. Despite some improvements in recent years, water pollution continues to undermine water security,[14] with 29 percent of major rivers failing to meet the basic quality standards (Classes I–III) required for drinking water supply and ecosystem function.[15] Pollution sources include industrial, domestic, and agricultural activities, with challenges increasingly around non-point sources (NPSs) such as agriculture. The northern river basins of the Huai, Hai, Liao, and Yellow rivers face severe physical and pollution-induced water scarcity,[16] resulting in the Yellow River Basin (YRB) being a net importer of virtual water.[17]

4. **Climate variability and change is accentuating the challenges of sustainable natural resource management and water security.** Projected temperature increases for China are expected to be above the global average, with more significant increases expected in northern and western regions, and considerable uncertainty around changes in average monthly precipitation.[18] Reductions in precipitation are projected in the western regions under all climate scenarios and in the arid northern regions when considering lower emission reduction pathways. The probability of extreme drought is expected to increase, with extreme temperatures and associated threats to natural resources resulting in degraded

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[10] Wang, Jinxia, Yunyun Zhu, Tianhe Sun, Jikun Huang, Lijuan Zhang, Baozhu Guan, and Qiuqiong Huang. 2020. "Forty Years of Irrigation Development and Reform in China." *Australian Journal of Agricultural and Resource Economics* 64 (1): 126–49. (link)
[11] Zhang, Kang, Xianhong Xie, Bowen Zhu, Shanshan Meng, and Yi Yao. 2019. "Unexpected Groundwater Recovery with Decreasing Agricultural Irrigation in the Yellow River Basin." *Agricultural Water Management* 213: 858–67. (link)
[12] Gonçalves, J. M., L. S. Pereira, S. X. Fang, and B. Dong. 2007. "Modelling and Multicriteria Analysis of Water Saving Scenarios for an Irrigation District in the Upper Yellow River Basin." *Agricultural Water Management* 94 (1–3): 93–108. (link)
[13] World Bank Open Data. Renewable internal freshwater resources per capita (cubic meters). (link)
[14] Ma, Ting, Siao Sun, Guangtao Fu, Jim W. Hall, Yong Ni, Lihuan He, Jiawei Yi, Na Zhao, Yunyan Du, Tao Pei, Weiming Cheng, Ci Song, Chuanglin Fang, and Chenghu Zhou. 2020. "Pollution Exacerbates China's Water Scarcity and Its Regional Inequality." *Nature Communications* 11 : 650 (link).
[15] Ministry of Ecology and the Environment. 2019. *State of Ecology and the Environment Report* (link).
[16] Ma et al. 2020. (link)
[17] Li, M., Q. Tian, Y. Yu, Y. Xu, and C. Li. 2021. "Virtual Water Trade in the Yellow River Economic Belt: A Multi-Regional Input-Output Model." *Water* 13: 748. (link)
[18] World Bank. 2021. *Climate Knowledge Portal - China*. World Bank, Washington DC. (link); IPCC (Inter-Governmental Panel on Climate Change). 2021. *AR6 Climate Change 2021: The Physical Science Basis*. Inter-Governmental Panel on Climate Change (link)

ecosystems and threats to biodiversity. Water security is predicted to become a major vulnerability, especially in northern China where the availability of water is expected to decrease up to 24 percent by 2050,[19] challenging sustainable ecosystems services, reducing environmental flows and further affecting aquatic biodiversity. Increased losses associated with the impacts of natural disasters, such as droughts and floods, are not expected to be distributed equally and are likely to be most strongly experienced by marginalized and asset-poor communities. Support for adaptation will be needed by many groups, particularly smallholder farmers who face potential yield losses and species range shifts, as well as to safeguard ecosystems and vulnerable at-risk habitats with high biodiversity value, such as wetland complexes in arid basins. However, if adaptation and resilience-building efforts are not well targeted and designed to consider potentially competing demands and tradeoffs between various users and uses, they may exacerbate these threats and challenges.

5. **Recognizing these challenges, China has established a series of red line policies as part of the transition to a more balanced development model.** These 'red line' strategies are intended to safeguard ecologically fragile regions which are prone to soil erosion, desertification and salinization, along with regions that provide important ecological functions, through measures such as water source protection, soil and water conservation, and biodiversity protection. The '*Three Red Lines*' for water, established in 2012 under the '*Most Stringent System for Water Resource Management*', are aimed at ensuring water sustainability by limiting water usage, promoting water-use efficiency, and improving water quality.[20] Binding targets have been established for 2030 based on local water availability and the need for social and economic development. These are allocated among 31 provincial units and further broken down to more than 2,500 county-level units.[21] The water red lines have been complemented through a series of '*Ecological Red lines*'[22] launched in 2017 to protect critical ecological areas and ensure national ecological security.[23] These ecological red lines define sensitive and vulnerable areas with important ecological functions that must be strictly protected. These are further supplemented by minimum ecological flow requirements that are intended to safeguard water for the environment and protect aquatic biodiversity.[24] While establishing clear policy benchmarks, there is a need to refine the determination of specific water and ecological targets to reflect local conditions and position these within integrated landscape approaches to catchment management. Regional indexes need to be developed relating to the

[19] 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)

[20] The Three Red Lines stipulate that by 2030, (a) cap national annual water use to 700 billion cubic meters, (b) reduce water use to 40 cubic meters per US$1,450 industrial added value and increase irrigation efficiency to 60 percent, and (c) ensure 95 percent of major water function zones comply with water quality standards and ensure all sources of drinking water meet national standards.

[21] Wu, B., H. Zeng, W. Zhu, N. Yan, and Z. Ma. 2021. "Enhancing China's Three Red Lines Strategy with Water Consumption Limitations." *Science Bulletin* 66 (2021): 2057–2060.

[22] The General Office of the Communist Party of China and the State Council, 'Opinions on Defining and Strictly Protecting Ecological Red Lines', Feb. 7, 2017. (*link*)

[23] The term National Ecological and Environmental Security was first proposed in the 'National Outline of Ecological and Environmental Protection' in 2010, which refers to ecosystems in the country that are able to provide sustainable ecosystem services to support human lives and socioeconomic development.

[24] Ministry of Water Resources, Working plan to determine ecological flow for important rivers and lakes (link).

integration of water availability and ecosystem services, sustainable limits imposed on water consumption, and independent assessments promoted to ensure ecological outcomes are realized.[25]

Sectoral and Institutional Context

6. **The YRB is emblematic of the competing demands on natural resources and the challenges in realizing integrated approaches for more balanced and sustainable development.** Considered the birthplace of Chinese civilization, the river flows through nine provinces and autonomous regions in the arid and semi-arid areas of northern China. The river has served as the political, economic, and cultural center for over 3,000 years and in 2018 the GDP generated in the nine provinces and autonomous regions within the basin was estimated at US$3.62 trillion (CNY 23.9 trillion). This accounts for 26.5 percent of the national GDP, making the YRB the fifth-largest economy in the world if it were a country. The basin's mean available water resources have been estimated at 64.7 bcm, less than 7 percent of that in the Yangtze River Basin, with annual precipitation averaging 446 mm, 40 percent that in the Yangtze River Basin. The basin's water resources supply water to over 160 million people (12 percent of the population) and support 15 percent of the country's irrigation area.[26] Agriculture accounts for more than 65 percent of water withdrawals,[27] with the irrigated area having expanded from 0.8 million hectares in 1950[28] to over 7.32 million hectares in 2018.[29]

7. **Balanced development in the Yellow River Basin is required to safeguard and sustain globally important biodiversity and ecosystems.** The river provides an important ecological corridor in an otherwise arid landscape, while the basin harbors biodiversity hotspots of global importance, including six wetlands of international importance,[30] at least 48 national protected areas,[31] and 83 key biodiversity areas. These provide critical winter breeding grounds and stop-over sites for migratory birds along the East Asian-Australasian and the Central Asian flyways and habitat for more than 150 threatened species.[32] The river originates in the Three River Source National Park, an area on the Tibetan Plateau that is rich in water resources and includes the headwaters of the Yellow, Yangtze, and Lancang-Mekong rivers. Regarded as the water tower of Asia, it includes important, fragile mountainous ecosystems such as grasslands, high-altitude freshwater lakes, wetlands, and forests and was one of only five areas to be designated as a national park under the new protected areas system.[33] The delta where the river dischrges into the sea is being considered for national park status given its global importance in supporting over 6 million migratory birds every year and being a critical breeding habitat for endangered species such as the oriental stork and the Saunder's gull. These wetlands have been identified as national conservation

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[25] Wu et al. 2021. ; Yu, Qiyang. 2021. "Thoughts on the Intensive, Economical and Safe Utilization of Water Resources." *China Water Resources* November. (link)
[26] Ministry of Water Resources. 2015. *China Water Resources Bulletin (in Chinese)*. (link)
[27] Yellow River Water Resources Bulletin (2020). (link)
[28] Cai, X., and M. W. Rosegrant. 2004. "Optional Water Development Strategies for the Yellow River Basin: Balancing Agricultural and Ecological Water Demands." *Water Resour. Res.* 40: W08S04. (link)
[29] Wang, Y., W. Zhao, S. Wang, S. et al. 2019. "Yellow River Water Rebalanced by Human Regulation." *Sci Rep* 9: 9707. (link)
[30] The six sites under the Ramsar Convention on Wetlands of International Importance are the Eling Lake, Zhaling Lake, Gansu Yellow River Shouqu wetlands, Sichuan Ruoergai Wetlands, Gansu Gahai wetlands, and Shandong Yellow River Delta wetlands.
[31] Fei, Duan, and Sheng Li. 2020. "The Status, Distribution Patterns, and Conservation Gaps for Bird Diversity in the Yellow River Basin, China." *Journal. Biodiversity Science* 28 (12): 1459–1468.
[32] Listed in the International Union for Conservation of Nature (IUCN) Red List (link).
[33] The announcement was made by President Xi Jinping during the UN Biodiversity conference COP15 in Kunming, China, October 2021.

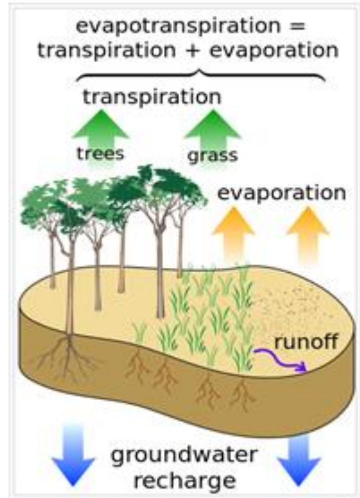
priorities in the National Biodiversity Strategy and Action Plan (NBSAP), prepared as a requirement under the Convention on Biological Diversity (CBD). However, freshwater biodiversity is rapidly diminishing due to competing demands and the over-exploitation of water resources, a lack of integrated planning, cascade hydropower development, invasive species, water pollution, and overfishing,[34] with fish species richness declining 35.4 percent over the past five decades.[35]

8. **Increasing pressure on water resources in the YRB constrains social and economic development, with implications for environmental sustainability.** The YRB Water Allocation Plan adopted in 1987 was the first for any of the country's large rivers, allocating 37 bcm among the nine provinces and autonomous regions. The plan also included allocations for Hebei and Tianjin, located outside of the basin, and set aside 21 bcm for ecological water uses, primarily to facilitate sediment transportation.[36] While the 1987 Plan allocated water consumption quotas to each province, the Government lacked an effective system to monitor, evaluate, and regulate actual consumption or respond to the rapidly changing development context among the provinces, focusing primarily on water withdrawals. Understanding the difference between water withdrawal and water consumption is critical to properly evaluating and managing water stress in a water scarce basin, like the YRB (box 1). Excessive water withdrawal and consumption in the 1980s and 1990s resulted in a reduction in streamflow, compounding a natural increase in seasonal droughts, resulting in around 11 percent of the main river drying up in 1997 and no water reaching the sea for 226 days. Following this, the central government revised the plan in 1998 and adjusted the annual allocation scheme by imposing provincial quotas in proportion to the expected water availability for the given year.[37] The Yellow River Conservancy Commission (YRCC) was mandated to operate the scheme under which ecological flows were prioritized to safeguard water for the environment. Completion of the Xiaolangdi multipurpose dam[38] in 2001 also improved the capacity to regulate flows in the YRB and prevent the cessation of flow along the mainstream in the subsequent 22 years.

[34] Zhao, Yahui, Yingchun Xing, Binbin Lü, Chuanjiang Zhou, Wenbo Yang, and Kai Zhao. 2020. "Species Diversity and Conservation of Freshwater Fishes in the Yellow River Basin." *Biodiversity Science* 28 (12): 1496–1510. (link)
[35] 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 (link).
[36] Yan, Z., Z. Zhou, J. Liu, H. Wang, and D. Li. 2020. "Water Use Characteristics and Impact Factors in the Yellow River Basin, China." *Water International* 45 (3): 148–168. (link)
[37] National Development and Reform Commission and Ministry of Water Resources. 1998. *Yellow River Water Quantity Dispatching and Management Measures*. Government Notice No. 2520.
[38] The World Bank contributed to the construction of the Xiaolangdi Multipurpose Project through three projects: CN - Xiaolangdi Resettlement Project (P003644), Xiaolangdi Multipurpose Project (P003562), and CN - Xiaolangdi Multipurpose Project: Stage II (P034081).

Box 1. The Difference between Withdrawal and Consumption-Based Water Management

Understanding both water withdrawal and consumption is critical to properly evaluate and manage water stress in a water scarce basin, like the Yellow River Basin.



Approaches based on water withdrawal measure the total amount of water abstracted from the river basin through either surface water or groundwater sources. This is done directly from the river or lake, from reservoirs behind dams, or through wells and boreholes. Measurements of water withdrawals help evaluate demands from domestic, industrial, and agricultural users and indicate the level of competition and dependence on water resources.

Water consumption is the portion of the withdrawn water permanently lost from the river basin through evaporation from the land surface and transpiration from plants. Measuring evapotranspiration (ET) helps quantify the impact of water withdrawals on downstream availabilities and is essential to evaluate water shortages and scarcity. It also helps understand how much water is consumed or really saved to inform better management of water withdrawal. Understanding and managing water consumption is critical for water scarce basins.

An illustrative example of this is two farmers who withdraw the same amount of water from a nearby river. The first farmer uses flood irrigation and consumes 70 percent of the water withdrawn, while the rest (30 percent) may form a return flow back to the river or aquifer, making it available for other users and the environment. The second farmer uses drip irrigation and consumes 95 percent of the water withdrawn, returning only 5 percent back to the river or aquifer. Although the two farmers withdrew the same amount of water, their impacts on the basin's water balance are different due to differences in water consumption and impacts on the return flow for other users, including groundwater recharge and the environment.

Promoting higher efficiency irrigation with the same amount of water withdrawals in the absence of regulation and control on total water consumption may exacerbate water scarcity and environmental impacts. Therefore, consumption based water management is critical to regulate water consumption to ensure environmental sustainability in water scarce basins.

9. **Significant social, economic, and environmental changes over the past three decades have accentuated water stress and resulted in the suboptimal allocation of resources.** Estimates by the Ministry of Water Resources (MWR) suggest the natural annual flow for 2001–2015 was 25 percent lower than 1956–1979,[39] while the water resources development and utilization rate reached 80 percent, exceeding the sustainable utilization threshold of 40 percent.[40] Decreases in the Yellow River flow have been attributed to climate change and intensifying human activities, such as increasing withdrawal of water for meeting growing agricultural irrigation needs.[41] Rapid development in some provinces has resulted in imbalances between water allocations, demand, utilization, and consumption, with some

[39] From an estimated average annual natural flow of 58 bcm before 1975, to 53 bcm from 1975 to 2000, and less than 50 bcm since 2000.

[40] The water resources development and utilization rate refers to the ratio of total water use to total water resources in a river basin or region. The regulatory requirements in China consider 40 percent of the water resources development and utilization rate as a threshold of sustainable water development. Exceeding the threshold indicates water resources are overdeveloped and overused, which will squeeze the environmental flow and reduce the self-purification capacity of water bodies.

[41] Zhang, Qiang, Zongjiao Zhang, Peijun Shi, Vijay P. Singh, and Xihui Gu. 2018. "Evaluation of Ecological Instream Flow Considering Hydrological Alterations in the Yellow River Basin, China." *Global and Planetary Change* 160: 61–74. (link)

provinces, such as Shandong, Henan, Shaanxi, and Inner Mongolia, now considered to be net virtual water inflow areas, while others, such as Shanxi, Gansu, Ningxia, and Qinghai, reportedly net virtual water outflow regions.[42] Other changes also have implications for the optimized allocation of water use. For example, the 1987 Plan allocated 36 percent of the annual flow as ecological water uses, mainly for regulating the transport of sediments. However, sediment control measures and revegetation in the middle reaches have reduced sediments by around 80 percent over the past two decades and increased total water consumption. In the interim period, the South-North Water Transfer has also started delivering water to Hebei and Tianjin without any revisions to quotas allocated from the YRB.

10. **Issues of water scarcity in the YRB are accentuated by persistent challenges of water pollution, with important regional impacts.** Despite significant progress in reducing point source pollution from industrial and municipal sectors through increased collection and treatment of urban wastewater, water quality in the YRB is lower than the national average.[43] Although wastewater collection and treatment coverage is relatively high in urban areas, there are persistent challenges with the low coverage of wastewater collection and treatment in rural areas and NPS pollution from the agricultural and livestock sectors, which reportedly contribute 56 percent of chemical oxygen demand (COD) and 66 percent of total phosphorous in the YRB.[44] Intensive chemical fertilizer use in vegetable and cereal cropping in Henan, Shaanxi, and Shandong, along with livestock and poultry operations in Henan, Shaanxi, Gansu, and Inner Mongolia, are the largest contributors to NPS pollution and important drivers of greenhouse gas (GHG) emissions. Mismanaged plastic waste, including from agriculture film and urban and rural solid waste, is an additional challenge, with a 2015 study[45] estimating that China is a significant contributor to ocean plastic debris and that its rivers—including the Yellow River—are the primary conduits, making China's role in combating marine plastic pollution critically important.

11. **Ecosystem degradation undermines resilience in the YRB and is a primary driver of biodiversity loss.** The catchment area of the YRB is vulnerable due to the fragile soils, limited vegetation, and arid conditions, with direct threats to the basin's biodiversity including habitat loss and degradation, climate change, pollution, over-exploitation of water resources, and invasive species.[46] Poor land management practices have led to overgrazing and degradation of grasslands and wetlands, with about 34 percent of the catchment suffering from erosion threatening the source of the Yellow River.[47] The fragile soils of the Loess Plateau in the middle reaches of the river are particularly vulnerable to erosion,[48] contributing over 90 percent of the river's sediments.[49] Erosion undermines the ecosystem's capacity to retain water in the soil and recharge groundwater while also transporting NPS pollutants that end up in the rivers, affecting

[42] Li et al. 2021. (link)
[43] Ministry of Ecology and Environment. 2019. "China Ecology and Environment Bulletin." P.R. China. (link)
[44] Yuan, Tao, Jing Xu, Hejing Ren, et al. 2021. "Spatiotemporal Evolution of Agricultural Non-Point Source Pollution and its Influencing Factors in the Yellow River Basin." *Transactions of the Chinese Society of Agricultural Engineering* 37 (4): 257–264. (link)
[45] Lebreton, L. et al. 2017. "River Plastic Emissions to the World's Oceans." *Nature Communications* 8 (15611) (link).
[46] Yue, Cao, Shuyu Hou, Zixuan Zeng, Xiaoshan Wang, Fangyi Wang, Zhicong Zhao, and Rui Yang. 2021. "Biodiversity Conservation Strategies for the Yellow River Basin Based on the Three Conditions Framework." *Biodiversity Science* 28 (12): 1447–1458 (link)
[47] The headwater areas contribute to over 40 percent of the Yellow River streamflow.
[48] Li, Jingjing, Su Pengfei, and Zhang Jianguo. 2021. "Soil Erosion Characteristics and Prevention Countermeasures for Ecological Protection and High-quality Development Planning in the Yellow River Basin." *Bulletin of Soil and Water Conservation* 41 (5): 238–243. [in Chinese] (link)
[49] Xin, Z., L. Ran, and X. X. Lu. 2012. "Soil Erosion Control and Sediment Load Reduction in the Loess Plateau: Policy Perspectives." *International Journal of Water Resources Development* 28 (2): 325–341.

aquatic biodiversity. The combined effect has degraded the ecological integrity of the river, rendering certain stretches biologically dead and unsuitable for any use.[50] Severe soil erosion has also led to considerable amounts of sediments being deposited in the river bed, forming an 800 km long 'suspended river' in the downstream reaches and exacerbating flood risks.[51] Improved land management practices and restoration of vegetation cover (particularly forest, grassland, shrublands, agroforestry) can reduce erosion, increase water infiltration by 40–80 percent,[52] and increase soil organic carbon by 28 to 45 percent,[53] thus increasing land productivity and soil carbon storage. Studies of restoration measures on the Loess Plateau suggest that efforts to increase vegetation cover can reduce runoff and sediment by 50 to 70 percent compared to bare land.[54]

12. **Catchment-based landscape approaches to address these challenges are undermined by institutional and planning processes that favor sectoral planning and administrative boundaries.** The 'Grain for Green' program was introduced in 1999[55] to improve catchment landscape management and ecological restoration, doubling vegetation cover between 1999 and 2013.[56] The area under soil and water conservation management has also increased from 3 percent in 1969 to 51 percent in 2012.[57] These achievements have improved land management practices, contributing to soil conservation, flood reduction, bioenergy production, and carbon sequestration.[58] However, the ecosystem integrity of many newly revegetated areas is poor, with large areas of monoculture forest that have low resilience to storms and pests, and low biodiversity values. Large scale revegetation efforts, largely focused on a handful of species, have also increased water consumption and resulted in decreased stream flow,[59] with revegetation in the Loess Plateau reportedly approaching sustainable water resource limits and requiring an adjustment of the revegetation strategy.[60] There is increasing recognition of the need for integrated approaches that can address the challenges of cross-sectoral coordination and inter-jurisdictional

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[50] Singh, Durgesh Kumar, Mengzhen Xu, Nandita Singh, and Fakai Lei. 2021. "Perspectives on Emerging Pressures and Their Integrated Impact on Large River Systems: An Insight from the Yellow River Basin." *Journal of Environmental Management* 298: 113423. (link)

[51] The 'suspended river', also known as the 'raised bed river', is formed due to substantial sediment deposited in the riverbed. In some river reaches in Henan Province, the riverbed is 20 meters higher than ground level, imposing substantial flooding risks to the surrounding areas.

[52] Sun, D., H. Yang, D. Guan, M. Yang, J. Wu, F. Yuan, C. Jin, A. Wang, and Y. Zhang. 2018. "The Effects of Land Use Change on Soil Infiltration Capacity in China: A Meta-Analysis." *Science of the Total Environment* 626: 1394–1401.

[53] Gong, L., G. Liu, M. Wang, X. Ye, H. Wang, and Z. Li. 2017. "Effects of Vegetation Restoration on Soil Organic Carbon in China: A Meta-Analysis." *Chinese Geographical Science* 27 (2): 188–200.

[54] Hu, J., Y. Lü, B. Fu, A. J. Comber, and P. Harris. 2017. "Quantifying the Effect of Ecological Restoration on Runoff and Sediment Yields: A Meta-Analysis for the Loess Plateau of China." *Progress in Physical Geography* 41 (6): 753–774.

[55] Wang, S., B. Fu, S. Piao, et al. 2016. "Reduced Sediment Transport in the Yellow River Due to Anthropogenic Changes." *Nature Geosci* 9: 38–41. (link)

[56] Chen, Y., K. Wang, Y. Lin, et al. 2015. "Balancing Green and Grain Trade." *Nature Geosci* 8: 739–741. (link)

[57] Wang, Y., W. Zhao, S. Wang, et al. 2019. "Yellow River Water Rebalanced by Human Regulation." *Sci Rep* 9: 9707. (link)

[58] Chen, C., T. Park, X. Wang, et al. 2019. "China and India Lead in Greening of the World through Land-Use Management." *Nat Sustain* 2: 122–129. (link); Deng, L., Z. Shangguan, and S. Sweeney. 2015. "'Grain for Green' Driven Land Use Change and Carbon Sequestration on the Loess Plateau, China." *Sci Rep* 4: 7039. (link)

[59] Feng, X., B. Fu, S. Piao, et al. 2016. "Revegetation in China's Loess Plateau Is Approaching Sustainable Water Resource Limits." *Nature Clim Change* 6: 1019–1022. (link); Wang, Y., W. Zhao, S. Wang, et al. 2019. "Yellow River Water Rebalanced by Human Regulation." *Sci Rep* 9: 9707. (link)

[60] Feng et al. 2016. (link); 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. (link)

cooperation[61] to reconcile the complex, sometimes competing, demands between restoration of ecosystems to promote various services and protect biodiversity and economic growth associated with increased water use and pollution.

13. **An integrated landscape approach to catchment management could help address ecosystem degradation and biodiversity loss and contribute to improved water security.** While the ministerial reforms of 2018 signaled an important policy shift toward the integrated management of natural resources and clarified responsibilities,[62] they also created challenges through a new division of responsibilities. Natural resource planning and ecosystem services were allocated to the newly established Ministry of Natural Resources (MNR), while responsibilities for managing water quantity were left with the MWR and those for water quality transferred to the Ministry of Ecology and Environment (MEE). These cross-sectoral issues are complicated further by jurisdictional responsibilities, with China's river basin organizations not having the administrative authority or coordination mechanisms required to align provincial actions, build consensus with local governments, or arbitrate in cases of dispute. These divisions frequently lead to sectoral plans being implemented in isolation within administrative boundaries (provincial, municipal, or county) instead of a geographic boundary (a specific landscape, such as the river basin, or ecosystem), preventing integrated landscape approaches to catchment management. Recognizing the need to better integrate regional and catchment planning processes to manage tradeoffs, the Government is pursuing dedicated legislation for the country's major river basins, with the Yangtze River Protection Law adopted in December 2020 and the draft law on protection of the Yellow River having been discussed at the executive meeting of the State Council on October 8, 2021, and presented to the National People's Congress for review.

14. **Responding to these challenges, the Government issued the Yellow River Basin Ecological Protection and High-Quality Development Master Plan on October 8, 2021.[63]** The 'YRB Plan' calls for a new integrated model for natural resource management, recognizing water as the most rigid constraint for development, emphasizing the principle that water determines urban, agricultural, population growth, and production. The Plan leverages the river's cultural importance and builds on historical references to "the amount of soup determines how much bread can be put inside," positioning ecological protection and high-quality development of the YRB as a national priority.[64] The Plan recognizes the need to improve inter-jurisdictional cooperation and cross-sectoral coordination and strengthen basin-level responsibilities for monitoring, regulation, and supervision, conferring specific obligations on national agencies and basin organizations, as well as provincial and local governments. This includes encouraging provincial governments to cooperate around catchment management and protection of the river, including floodplain management and environmental restoration while providing guidance to local governments on controlling water consumption and prohibiting projects such as the large-scale planting of trees, irrigation expansion, and creation of artificial lakes. The YRB Plan further calls for integrated approaches that can address the challenges of cross-sectoral coordination and inter-jurisdictional cooperation to reconcile competing demands and optimize tradeoffs within a water-constrained

[61] Shan, Lun, and Wang Fei. 2021. "Some Scientific Issues in the Cooperative Management of the Yellow River Basin." *Yellow River* 43 (10): 7–10 [in Chinese] (link).
[62] World Bank Group. 2018. *Watershed: A New Era of Water Governance in China - Synthesis Report*. World Bank, Washington, DC. (link)
[63] Yellow River Basin Ecological Protection and High-Quality Development Plan. (link)
[64] Keynote speech by President Xi Jinping on September 18, 2019, at the symposium on ecological protection and high-quality development in the YRB.

environment, highlighting the role of the YRCC and the need to enhance its capacity for determining the sustainable limits within which to sustain economic growth and maintain ecosystem services. However, realizing this ambitious vision requires new approaches and improved capacity for integrated planning and monitoring, along with the alignment of incentives with the differentiated responsibilities among various levels of government.

PforR Program Scope

15. **The Program will support a subset of activities at the basin level as part of the YRCC program and from the sub-national provincial programs in Henan and Shaanxi Provinces as a contribution to the national program for Ecological Protection and High-Quality Development in the YRB.** To address the main challenges of water scarcity, water pollution, and ecosystem degradation, the Program will support the Government's programs in the areas of water saving and water use efficiency, water pollution management, and ecosystem protection and restoration while promoting innovation through integrated landscape approaches to catchment management. The Program will focus on select demonstration sub-basins in Henan and Shaanxi and scale up the integrated approach to provincial level for the YRB (Henan) and the Wei River Basin (Shaanxi), as well as across the whole of the YRB through the YRCC (**Error! Reference source not found.**). The World Bank's international experience and knowledge will be used to develop and introduce an innovative, integrated water and ecosystem management approach into the Government's program based on improved methodologies for the assessment of water balance, water pollution, and ecosystems. These will be used to identify tradeoffs and optimize options for improved water and ecosystem management, introducing incentives for cross-sectoral and inter-jurisdictional collaboration to further leverage the Government's program.

16. **At the basin level, the Program is anchored in YRCC's 'Water Security Plan for the YRB Ecological Protection and High-Quality Development' and will support institutional capacity building to scale up sub-basin- and provincial-level results.** The Program leverages the mandates given to the YRCC as part of the YRB Plan to enhance the YRCC's technical and regulation capacity. The Program will support results in three key areas aimed at developing innovative tools and scaling up integrated ecosystem and water resources management: (a) develop a new assessment and management tool to estimate water consumption and identify water constraints in the YRB, along with the development of an integrated hydro-economic model to optimize decision-making under uncertainty, including to climate change, enhancing the regulation of water withdrawal permits, and piloting these tools in a sub-basin shared between Henan and Shaanxi Provinces; (b) further develop and operationalize an integrated ecosystem and water resources information management platform to support decision-making on ecosystems and water resources in the YRB;[65] and (c) incorporate the integrated ecosystem and water management approaches and innovative tools developed under this Program into the YRB protection standards and guidelines to further guide basin management.

17. **In Henan Province, the Program is anchored in the 'YRB Ecological Protection and High-Quality Development Plan', with demonstration activities in three sub-basins.** These include the Hong Nong Jian, Qing Long Jian, and Jian River Basins[66] and provide a good example of the water and ecosystem related

[65] The so-called Smart Yellow River platform under development by the YRCC.
[66] The three demonstration sub-basins in Henan cover five counties and one municipality district: Lingbao, Xiazhou, Hubin, Mianchi, and Yima counties and Sanmenxia City.

challenges in the YRB. These areas cover 6,900 km^2 in the Sanmenxia municipality, representing about 20 percent of the YRB in Henan. Sanmenxia is a water stressed area with poor water infrastructure and degraded ecosystems. About 30 percent of the land area in the sub-basins suffer from soil erosion, causing siltation of dams and limited habitat value for biodiversity. This makes ecosystem restoration a high priority for the Government. The Program will support Sanmenxia's priority investments to address these challenges and will include activities on (a) water use efficiency improvement, including establishing and implementing water consumption targets through target value allocation plans (TVAPs); improving agricultural water management through irrigation district modernization, water saving irrigation, high-standard farmland development, crop pattern adjustment, and irrigation management platform development; enhancing the capacity of farmers and water user associations (WUAs); and improving rural water supply; (b) water quality improvement, including wastewater treatment plant upgrading, agricultural NPS pollution control, and rural domestic wastewater management; and (c) ecosystem restoration and management, with a focus on water source protection, water and soil conservation, wetland restoration, re/afforestation and forest ecosystem management, terracing, and river embankment improvements, among others. In addition, the Program will support provincial-level results for the province to integrate environmental and water resources management considerations into strategic planning for the whole YRB in Henan.

18. **In Shaanxi Province, the Program is anchored in the Wei River Basin Water Ecological Restoration Plan, with demonstration activities in four sub-basins.** These are the Beiluo, Jing, Qishui, and Shichuan River basin areas that cover about 13.5 percent of the area in the southeastern part of the Wei River Basin in Shaanxi. The geographic boundary of the Program includes nine counties in two municipalities (Xianyang and Tongchuan).[67] The challenges facing the upstream reaches in these demonstration sub-basins include both water conservation and NPS pollution, while water and soil erosion is the main problem in the middle reaches and NPS pollution in the downstream. The Program will include demonstration activities included in the 14th Five-Year Plan (FYP) and support institutional capacity building toward (a) water use efficiency improvement, including establishing and implementing water consumption targets through TVAP, improving agricultural water management through water saving irrigation and agronomic practice improvement, and enhancing the capacity of farmers and WUAs; (b) water pollution reduction, with a focus on NPS reduction from chemical fertilizer consumption, wastewater collection and treatment, and manure management; and (c) ecosystem restoration and management, with a focus on water source protection, water and soil conservation, wetland restoration, re/afforestation and forest ecosystem management, terracing, and river embankment improvements, among others. The Program will also support provincial-level results, including the ability to carry out integrated ecosystem and water resources management plans, which are expected to inform future programs and investments in the province.

19. **The Program's four results areas (RAs) are designed to address the key challenges of water scarcity, water pollution, and ecosystem degradation and their integration at the basin, provincial, and sub-basin levels.** These are aligned with the objectives of the Government program and were informed by assessments of the water balance, water quality, and ecosystems. They are nested at three levels: (a) at the demonstration sub-basin level, integrated ecosystem and water resource management plans will be piloted following a water consumption approach and selected interventions implemented to increase

[67] The four demonstration sub-basins in Shaanxi spread across nine counties: Yaozhou, Yintai, Wangyi, Yijun, Xunyi, Liquan, Yongshou, Qianxian, and Xingping, in two municipalities, Tongchuan and Xianyang.

water use efficiency, improve water quality, and restore key ecosystems; (b) at the provincial level, these integrated plans will be scaled up through the development of technical guidelines for integrated ecosystem and water resource management planning that will be applied in other sub-basins in Henan and Shaanxi to guide planning and implementation of investments under future government programs; and (c) at the basin level, the YRCC will operationalize an integrated ecosystem and water resources information management platform and carry out water resource assessments with a consumption-based approach within a pilot sub-basin with the objective of replicating this approach within the whole YRB.

20. **Duration.** The timeline for the Program is 2022 to 2027. This is aligned with the timeline for implementation of the Government's program, with the Program preparation and implementation period coinciding with the Government's schedule to prepare and implement provincial plans and implementation of the 14th FYP (2021-2025). The timeline for the Program allows the World Bank to engage early, introduce international experience and knowledge, and support the Government with innovative technologies and good international practices. It also allows for the utilization of results and experiences of the Program to inform the next phase of investment planning (15th FYP).

Table 1. Overview of the Government program and PforR Program: Results Areas, Activities and Geographic Area

<table>
<tr><th colspan="6"></th></tr>
<tr><td rowspan="4">Government program</td><td>National program</td><td colspan="4">'Yellow River Basin Ecological Protection and High-quality Development Master Plan' (YRB Plan)
National guiding plan with six key areas: (a) ecological and environmental protection,; (b) water conservation, (c) disaster management, (d) pollution management, (e) high-quality development, and (f) Yellow River culture. Covering 9 provinces and 752,443 km^2.</td></tr>
<tr><td>YRCC program</td><td colspan="4">YRCC's 'Water Security Plan for the YRB Ecological Protection and High-Quality Development'
Basin agency plan with five key areas on ensuring water resources security, enhancing water ecological protection and restoration, strengthening soil and water conservation, and enhancing basin management capacity. Covering 9 provinces and 752,443 km^2.</td></tr>
<tr><td>Henan Province program</td><td colspan="4">'Henan YRB Ecological Protection and High-Quality Development Plan'
Provincial plan with five key areas on enhancing water saving, strengthening flood management, enhancing ecosystem protection and restoration, strengthening pollution management and promoting capacity building and institutional reform. Covering 7 municipalities and 36,200 km^2.</td></tr>
<tr><td>Shaanxi Province program</td><td colspan="4">'Shaanxi Province Wei River Basin Water Ecological Restoration Plan'
Provincial plan with six key areas, including water conservation, ecological protection and restoration, and water pollution reduction. Covering 54 counties and 67,000 km^2.</td></tr>
<tr><td>PforR</td><td>Program Activities</td><td>RA 1: Improving Water Use Efficiency</td><td>RA 2: Improving Water Quality</td><td>RA 3: Improving Ecosystem Management</td><td>RA 4. Strengthening integration of ecosystem and water resources management into strategic planning</td></tr>
</table>

		• Modernizing and rehabilitating irrigation schemes • Improving agronomic practices • Developing and implementing TVAPs • Building or rehabilitating rural water supply systems and pipelines • Improving the capacity of local communities and WUAs on agricultural water management • Increasing the participation of women in leadership roles within the WUAs	• Upgrading effluent standards within existing wastewater treatment plants • Installing rural wastewater treatment systems with household connections • Rehabilitating rural wastewater treatment pipelines • Improving livestock and poultry manure collection and treatment rate • Promoting organic fertilizer use and precise chemical fertilizer application	• Integrated landscape management planning • Afforestation/ reforestation with increased species diversity • Soil and water conservation including terracing • Wetland protection and restoration • Vegetation restoration with promoted natural regeneration	• Preparing integrated ecosystem and water resources management plans for demonstration sub-basins • Preparing provincial-level guidelines for integrated ecosystem and water resources management planning and developing provincial-level integrated plans • Developing consumption-based water management approaches for the YRB and piloting them at the sub-basin level • Developing and operationalizing an integrated ecosystem and water resources information management platform for decision-making at the YRB • Preparing technical standards and guidelines for the protection of YRB • Training and capacity building on ecosystem and water resources management at the provincial and basin levels
	Boundary	Henan: Hong Nong Jian, Qing Long Jian, and Jian sub-basins, covering 6,900 km^2 (five counties and one municipality) Shaanxi: Qishui, Jing, Shichuan, and Beiluo sub-basins, covering 38,842 km^2 (nine counties and two municipalities)			Demonstration sub-basins in Henan and Shaanxi Yellow River Basin Henan Province, Wei River Basin Shaanxi Province YRB-wide through support to YRCC

21. **The Program's RAs are designed around an integrated landscape approach to catchment management.** These support a nested hierarchy of activities with activities under RAs 1, 2, and 3 implemented in demonstration sub-basins, while provincial and basin-wide results will be supported through RA 4. Activities within the demonstration sub-basins are built on baseline assessments of current land use patterns, biophysical and socioeconomic conditions, a remote sensing based water balance to determine water consumption, modeling of water quality, and a diagnostic of the drivers of land degradation and biodiversity loss. These assessments were used to guide the definition of priority interventions that includes activities related to water use efficiency, water pollution control, and ecosystem management at the demonstration sub-basins (RA 1, 2, and 3) and also support the preparation of integrated ecosystem and water resources management plans within the demonstration sub-basins (RA 4). Based on the experiences and lessons learned from the preparation of these integrated ecosystem and water resources management plans within the demonstration sub-basins, RA 4 will support upscaling through the development of provincial technical guidelines and their application to preparation of provincial-level integrated plans for the Yellow River in Henan Province and the Wei River

in Shaanxi Province. RA 4 will also support the YRCC to leverage the experiences and lessons learned to deliver basin-wide results on the promotion of integrated ecosystem and water resources planning and the supporting information systems and tools. Specifically:

- **RA 1: Improving water use efficiency.** This RA will support selected interventions to increase water use efficiency within sustainable limits (table 1). RA 1 activities will be implemented in the demonstration sub-basins in Shaanxi and Henan Provinces. The activities will improve water productivity through modernization and rehabilitation of irrigation schemes, enhanced capacity of WUAs for agricultural water management and increased water use efficiency within agreed target values for water consumption. The combination of these activities will increase water productivity, reduce water consumption, and further safeguard ecological flows for ecosystems, which contribute to global biodiversity outcomes.

- **RA 2: Improving water quality.** This RA will support selected water pollution management interventions to address water pollution (table 1). RA 2 activities will be implemented in the demonstration sub-basins in Shaanxi and Henan Provinces. The activities will reduce pollutant loads through improved collection and treatment of rural wastewater and addressing NPS pollution from the agricultural sector. These activities will further reduce GHG emissions from wastewater and the agricultural sector and improve water quality to support critical ecosystems, thus directly contributing to the GPGs of climate mitigation and biodiversity while indirectly contributing to reductions in the leakage and transmission of plastic waste through waterways into the ocean.

- **RA 3: Improving ecosystem management.** This RA will support selected ecosystem protection interventions to address ecosystem degradation and improve resilience (table 1). RA 3 activities will be implemented in the demonstration sub-basins in Shaanxi and Henan Provinces. The activities will promote ecosystem restoration and catchment management while addressing the key drivers of biodiversity loss within the demonstration sub-basins. The RA will introduce a shift from monoculture forest to a diversified forest structure with mixed species, to enhance environmental benefits and increased resilience to natural disasters. It will also restore degraded ecosystems using close-to-nature approaches, increase interconnectivity, and support habitat conservation for biodiversity. Among others, these activities will improve ecological functions, enrich biodiversity, enhance resilience to climate change, and facilitate carbon sequestration, thus contributing to the biodiversity and climate mitigation GPGs.

- **RA 4: Strengthening integration of ecosystem and water resources management into strategic planning.** This RA will scale up selected innovations to the sub-basin, provincial, and YRB levels (table 1). RA 4 activities will be implemented by Henan and Shaanxi at the demonstration sub-basins and provincial levels and by the YRCC at the YRB level. The activities will embed the integrated water and ecosystem management approaches into the Government programs to promote resilient, sustainable, and high-quality development for the demonstration sub-basins and the Program provinces while also introducing innovative consumption-based approaches to the assessment, allocation, and monitoring of water resources in the YRB. This RA therefore has large potential to contribute to all Program GPGs.

C. Proposed Program Development Objective(s)

Program Development Objective(s)

22. **The PDO** is to strengthen integrated water use efficiency, water pollution control, and ecosystem management, in selected regions of the Yellow River Basin.

23. **PDO level indicators:**

(a) Agricultural water productivity increased (CNY/m^3)

(b) Pollutant loads reduced (tons/year)

(c) Reduction of soil erosion per km^2 (tons/year)

(d) Capacity of YRCC to support integrated ecosystem and water resources management of the YRB (text).

D. Environmental and Social Effects

24. **An Environmental and Social Systems Assessment (ESSA) has been conducted to provide a comprehensive review of environmental and social (E&S) systems and procedures in China and in Henan and Shaanxi Provinces.** The ESSA concludes that a comprehensive and effective system has been established in relevant sectors at both national and provincial levels to identify, assess, mitigate, manage, and monitor E&S impacts and risks related to Program activities, including (a) a comprehensive regulatory system, with applicable laws, regulations, policies, standards and technical guidelines at the state and local levels; (b) clear implementation mechanisms, with clear administrative procedures, institutional arrangements and responsibilities for E&S impacts and risks management, and necessary professionals and financial resources; and (c) good performance of the Environmental and Social Management Systems (ESMSs) according to the field investigation findings. Based on the assessment, the ESMSs related to the Program are principally consistent with the World Bank's PforR Policy and Directive.

25. **The ESSA was conducted according to the following methodology**: (a) thorough screening of the potential impacts from the activities to be supported by the PforR and the potentially associated activities; (b) desktop review on E&S laws and regulations and procedures related to managing the relevant Program activities at the national, provincial, and local levels; and (c) field visits to sites of typical Program activities in selected counties, with extensive meetings and interviews with key stakeholders ranging from implementing agencies to government officials at provincial, county, township, and village levels and representatives of local communities. Observations and discussions during these visits provided a good understanding of the potential E&S impacts associated with the Program's activities and capacity of government departments for dealing with such impacts, including measures adopted under relevant laws and regulations.

26. **The ESSA estimates the E&S risk associated with the Program to be substantial considering the diversified basin-wide activities and potential cumulative impacts.** The Program will have significant and

broadly positive E&S effects, designed to address three key challenges facing the YRB: water scarcity, water pollution, and ecosystem degradation. The Program does not involve construction of associated activities/facilities, but some proposed rural water supply activities may rely on existing reservoirs as water sources. E&S screening was conducted on the proposed Program activities and the potentially associated activities to exclude those with the potential to cause significant adverse impacts on the environment and/or potentially affected people, including (a) remediation of old mines; (b) activities (such as 'creation of new wetlands') that may involve large-scale land acquisition; (c) water transfer projects; (d) reservoir dredging, dam reinforcement, and rehabilitation; (e) construction and expansion of domestic sewage treatment plants with a total capacity of more than 50,000 m^3/day, or any facilities involving industrial wastewater treatment; and (f) other activities that are classified as Class A (requiring full Environmental Impact Assessment [EIA] Report) according to the latest national Catalogue for the Classified Management of the Environmental Impact Assessment of Construction Projects, for example, river rehabilitation (including dredging) in environmentally sensitive areas, river dredging activities involving contaminated dredged material, and so on. With the application of these exclusion criteria, the range of activities required to achieve the Program results are not expected to include any which would be defined as 'High Risk'. The negative environmental impacts associated with the Program activities will generally fall within a 'Moderate' category, generally manageable with known and demonstrated mitigation measures including (a) construction-related and site-specific impacts/risks such as temporary generation of emission, wastewater, noise, solid waste, and soil erosion and operational, health, and safety (OHS) management issues; (b) impacts on local environment and ecosystems with the operation of Program-supported facilities/works such as effluent discharge and solid waste generation of wastewater treatment facilities, safe operation of facilities, labor management issues, workers' health and safety, safe application of fertilizers, impacts on farmers' livelihoods, and so on; and (c) safety management of existing dams supplying water for rural water supply activities. These adverse E&S impacts are not significant and can be well identified and readily avoided, minimized, and mitigated through mature technologies and good management practices. Also, the downstream E&S impacts of proposed planning and capacity building results are anticipated to be positive in the long term. Neither OP 7.50 - Projects on International Waterways nor OP 7.60 - Projects in Disputed Areas are applicable to the Program. However, given the number of activities and the geographic scale across the river basin, potential negative E&S cumulative impacts still need to be assessed and addressed as part of the Program in planning specific interventions at the sub-basin levels, particularly considering the various types of interventions and insufficient coordination of ecological and water management action across jurisdictions and sectors at the current stage. Therefore, the overall rating of E&S risks of the Program is 'Substantial'.

27. **The ESSA recommends that the PforR be used as an opportunity to enhance the E&S management capacity and the implementation of integrated river basin/sub-basin ecological protection and restoration plans.** Some areas for improvement were identified in the assessment: (a) challenges remain with optimizing inter-jurisdictional coordination of water ecosystem and water management, which in turn has implications for E&S risk management; it is anticipated that the basin and provincial results of the Program will result in improvements in this regard; (b) a number of sewage treatment facilities, particularly those in the rural areas, have operation and maintenance (O&M) challenges such as lack of timely maintenance, lack of technical support, and poor management; in addition to direct E&S implications created by poor outflows, other O&M issues such as OHS management, community awareness, and so on also exist; (c) documentation on public consultation, information disclosure, and grievance redress mechanism (GRM) operation is relatively weak, and some enterprises have not established the GRMs for their construction and operation. Accordingly, two particular PAP actions are

recommended to address point b and c: (a) provide regular training for the staff maintaining the town and village sewage treatment facilities focusing on OHS and other E&S impacts associated with poor O&M and (b) establish monitoring and reporting mechanisms for meaningful public participation and GRM and strengthen information and documentation management during the Program social risk management.

28. **Consultation and information disclosure.** Relevant stakeholders, including both government departments and local communities, were consulted through meetings and field visits to selected counties. The draft ESSA report was shared with the Henan and Shaanxi PPMOs and all Program counties during preparation. Consultation meetings were carried out with key stakeholders at the provincial and county levels on November 11 for Henan and December 6 for Shaanxi, and the report was shared with the YRCC in January 2022. The stakeholders consulted voiced their support in implementing the proposed Program and concurred with the findings and recommendations of the draft ESSA, which were considered relevant and valuable for strengthening the actual effectiveness of the implementation of the existing E&S system. Some stakeholders provided valuable opinions to improve the accuracy of the ESSA description in local context, which have been reflected in the revised ESSA. Upon finalization, the ESSA report will be disclosed on the World Bank's website (in English) and on the two provincial websites and the YRCC's website (in Chinese) in January 2022.

E. Financing

29. **Program financing.** The total Program financing is estimated at US$1,776 million, of which US$1,396 million (78.6 percent) will be financed by the Government and US$380 million (21.4 percent) will be financed by an IBRD loan (**Error! Reference source not found.**). Of the US$1,396 million Government financing, it is estimated that US$80 million (5.7 percent) will come from YRCC, US$542 million (38.8 percent) will come from Henan Province, and US$774 million (55.4 percent) will come from Shaanxi Province. Of the US$380 million IBRD loan, US$10 million will be allocated to a disbursement linked indicator (DLI) supporting the YRCC and the basin-level program, with US$185 million each allocated to Henan and Shaanxi Provinces in support of their respective sub-national programs. The proposed PforR will exclude high-risk activities with potentially adverse impacts on the environment and or affected people. In addition, it will exclude activities that involve the procurement of (a) works estimated to cost US$75 million equivalent or more per contract, (b) goods and non-consulting services estimated to cost US$50 million equivalent or more per contract, or (c) consulting services estimated to cost US$20 million equivalent or more per contract.

Program Financing (Template)

Sources	Amount (USD Million)	% of Total
Counterpart Funding	**1,316.00**	**77.59**
Borrower/Recipient	1,316.00	77.59
International Bank for Reconstruction and Development (IBRD)	**380.00**	**22.41**

Total Program Financing	1776.00	

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